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DOCTOR OF PHILOSOPHY

Asnani' – my teeth – exploring behavioral prevention strategies for dental caries in Qatari primary schools: A case study approach

Alyafei, Najat

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‘Asnani’ – my teeth – exploring behavioral prevention strategies for dental caries in Qatari primary schools: A case study approach

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PRIFYSGOL
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DEDICATION

I dedicate this thesis to my family, in particular my children who hugged me dearly and held back their tears whenever I was about to travel, knowing I was leaving them behind. To my eldest son Abdullah, who wishes always for my wellbeing, for not staying out late or alone and always reminding me to sleep early in preparation for the meeting with my supervisor the following day. Whenever I asked him what gift I should bring back for him, he always said for “you to come home safely mom”. To my second baby, my girl Reem, who cleaned and decorated my room all the time, updating me with everything happening at home, and how much she was thinking of me. To my son Khaled, who all the time showed his strong at the same time showed me how much he will miss me sweethearts who were hugging me days before traveling and were asking for a recent photo for them to remember me by. To my youngest son Yousef (twin of Samia) who was asking all the time ‘when are you coming back mum’ and asking for a list of gifts whenever I was returning home. To my youngest, dearest Samia who addressed letters to me in my absence, expressing how much she missed me and always asked for an updated photo to look at when she missed me, whilst I was away. To all of my children who celebrated when I was back in the country by buying from their school breakfast money, chips and chocolates and pray for me to pass my viva and get my PhD.

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ABSTRACT

Introduction

Dental caries, popularly known as tooth decay, is the most prevalent chronic disease among children worldwide. The overall aim of this study was to understand how best to develop dental caries behavioural prevention strategies for children in Qatari primary schools by examining the evidence underpinning behavioural strategies with the use of a case study approach. The study sought to illuminate contextual factors that are deeply embedded in the spheres of the primary school and home environment and their interplay with the existing oral hygiene programme

Methodology

The study was conducted in 3 phases: scoping review, case study, and co-production workshop. The scoping review was a conceptual review of the evidence in the literature to provide the theoretical background and conceptual framework that guided the empirical case study work. A multiple case study was conducted using a public school and a private school to understand why the prevalence of dental caries was high among primary school children in spite of previous oral health strategies. The outcome from this phase was used to inform the refinement of current dental caries behavioural prevention strategies in Qatar for school children in both public and private settings through co-production workshop which was the final phase.

Results

The study found that oral health programmes targeted at primary school children in Qatar are fragmented. Organisational and cultural forces were identified as negative fractured forces that hinder the success of oral health programmes in Qatar. The study found factors that may enhance the effectiveness of school oral health programme, which include a comprehensive school oral health policy, regular programmes, active involvement of parents, pupils and teachers, and adequate follow-up/monitoring. The study found that home context plays a crucial role in terms of oral health motivation in Qatar. It was found that at home, children are taught the most daily oral hygiene-related behaviours, including tooth-brushing and dental flossing. The study revealed the role of parents at home in supporting oral health activities as a way to motivate and empower children to take part in such behaviours. Also, parents and teachers work in collaboration to enhance oral health behaviours in children. The study revealed that teachers play a crucial role in implementing appropriate oral health lessons

in schools to educate children about tooth brushing, dental flossing, and the need for dental clinic visits.

Conclusion

A comprehensive school oral health programme could be a means of integrating the dental health services at school and home to improve oral health of schoolchildren in Qatar.

PREAMBLE: A REFLEXIVE ACCOUNT

Introduction

This reflection provides a platform for positioning my role as the researcher within the study that explored the development of a primary school based behavioural prevention programme for childhood caries in Qatar. The study was sought to provide a better understanding of the contextual mechanisms and cultural processes that may influence the programme for preventing dental caries among primary school children in Qatar. Consequently, the study adopted a multiple case study approach to understand in-depth the complexity of relationships between children, parents, and those working in the schools across private and public sectors. The study critically appraised *how* these stakeholders constructed dental hygiene and dental caries in the context of a programme that was embedded in primary schools within the cultural environment of Qatar.

A researcher using qualitative methods either participates as an ‘insider’ or an ‘outsider’ in the research process (Breen, 2007). In the context of the study, I could be described as an ‘insider’ in this research as a Qatari parent and dental hygienist. I was previously a Senior Dental Hygienist at Hamad Medical Corporation. Currently, I am the Head of Preventative Oral Health Services at the Primary Healthcare Corporation, a member of the National Oral Health Committee (NOHC) 2014-2016, a Deputy Member of the Oral Health Promotion and Prevention Working Group, and the Leader of the School Oral Health Programme (SOHP) tagged ‘*Asnani*’ in Arabic which means *My Teeth*. The value system of a researcher using qualitative methods, especially as an insider, often influences the research process and outcome (Greenbank, 2003). In this reflexive account, I reflected on how my value system might have influenced my role within this research based on a framework that satisfied the value system into *competency, moral, personal, and social values* (Rokeach, 1973). Competency values refer to the individual perception about the comparative effectiveness of different approaches of executing the same task. Moral values entail an individual sense of ‘right’ and ‘wrong’. Personal values are the hopes and aspirations of each person. Social values refer to how individuals feel society should operate. Individuals may need to prioritize values when conflict occurs (Greenbank, 2003). I examined my competency values as a dental hygienist and how these influenced the planning and implementation of this research. In addition, I reflected on my personal values as a Qatari mother of five children and how this influenced the choices I made in relation to the research. Finally, I reflected on my moral and social values in relation to my upbringing within the cultural context of Qatar and my dental hygiene education in Saudi

Arabia, the United States of America, and the United Kingdom. I particularly discussed how all these values have influenced my choice of research topic, study design, recruitment of participants, data collection, and data analysis.

Competency Values

Competency values are described as the belief of an individual regarding effective ways of implementing tasks (Rokeach, 1973). My competency values were largely influenced by over 2 decades of experience as a dental hygienist. Since I began my career as a dental hygienist within Hamad Medical Corporation (HMC) in Qatar in 1992, oral health education has been an integral part of my post. I had volunteered as a health educator in different local and national events. I have published six oral health educational posters and two oral health educational booklets for school and community awareness. I was also involved in the prevention and care of childhood dental caries during this extended period. Furthermore, I have participated in designing school oral health programmes since March 2016, when I was appointed as the Head of Preventative Oral Health Services in Primary Healthcare Corporation (PHCC), Qatar. During this period, I had come to appreciate the high prevalence of dental caries in Qatar and the existing gap in prevention strategies. I noticed that dental caries prevention strategies at the school health clinic focused only on dental examination of children in grades 1 and 4 with no behavioural prevention strategies involving the wider school. This realisation and identification of a gap in applied practice was the primary motivation for the development of this research. Echoed with my own experiences as a dental hygienist with more than two decades of experience, I cannot effectively prevent dental caries without promoting positive oral health behavioural change. The major underlying factors of dental caries are poor oral hygiene and consumption of sugary candies (Bener, Al Darwish, Tewfik, & Hoffmann, 2013). I believe tackling these root causes remains the most effective primary prevention of dental caries.

After deciding the topic, I focused on selecting the study design, which was a major decision that I had to make. I was confronted with the choices of positivist and interpretivist approaches (Idowu, 2017). Would the positivist approach, which tends to favour quantitative research methods such as meta-analysis and randomised controlled trials, be appropriate for my studies? Would the constructivist approach, which favours the qualitative methods, be acceptable to the policymakers? Deciding between these two alternatives was indeed a major challenge and my choice of the interpretivist's perspective was largely influenced by my competency values. In my years of dental hygiene clinical practice, I came to realise the high regard of quantitative evidence among policymakers. However, I have also realised the

importance of qualitative evidence in providing an insight into why and how things work. I therefore chose the interpretivist approach to aid the understanding of the ‘how’ and ‘why’ questions of dental caries in Qatari context.

Personal Values

According to Rokeach (1975), personal values refer to the hopes and aspirations of an individual. The hopes and aspirations of every mother in the world is for her child to be healthy. I am a Qatari mother of five, with my youngest children being 7-year old twins at the beginning of this study, It was no coincidence that I became interested in the oral hygiene of children aged 6 to 11. My experience with oral hygiene of my children has taught me the significant roles of parents in communicating behavioural change to their children, including oral hygiene (Evans, Pearson, & Simons, 2013; Polk, Geng, Levy, Koerber, & Flay, 2014). This is, especially, important with dental caries that are linked to behaviours, such as consumption of sugary snacks, which are often provided by parents (Damle, Patil, Jain, Damle, & Chopal, 2014; Yekaninejad et al., 2012). As a mother, I had to strike a balance between my children’s craving for confectionaries and oral hygiene by allowing them a few candies but insisting on regular tooth-brushing and dental flossing. I, therefore, understood that many parents might be going through a similar experience.

The choice of study design was greatly influenced by my personal values and experience as a mother. I chose to interview children as a dyad with their parents in recognition of the crucial roles that parents play in the context of the dental hygiene of children. I have approached the interview of parents with empathy since we share a similar experience in the context of raising children in Qatar. When children reported very poor oral hygiene or demonstrated poor oral hygiene knowledge, I avoided judging them or their parents. I was also careful not to allow my pre-conceived ideas and assumptions to interfere with the interview. I used probes to obtain more clarification whenever I observed non-verbal cues during the interview rather than relying on inference.

Moral Values

Moral values refer to the perception of individuals about the ‘rightness’ or ‘wrongfulness’ of an action (Rokeach 1973; Wikström, 2009). My moral values were largely influenced by being brought up in the Islamic cultural context of Qatar. Personal hygiene, including oral hygiene, is a cardinal virtue in Islam. A Muslim is expected to brush his teeth with Miswak (chewing stick) before prayers five times a day. It is stated that the regular use of Miswak purifies the mouth and pleases Allah (God). Thus, my religion was an important motivation for my keen interest in promoting oral hygiene.

Islam recognises the roles of teachers and parents in guiding children in the right way of life. Although the roles given to parents and teachers in this research were based on the literature (Gonzalez-Del-Castillo-McGrath, Guizar-Mendoza, Madrigal-Orozco, Anguiano-Flores, & Amador-Licon, 2014), my moral values and cultural context have also influenced my decision to assign prominent roles to teachers and parents in this research. Apart from being interviewed during the case studies, teachers and parents were also involved in the co-production of oral health strategies for the prevention of dental caries among primary school children in Qatar.

Social Values

Rokeach (1973) observed that social values are concerned with expectations of how society should operate. Although I was brought up in Qatar, I had all my higher education outside the country. I obtained a Bachelor of Science in Dental Hygiene in 1992 from King Saud University (KSU), Riyadh, Saudi Arabia, a neighboring country with a similar language and culture. I obtained a Master of Science in Education, Administration, and Dental Hygiene at Old Dominion University, Virginia, USA in July 1998. I started my PhD in October 2016 at Bangor University, United Kingdom. My education sojourn and transition through these different cultures definitely had an impact on my current research. Rather than being a disadvantage, this transition through cultures broadened my horizon on how a society should operate and influenced my choice of methodology for each stage of the study.

My master's degree dissertation, which focussed on oral health knowledge, attitudes, and behaviours of Qatari people, gave me a prior insight into how the Qatari society operates in relation to oral health. My PhD is thus an attempt to influence how school oral health programmes should operate in Qatar. I started my research by reviewing oral health-related policies to provide further understanding of how oral health programmes were operating in Qatar. I also conducted a scoping review of the literature to obtain international experience about dental caries behavioural prevention programmes across the world and identify international best practices. I then conducted multiple-case studies to test the propositions from the literature. Finally, parents, teachers, and school nurses were involved in the design of behavioural prevention strategies for dental caries among primary school pupils in Qatar.

Summary

Using a framework of value system, which was developed by Rokeach in 1975, I have reflected on how my competency, personal, moral, and social values influenced my roles as a researcher. I reflected on my career, my parental responsibilities, my upbringing, and educational sojourn. It is, however, important to note that these values were not strictly

restricted to the corresponding experience as described. For example, my competency values were not only a function of my career, but also were a function of my parental experience with oral hygiene of my children. Similarly, my social values were also largely influenced by my social interaction in my career and not just my education. Thus, the values are interrelated. This reflexive account has provided an understanding of my insider position in this research and how this position influenced my choices of research topic and methods.

STRUCTURE OF THE THESIS

The thesis is presented in eight chapters.

- Chapter One maps the background context on oral health indices, programmes and policies in Qatar. The huge burden of dental caries in Qatar was highlighted. The policy analysis revealed that the school-based oral health initiatives is a recognised priority objective of the national oral health policies, and the PHCC and HMC were identified as major stakeholders in oral health delivery in Qatar.
- Chapter Two provided a review of behavioural change theories which have been applied to school oral health including Social Cognitive Theory, Health Belief Model, Theory of Reasoned Action, Theory of Planned Behaviour, and Transtheoretical theory. An initial theoretical framework was developed for the study based on the review.
- Chapter Three presented the scoping review of international literature on school-based programmes for dental caries. The review found that multiple factors influence the effectiveness of behavioural intervention among school children, which include engagement and active participation of pupils, the involvement of significant others, regularity of intervention, the use of teaching aids, and combination of interventions. These were used as theoretical propositions for the case study.
- Chapter Four presented the justification for using a case study methodology adopted for the study, including the case study interviews and co-production workshop. The study used a multiple case study approach. The theoretical propositions were developed based on the review of behavioural change models and scoping review of international literature. Semi-structure interviews were conducted with pupils, parents, teachers, and school nurses in the private and public schools using English and Arabic semi-structured interview guides. A co-production workshop was then organised based on the results of the interviews.
- Chapter Five reported the findings of the multiple case studies conducted among pupils, parents, teachers, and school nurses in a private and a public primary school in Qatar. The case studies were the second phase of the study to explore participants' views on how best to develop prevention strategies for dental caries among children in Qatari primary schools and look at the lessons learnt from the current oral health programme being implemented in primary schools. The views of parents, children, teachers, and school nurses were explored on how best to implement a school oral health programme workshop.

- Chapter Six reported the findings of the co-production workshop, which was aimed at obtaining further inputs of the school oral health stakeholders in the framework being developed for dental caries prevention. The co-production process workshop was the final phase of the study where the participants of each school worked together to explore from their points of view the factors that were important in the primary school and home environment, and how it can be linked up with the existing oral hygiene programme being implemented in primary schools within Qatar. The concept was so that to give them a chance to shape what a good programme should focus on and what would be involved in the future, and thus identifying how best to develop dental caries behavioural prevention strategies for children in Qatari primary schools by examining the evidence. A brief overview of the methods used for the workshop and the patterns that emerged from the data were also presented.
- Chapter Seven focused on the synthesis of the findings of all the three phases and modelling of the framework for dental caries prevention among primary school children in Qatar. The chapter provided the summary of the key findings of scoping review, the case study interviews, and the co-production workshop
- Chapter Eight outlined the discussion of the overall findings within the contemporary international literature, as well as identifying recommendations for research, policy, and practice. This chapter presented the discussion of the findings from the case study interviews and co-production workshop drawing on evidence from the literature to address the objectives of the study.

GLOSSARY OF ABBREVIATIONS

Asnani	My Teeth	MI	Motivational interviews
BPS	Behavioural prevention strategy.	NOHC	National Oral Health Committee
ChildSmile	National oral health programme in Scotland.	OHB	Index, oral health behaviour
CDS	Community Dental Service	OHE	Oral health education
CRA	Caries Risk Assessment	OBG	Oxford Business Group
Designed-to-Smile	National oral health programme in Wales	OHI-S	Simplified Oral Hygiene Index
DHE	Dental Health Education	OHK	Oral health knowledge
DMFT	Decayed (D), Missing (M), Filled (F) or Teeth (T).	OHRQoL	It is a multidimensional concept that captures people's perception.
DMFS	Decayed (D), Missing (M), Filled (F) or Surfaces (S).	OHS	Oral hygiene status
EL	Experiential learning	PHCC	Primary Healthcare Corporation
HMC	Hamad Medical Corporation	PHCE	personal, Social, Health, and Economic
GBI	gingival bleeding index.	QA	Quality Assurance
GCC	The Gulf Cooperation Council (GCC) is a political and economic union of Arab states bordering the Gulf. It consists of 6 members: Qatar, Saudi Arabia, Oman, Kuwait, Bahrain, and United Arab Emirates.	SEHA	National Health Insurance Scheme
GDP	gross domestic product	SOHP	School Oral Health Programme
IEC	Implementation of education and communication materials	SPMT	The South Pacific Medical Team
IIF	Institute of International Finance	WHO	World Health Organization
IMDP	Into the Mouth of Babes Programme	VBI	Visible bleeding index
KBS	Knowledge, behaviour, and oral hygiene status		
KGO	Knowledge about gingivitis and oral cancer/oral submucous fibrosis.		
JICA	Japan International Cooperation Agency		
MaliMali	National oral health programme in Tonga		
MDU	Mobile dental units		

CHAPTER ONE

Introduction And Background Context

Introduction

The study aimed to provide better insights into the availability of behavioural prevention strategies in Qatar's public and private schools. The study explored the perceptions of teachers, nurses, parents, and pupils of both public and private schools in Qatar to determine their oral health knowledge and how oral health behaviour can be improved to reduce and prevent oral health disorders, including dental caries. The study used a qualitative multiple case study approach in which parents, teachers, pupils, and nurses from public and private schools in Qatar were interviewed. The overall study is framed as a case study work, and adopts a constructivist stance to examine an aspect of oral health in Qatar based on the constructions of different groups. The study aims to provide actual meaning based on the perceptions of teachers, students, and nurses regarding oral health.

This chapter summarises the study's research, aims and objectives. The chapter also provides the background context regarding issues around oral health in an international context prior to outlining the nature of oral health in Qatar and the challenges of dental caries in schools within Qatar.

Aims and Objectives

The primary aim of conducting the study was to explore oral health in Qatar and to gain insight into behavioural prevention strategies for preventing dental caries among school children of public and private schools.

The objectives of the study were to:

1. Understand how oral health behavioural prevention strategies operate in the contexts of public and private primary schools in Qatar;
2. Explore *why* oral health knowledge and behaviour of primary school pupils in Qatar remains intransigent despite oral health programmes in schools;
3. Explore the contexts and mechanisms that underpin the motivation of primary school pupils and their parents in Qatar to improve their oral health behaviour;
4. Understand how changes in oral health behaviour may be sustained among primary school children in Qatar

Rationale of the Study

Good oral health is critical in preventing oral and dental diseases, including dental caries, chronic mouth pain, oral cancer, periodontal diseases, tooth loss, tooth decay, and other related diseases of the oral cavity (Kapoor, 2015). Based on the increasing cases of oral health problems both globally and in Qatar, the WHO has found the need to support healthcare professionals in implementing evidence-based interventions or programmes to prevent oral diseases and improve oral health (Pitts et al., 2016). Professionals also work to reduce inequalities in oral health and provide appropriate services (Kapoor, 2015). As such, this study provided useful information that would guide the adoption of oral health strategies in Qatar to prevent oral diseases. The findings of the study provided valuable information for effective prevention programmes that can be used with preschool and school-aged children to reduce the prevalence of dental caries. The daily routines in schools present an opportunity to deliver and reinforce oral health prevention programmes. Earlier studies suggest that school-based programmes could be effective in educating preschool and school-aged children on healthy habits to prevent oral diseases (Macnab, 2015; Nakre & Harikiran, 2013). As a result, the aim of this thesis was to provide a better understanding on the mechanisms that may prevent or reduce the prevalence of oral health problems among school children in Qatar. The findings helped improve the adoption and effectiveness of school-based oral health programmes internationally. The findings also contributed to the existing body of literature by elaborating on what is known and what is not known about oral health in Qatar.

Critique of Global Oral Health Systems

While the primary investigator noted that various researchers had investigated oral health, the topic was far from being exhausted. Research into oral health improvement among children using all stakeholders like the pupils, teachers, parents, and nurses using visual aids would benefit school-going children. Various researchers noted that oral health improvement or awareness programmes lead to average improvements in dental hygiene practices. The primary investigator described the reason for such in several studies to have been caused by the strategies used in implementing and developing the programmes. The existing oral health programmes are unclear regarding the most suited persons to implement them among various populations. Most oral health programmes are teacher-guided. Whereas school-based oral health programmes were proven to be successful, the primary investigator noted that the children's oral health at home negatively influenced the programme's outcome.

Moreover, the primary investigator noted a significant limitation in oral health programmes: inequalities in access and provision of oral health care in developing countries and low-income earners. Therefore, the present study aimed to identify how to reduce the gap

in access and delivery of oral health programmes to eliminate inequalities. The primary researcher noted that oral health programmes adopted in schools globally have not been fully effective due to the absence of policy guidelines. Such an aspect guided the researcher into investigating how to enhance school-based oral health programmes' success through policy implementations. Therefore, investigating the various oral health aspects in Qatari was expected to yield findings that would enhance children's oral health globally. Besides, positive findings from the study were expected to guide the adoption of sustainable oral health programmes that will lead to better dental behaviours up to adulthood.

Critique of the Health System in Qatari

While the Qatari government has prioritized oral health, there are gaps in how oral health education and awareness programmes effectively yield sustainable findings. The primary researcher noted that despite Qatar being a third-world country, it is still a rich country. However, despite being rich, its people are still suffering from periodontal disease and dental caries. The Ministry of Public Health (2015) reported that Qatar had no community or school strategy for implementing oral health hygiene practices. Therefore, the primary investigator noted that Qatar is far from effectively enhancing oral health behaviours and practices among children and parents. Public awareness campaigns were noted by the primary investigator as warranted for promoting oral health behaviours and increasing dental clinic visits, which researchers stated to be below the desired levels. Various researchers noted policy development to be the first aspect that needed to be focused on regarding oral health programmes in Qatar. The reason for making such a conclusion is that oral health hygiene programmes implemented in Qatar have not been successful due to the lack of policy guidelines. The country's water has noted to be salty with low minerals, an aspect that might explain the high incidences of dental caries. Thus, oral health hygiene programmes need to consider how standard fluoridation policies may be put in place by the government to enable all Qatari residents to drink water that would not place them at risk of dental caries. Another limitation that the primary investigator noted is the high value placed on sweets during celebrations in Qatar. Therefore, the people of Qatari need to be educated on the negative impact of the high-consumption of sweets during celebrations on their oral health.

Research Questions

The research questions of the study were as follows:

1. How do oral health behavioural prevention strategies operate in public and private primary schools in Qatar?
2. What is the oral health knowledge and behaviour of primary school pupils in Qatar?

3. Why have previous oral health programmes undertaken in the primary healthcare centers not produced any improvement in dental caries rate in children?
4. What are the different contexts and mechanisms that underpin the positive motivation of primary school pupils and their parents in Qatar to improve their oral health?

Background Information

Oral health.

Oral health is defined as the absence of disorders, defects, and diseases of mouth, teeth and adjacent structures (World Health Organisation, 2012). Oral health is an integral component of the overall human health, and the oral cavity is a major portal of entry for several diseases (World Health Organisation, 2012). Oral health is fundamental to overall health and well-being (Quadri, Shubayr, Hattan, Wafi, & Jafer, 2018). Loss of teeth is directly associated with deteriorating diet and compromised nutrition, which can impair health and exacerbate existing health conditions (Skeie & Klock, 2018). Oral diseases can affect a person's appearance and speech and may result in anxiety, depression, poor self-esteem and social stigma, which may inhibit opportunities for education, employment and social relationships (Prasai Dixit, Shakya, Shrestha, & Shrestha, 2013; Quadri et al., 2018).

Dental caries is a multifactorial disease caused by an interaction of biological, environmental, and social factors (Quadri et al., 2018). Dental caries result from a complex interaction of bacteria, diet, and host susceptibility. Dental caries entails demineralization of the hard structure of the tooth by the acids produced by the bacteria in the biofilm of dental plaque on the tooth surface. The production of acids is facilitated by saliva and sugary diet in the form of ingested refined carbohydrates (Garkoti, Singh, Rawat, & Pandey, 2015). The onset of dental caries is due to the development of dental plaque, which is caused by poor dietary habits, including high intake of fermentable carbohydrates and poor oral hygiene associated with infrequent tooth-brushing with fluorinated toothpaste (Evans et al., 2013; Mobley, Marshall, Milgrom, & Coldwell, 2009; Struzycka, 2014). Plaque bacteria, especially *Streptococcus mutans* and *Streptococcus sobrinus* metabolize fermentable carbohydrates in the mouth to produce acids that diffuse into demineralized hard dental tissue (enamel and dentine) (Evans et al., 2013; Mobley et al., 2009; Struzycka, 2014). As dental caries progresses further, it results in the cavitation and pulpitis or toothache, which, if untreated, can lead to tooth extraction (Evans et al., 2013; Mobley et al., 2009; Struzycka, 2014). In children, dental caries can be rapid due to the relative thickness of enamel and dentine in deciduous teeth compared to the permanent dentition.

Not only dental caries and its sequelae in children affect the individual, but also affect the entire society (World Health Organisation, 2012). Affected children may experience discomfort and pain and may require clinical intervention such as a restoration (filling) or dental extraction, which may have to be undertaken with general anesthesia involving hospital admission (Gray, 1989). Such experiences are distressing for children and their parents, and present a substantial cost burden on the healthcare system (World Health Organisation, 2012). Management of dental caries is expensive, and people with such oral diseases can enter a lifelong cycle of further dental interventions with increasing complexity (Casamassimo, Thikkurissy, Edelstein, & Maiorini, 2009). The dental plaque that precedes dental caries is a soft adherent deposit on the tooth surface that consists of mixed bacterial flora, desquamated epithelial cells and migrated polymorphonuclear leukocytes. The extent of dental plaque can be measured and is commonly quantified using several indices, including:

- Oral Hygiene Index
- Simplified Oral Hygiene Index | OHI-S
- Silness-Löe Index
- Quigley Hein Index (modified)
- Plaque Control Record

Various indices are also used to estimate the magnitude and severity of dental caries. Decayed, Missing, and Filled Teeth (DMFT) and decayed, missing, and filled surfaces (DMFS) are the most commonly used indices to indicate the number of teeth affected by dental caries in an individual. DMFT and DMFS are obtained by calculating the total number of decayed (D), missing (M), filled (F) teeth (T) or surfaces (S). Decayed teeth refer to the number of teeth that have caries lesion. Missing teeth indicate the number of teeth that have been extracted, and filled teeth refers to the number of teeth that have been restored. For any child, the prevalence of the disease can be calculated (proportion of teeth that have at least one dmft) or its severity (the number of dmft).

The prevalence of dental caries is a significant public health problem despite being entirely preventable (World Health Organisation, 2012). Primary preventive strategies for dental caries include oral health promotion through the interplay of different aetiological factors through public health policies, the creation of supportive environments, strengthening community action, developing personal skills, and reorientation of health services to manage the disease (WHO, 2018). Oral health behavioural prevention strategies seek to empower school children to prevent dental caries and improve their overall health (Kumar & Preetha,

2012). The school as an organised setting provides a potential opportunity to implement oral health programmes by promoting healthy food choices, sponsor on-site dental services, and provide oral wellness programmes (Gambhir, Sohi, Nanda, Sawhney, & Setia, 2013; Prasai Dixit et al., 2013). The literature suggests that school oral health programme may improve oral hygiene and reduce oral health disorders among children although the evidence-base is mixed (Cooper et al., 2013). It is evident that oral health problems also exist in Qatar.

Global burden of oral health.

The World Health Organisation, WHO (2012) reported that dental caries affects 60-90% of schoolchildren worldwide and recommends school-based oral health interventions as a key strategy to control childhood caries. Dental caries and periodontal disease are collectively the most common chronic disorders in humans with significant effects on the oral functions, quality of life, individual self-esteem, and the overall wellbeing and health of those affected (Jin et al., 2016). As such, dental caries poses a serious public health problem to people across their life-course (Jin et al., 2016). Dental caries is also the most common disease that affects children (Benjamin, 2010; Jin et al., 2011; Jin, 2013; Jin, 2015). According to the data from the European Union, it is estimated that 79 billion Euros per year are spent for the management of dental diseases, which is projected to increase to 93 billion by 2020 (Jin et al., 2016; Petersen & Ogawa, 2012). This financial burden is experienced by the healthcare system, the government, and the individual patient. The financial burden posed by dental caries is further exacerbated by health inequalities as many individuals do not have universal health coverage (Ndagire et al., 2020). Dental diseases are also amongst the commonest causes of lost time from work, school dropout, and disruptions to daily activities (Hayes, Azarpazhooh, Dempster, Ravaghi, & Quiñonez, 2013).

Internationally, it is estimated that more than three million people globally are affected by oral health disorders (Jin et al., 2016). It is apparent that 35% of the world's population experience untreated dental disease, and the worldwide prevalence of periodontitis, dental caries, and tooth-loss is 11%, 9%, and 2.3%, respectively (Kassebaum et al., 2014; Marcenes et al., 2013). Based on Disability-Adjusted Life Years (DALYs) and Years Lived with Disability, 224 years were lost per 100,000 population due to dental disease, and as a proportion of total DALYs for chronic diseases, this rose from 0.6% to 20.8% between 1990 and 2010 respectively (Marcenes et al., 2013).

Oral diseases are a major public health problem worldwide that affects 3.6 billion people, which represent more than half of the world's population (Kassebaum et al., 2017;

Watt et al., 2019). Dental caries, popularly known as tooth decay, is the most prevalent oral disease with 2.5 billion people affected around the world with children accounting for 500 million (GBD Disease and Injury Incidence and Prevalence Collaborators, 2017). The burden of dental caries is most severe in low-income countries and disadvantaged populations in high-income countries (Tarvonen et al., 2017). The severity of dental caries in such countries is due to limited access to healthcare services (Tarvonen et al., 2017). The prevalence of cavitated dental caries among children aged 5-6 years old ranges from 49% in high-income countries to 83% in lower-middle-income countries (Frencken et al., 2017). Besides, it is estimated that among children aged 12 years, the prevalence ranges from 42% in lower-middle income countries to 47% in high income countries (Frencken et al., 2017).

Despite global efforts to combat dental diseases across countries, health and cost burdens remain a public issue. Kassebaum et al. (2017) found that between 1990 and 2015, the prevalence has increased from 2.5 billion to 3.5 billion cases across 195 countries. Listl, Galloway, Mossey, and Marcenes (2015) argued that the cost of managing dental diseases was so high that it affected the gross domestic product (GDP) of many countries per capita (US\$144 billion a year). The estimated dental expenditures in the year 2010 varied across the regions globally. In Latin America and the Caribbean, dental expenditure amounted to 5% of GDP compared to 4% of South Asia's GDP. Central and Eastern Europe was 3%, and North Africa and the Middle East were 2% (Listl et al., 2015). One of the most recent studies calculated the direct cost of dental caries to be \$356.8 billion and the indirect cost to be \$187.61 billion (Righolt, Jevdjevic, Marcenes, & Listl, 2018). Both Righolt et al. (2018) and Listl et al. (2015) posited that there is a need for improvements in policies in the health sector globally because of the high costs of treating dental diseases. In addition to the direct and indirect cost of dental caries, Peres et al. (2019) noted the indirect cost of dental caries and other dental diseases, which also emerges as part of the economic burden. The indirect cost of oral diseases is associated with pain while biting, eating, chewing, tasting, speaking, and smiling.

Interventions to improve child oral health globally.

Global oral health is an issue that has been given very little attention in both developed and developing countries despite its high health and cost burden (Watt et al., 2019). This has been attributed to inequality in the availability and affordability of dental services, lack of integration of dentistry into the main healthcare system, and the lack of interventions to disrupt the aetiology of dental diseases. Watt et al. (2019) argued that healthcare systems should combine programmes for oral and general health due to many shared antecedents and risk factors. Such programmes should be evidence-based, cost-effective, equitable, universal, and

clinically effective and lead to population empowerment. To create a public health system that meets these requirements, there is a need to develop universal and affordable oral healthcare down-stream that promotes service widening (Watt et al., 2019). This helps in ensuring adequate population coverage and deepens service to promote the quality of health that is offered (Watt et al., 2019). The authors also suggested the need for innovation amongst oral healthcare workers through continuous training to promote professional ethics, social responsibility, and public health values. They advocate for health system enablers in terms of financing, infrastructure, and legislation, alongside regular epidemiological programmes to monitor change. Another critical component that Watt et al. (2019) argued for is health promotion programmes to reduce sugar consumption and promote better oral health practices using up-stream and mid-stream approaches. Upstream policies to reduce sugar production may include the formulation of policies that require products to have reduced sugar content, an increase in levies on sugary products, improvement of labelling to show sugar content, and restricting marketing strategies of sugary products that target children. This is especially important as most dental diseases start early, and there is a direct association between early caries experience and the dental burden across childhood (Hall-Scullin et al., 2017). Peres et al. (2019) posited that when adverts target children, their preferences for food, purchases, health, and consumption patterns are influenced. Mid-stream strategies include restricting promotions and sale of high-sugar products and limiting the sale of free sugars in schools (Watt et al., 2019).

There are also down-stream approaches to promote oral health on a one-to-one basis. Various national programmes have been implemented in a number of countries. For example, ‘ChildSmile’, ‘MaliMali’, and ‘Designed-to-smile’ have been implemented in Scotland, Tonga and Wales respectively (Macpherson et al., 2010; Morgan, 2015; Takeuchi et al., 2016). Childsmile was developed as an initiative by the Scottish Executive in 2005 and comprises several interlocking elements. The programme followed a targeted approach to improve the dental health of young children, hence complementing the Scotting programme of establishing a tooth brushing scheme for all Scottish children up to six years of age (Macpherson et al., 2010).

Childsmile Practice is one of the programmes that adopted a Caries Risk Assessment (CRA) protocol aimed at identifying infants who were at higher risk of getting dental caries. Training, guidance, and financial support in the form of flexible payment plans were offered for those parents who could not afford to pay for dental caries treatment at once. Childsmile Nursery and

Childsmile School aimed to prevent dental caries among children who attended priority primary and nursery schools (Macpherson et al., 2010). Following both models, nurses working in dental sectors improved their skills and hence developed their careers, whereas children were given sealants by therapists, dentists, or hygienists to protect them from tooth decay in any tooth with dental caries. The Childsmile Core programme, on the other hand, entailed the provision of a set of toothbrushes and toothpaste to all children till they reach the age of five on six occasions (Macpherson et al., 2010). Moreover, the Childsmile Core tooth brushing programme was made available to children in the first and second years of their primary education in disadvantaged areas in Scotland (Macpherson et al., 2010). Childsmile uses an integrated model, as illustrated in Figure 1 below (Macpherson et al., 2010).

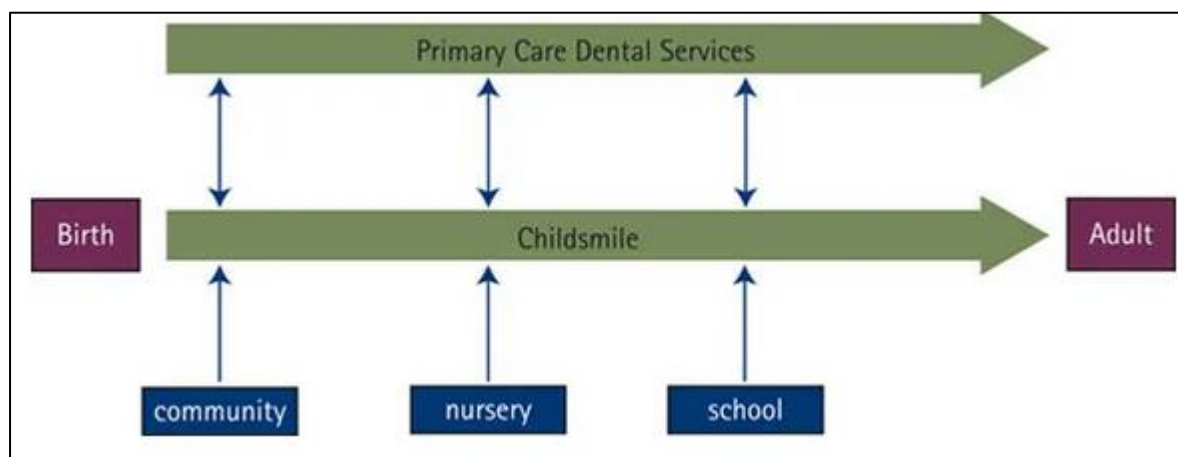


Figure 1. Childsmile care pathway. Source: Macpherson et al. (2010)

All families that have new-born children are enrolled in the dental health programme. To provide better support to children, enrolment is also done via nurseries, communities, primary care dental services, and schools. The adoption of the integrated model provides ways for handling the different needs of children regarding their oral health (Macpherson et al., 2010).

Scottish Dental (2019) reported that since the initiation of the Childsmile programme, the number of children who did not have caries increased from 40% to 70%. The increased number of children with no dental caries was attributed to the availability of toothbrushes and fluoride toothpaste among all children from either high-income or low-income areas across Scotland (Scottish Dental, 2019). Sustainable improvements in the overall oral health of children have, therefore, been attained with the adoption of Childsmile in Scotland. The improvements have consequently led to a reduction in the inequality levels of dental health (Macpherson et al., 2010).

Similarly, the 'Designed-to-Smile' programme was implemented in Wales to help reduce cases of dental caries among five-year-olds (Morgan, 2015). Various strategies are proposed by the Designed-to-Smile programme, which includes the adoption of tooth brushing activities on daily basis in schools. The second strategy proposed by the programme is the provision of the home package, where every child is given a toothbrush and fluoride toothpaste aimed to encourage them to continue brushing their teeth even when they are at home. The third strategy is the involvement of parents and teachers in the programme to ensure that the programme is successful (Morgan, 2015). Generally, before the Designed-to-Smile programme is implemented, risk assessment on the class is done, followed by training of school staff on the protocols for tooth cleaning, and how to avoid cross-infections. The Community Dental Service (CDS) teams visit each setting once after every half term to check whether the cleaning standards are maintained and thereafter fill out a Quality Assurance (QA) assessment form while observing the tooth brushing process (Morgan, 2015). Following the success of the tooth brushing scheme, the Designed-to-Smile programme progressed to perform fissure sealant and fluoride varnish application activities on the children's teeth (Morgan, 2015). Children in Wales (2017) reported that the Designed-to-Smile campaign has led to a reduction in tooth decay by 12% among children aged five years old. The successful prevention of dental diseases among these children indicates the need to prevent the occurrence of dental caries at an early age (Children in Wales, 2017; Hall-Scullin et al., 2017; Morgan, 2015).

In North Carolina, Into the Mouth of Babes Programme (IMDP) on missing, filled, decayed teeth have been introduced for kindergarten kids in all schools in the state, and in the largest population hailing from families with low-income (Achembong, Kranz, & Rozier, 2014). The IMPD application was successful in reducing the prevalence of dental caries among all the children who participated. The application also reduced the disparities in dental health among children from high-income and low-income families (Achembong et al., 2014). To aid in the sustainable prevention of dental caries and other oral health diseases, IMPD needs to be integrated into the primary health care services, and community-based strategies (Achembong et al., 2014). All the national programmes follow the guidelines placed by the World Health Organization (2020) on the prevention of oral health using dietary, behavioural, and lifestyle changes.

In the Kingdom of Tonga, an oral health programme named MaliMali (meaning smile in Tonga) is in existence (Takeuchi et al., 2016). The authors sought to evaluate the MaliMali programme in terms of the population it reached, its effectiveness, implementation, and

maintenance framework. The South Pacific Medical Team (SPMT) in collaboration with the Japan International Cooperation Agency (JICA) and the Ministry of Health and Education have been tasked with the management of the MaliMali programme to ensure prevention of caries, and preservation of teeth. A school-based dental health promotion programme managed by the MaliMali team was adopted to reduce caries (Takeuchi et al., 2016). Takeuchi et al. (2016) presented the roles of the different stakeholders in the Malimali team as stated below:

- At the Vaiola Hospital: Treating fissure sealants, enforcing lectures, applying silver diamine fluoride
- At the schools: Oral health education, Dental examination, Application of fluoride, Instructions on tooth brushing
- At the community: Enforcing workshops, Media like websites and radio, Hold oral health festival
- SPMT Role: Plan the MaliMali Programme, Donating toothbrushes, dental materials, fluoride, and transportation vehicles
- Role of JICA: Developmental assistance, Raise and provide funds
- Role of the Health Ministries in Tonga: Provision of dental therapists and dentists, planning of the MaliMali Programme (Takeuchi et al., 2016).

In terms of adoption, most nursery schools in Tonga are now participating in the programme because of the positive benefits in oral health of children who were already enrolled. For instance, tooth brushing habits among children in six primary schools that engaged in the MaliMali oral health programme reported a 100% increase in the number of participants with improved brushing hygiene practices. The MaliMali programme reached more school children from 2007 to 2011 by 11% (Takeuchi et al., 2016). The MaliMali Programme was also proven to be effective, as depicted by a decrease in the mean DMFT scores for all the participating children. The MaliMali programme, since being created in 1998, has become a countrywide intervention because of the following:

- I. Operation agreements between SPMT and JICA enhanced the effectiveness of relationships between the Ministry of Health, Ministry of Education, and SPMT (Takeuchi et al., 2016).
- II. Workshops were used as a platform for dentists, medical, and education staff for sharing information (Takeuchi et al., 2016).

- III. Literature was used for dental education; Faculty: prevention oral therapy, Students: benefits of improving oral hygiene in figures and photographs, Dental staff: prevention and therapy in dental health (Takeuchi et al., 2016).
- IV. Publicity interventions: advertisements were made via radio, TV, newspapers, and Tonga government websites (Takeuchi et al., 2016).

Oral health in Qatar.

As the prevalence of childhood caries is high among older children in many high-income countries, the disease remains highly prevalent among children of all ages in Qatar despite school-based oral health interventions (Al-Darwish, El Ansari, & Bener, 2014; Alkhtib et al., 2016; Bener et al., 2013; Primary Health Care Corporation, 2018; Supreme Council on Health, 2011). Qatar's National Oral Health Survey found the prevalence of dental caries to be 72% and 54% among 6-year old and 12-year old children, respectively (Supreme Council on Health, 2011). A recent survey of primary school children in Qatar reported the prevalence of dental caries to be 82.4% (Primary Health Care Corporation, 2018). Therefore, this thesis sought to explore the current behavioural prevention strategies for dental caries in Qatari primary schools to inform school-based oral health programmes.

Burden of oral health in Qatar.

Studies undertaken in Qatar appear to reflect the international literature and highlight a high health and cost burden (Hall-Scullin et al., 2017; Kassebaum et al., 2017; Listl et al., 2015; Peres et al., 2019; Righolt et al., 2018). However, there is a shortage of up-to-date data on the prevalence of childhood caries in Qatar. There are only three available sources of population-level data on dental caries in children and adolescents in Qatar (Al-Darwish et al., 2014; Alkhtib et al., 2016; Supreme Council on Health, 2011).

The Supreme Council on Health (2011) provided data on the National Oral Health Survey, which provided a formal source of information on oral health in Qatar. The survey used the WHO Oral Health Survey basic methodology focussing on three key ages in childhood and adolescence, which included children, aged 6 years, 12 years, and 15 years. The survey provided information on both dental caries and dental fluorosis. According to the first National Oral Health Survey, the prevalence of dental caries in primary/baby/milk teeth among 6-year old children was 72%, in the permanent teeth among 12- and 15-year olds were 54% and 55% respectively (Supreme Council on Health, 2011). Qatari girls in public schools and those from the lower socio-economic background were significantly more affected in all age groups

(Supreme Council on Health, 2011). Al-Thani et al. (2016) carried out a secondary data analysis of the National Oral Health Survey data and reported an overall DMFT of 4.2. The study also reported a higher prevalence among girls compared to boys (73.8% versus 68.9%) and 3.8 times higher odds of dental caries among Qatari compared to Non-Qatari children (Al-Thani et al., 2016). Despite being a high-income country, there was a widespread experience of untreated decay in children of Qatar (Supreme Council on Health, 2011).

Another source of population-level data on childhood caries in Qatar was the survey by Alkhtib et al. (2016) that explored the experience of tooth decay among 4-5-year-olds. The study found that 89% of pre-school children aged 4-5 years had tooth decay in their primary teeth, and 73% of the children had a severe form of dental caries (Alkhtib et al., 2016). The average number of decayed teeth was 7.6 (Alkhtib et al., 2016), which almost doubled the number reported in the National Oral Health Survey (Supreme Council on Health, 2011). According to the cross-sectional survey, more than 61% of mothers of pre-school children had dental/ gum problems (Alkhtib et al., 2016). Further, the majority of children with dental caries were untreated, which reflected lack of dental visits before the age of 6 as only 51% of the pre-school children had ever attended a dental clinic (Alkhtib et al., 2016). The pattern of caries across the 20 primary (baby/milk) teeth was suggestive of typical early childhood caries with the involvement of upper incisor teeth and all molar teeth (Alkhtib et al., 2016). Poor child feeding practices were also associated with dental caries in young children (Alkhtib et al., 2016). Another study by Al-Darwish et al. (2014) reported a prevalence of 85% for dental caries among the 12-14-year-old children with the average number of decayed teeth ranging from 4.6 to 5.5 across the ages 12, 13 and 14 years (Al-Darwish et al., 2014). Thus, the prevalence of dental caries among 12-year old children was 1.5 times that of the National Oral Health Survey (Supreme Council on Health, 2011). Again, most of the dental caries were untreated, and about two-thirds of the untreated decay were on the permanent molar teeth (Al-Darwish et al., 2014). The first permanent molar teeth had half untreated caries, and they were the teeth most likely to have been extracted or subjected to restoration (Al-Darwish et al., 2014). This indicates the need for preventive interventions that target the first permanent molars in school-aged children and the second permanent molars in adolescents (Al-Darwish et al., 2014).

The reported prevalence of dental caries in the population-based studies conducted in Qatar was corroborated by a survey of children aged 6–15 years old who visited the Primary Health Care Centres in Qatar (Bener et al., 2013). The study found a prevalence of 73% dental

caries in the permanent dentition and a mean DMFT value of 4.5 (Bener et al., 2013). The study also reported that 69% of dental caries were untreated (Bener et al., 2013). The survey also found that gender (females), health condition, including obesity, and high income and poor attendance of public school were independent risk factors for dental caries whilst tooth brushing more than once a day appeared to be the key protective process against dental caries (Bener et al., 2013). The proportion of children without dental caries that consumed seafood, cod liver oil, and vitamin-D-fortified milk less than once a week were significantly higher compared with those with caries (11.7 vs. 8.3%, 92.4 vs. 87.5%, and 10.6 vs. 6.3%, respectively).

Context of Oral Health in Qatar

Oral health in Qatar is influenced by an interplay of biological, socio-economic, behavioural, and political factors (Tellez, Zini, & Estupiñan-Day, 2014; WHO, 2018).

Socio-economic and biological factors and oral health.

Existing literature has shown that the interaction between social and biological factors have a significant impact on oral health. Socioeconomic position in terms of income and education, as well as biological factors, such as the existence of bacterial load, facilitates childhood caries, especially those from socially disadvantaged families (Gomaa, Glogauer, Tenenbaum, Siddiqi, & Quiñonez, 2016). Also, socially disadvantaged people with low socioeconomic positions have higher levels of stress, which leads to higher elastases and poor treatment outcomes for periodontal therapy. Lack of proper treatment of periodontitis increases the incidences of oral health diseases (Gomaa et al., 2016).

Behavioural factors and oral health.

The majority of oral health problems are associated with lifestyle behaviours. Most children fail to clean and brush their teeth, especially after eating cariogenic foods (Rad, Shahravan, & Haghdooost, 2018). School children, especially those from rural areas, lack knowledge and attitude to the effects of lifestyle behaviours, dental care visits, and brushing behaviours. Consequently, after consuming cariogenic products or foods, they are at higher risk for oral health diseases (Rad et al., 2018). Eating habits are associated with dental caries. After eating sugary food, preschool children do not brush or clean their teeth due to a lack of knowledge and attitudes on oral health hygiene. As a consequence, these children continue to experience dental caries throughout their lives (Soltani, Sharifirad, Mahaki, & Eslami, 2018).

Political factors.

Lack of political attention is one of the contributing factors to oral health problems. The global oral health has been neglected, and this negatively impacted political support towards the implementation of prevention interventions for oral health diseases (Benzian et al., 2011). Besides, political instability is associated with oral health inequalities. It is well established that political issues increase alcohol and tobacco use, which compromises the oral health of some groups (Peres et al., 2015). It is, therefore, important to understand the overall context of Qatar and how it influences oral *health* policies and programmes. Walt and Gilson (1994) identified context as an essential element of the policy triangle as presented in (Figure 2).

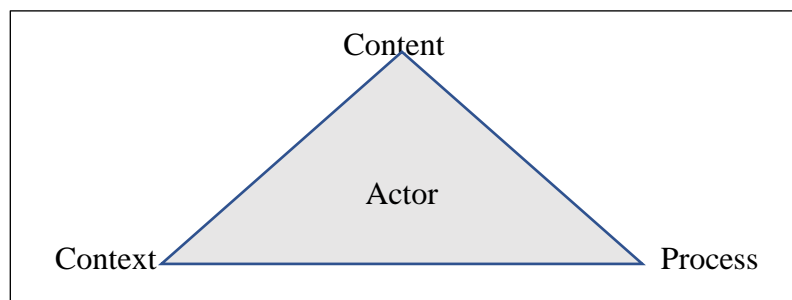


Figure 2. Policy Triangle. Source: Walt and Gilson (1994)

The State of Qatar

Qatar is a sovereign Arab state situated on the western shore of the Arabian Gulf with an approximate area of 11,586 sq km (One World-Nations Online, 2020). It is bordered by Saudi Arabian Gulf and the United Arab Emirates in the south and Bahrain in the northwest, as shown in Figure 3.



Figure 3. Map of Qatar. Source: One World-Nations Online (2020)

Qatar shares cultural and demographic characteristics with other countries in the Arabian Gulf, which is jointly referred to as the Gulf Cooperation Council (GCC) countries. Qatar has a total population of 2.6 million, out of which only 313,000 are indigenous, and 2.3 million are expatriates (Priya DSouza Communications, 2019). The indigenous people of Qatar are Arabs with a high proportion of the population less than 15 years of age. The official language is Arabic. However, the English language is increasingly used to facilitate business transactions (Priya DSouza Communications, 2019).

Culture and religion of Qatar

It is important to understand the cultural and religious context of Qatar as this impacts the oral health behaviour of Qatari people. Qatar is a traditional Islamic country that is experiencing quick social changes. Its priority is to keep the heritage and keep up with the world's modern transformation (Melikian, 1981). Qatar shares the same cultural characteristics with other Middle Eastern Arabic countries pervaded by "Islamic beliefs, traditions, and designs for behaviour (Melikian, 1981). It is a culture where actions are dichotomized into the permitted and the forbidden, into shameful and those that are acceptable (Melikian, 1981). Islam is the official state religion in Qatar. However, Qatar has become a multi-religious society due to waves of immigration, with Muslims being the majority (67.7%) of the population, followed by Christians (13.8%), Hindus (13.8%) and Buddhists (3.1%) (Online Qatar, 2019). Other religions found in Qatar account for 0.7% of the population, and 0.9% of the population are unaffiliated to any religion. Qatar is known for hosting several conferences for interfaith dialogue (Religious Composition by Country, 2013).

Based on cultural beliefs in Qatar, Men greet each other by shaking hands while male relatives greet by touching each other's noses and kiss on the cheek as a way of preventing oral health problems, which can be contacted through kissing. Women greet each other by shaking hands. On the other hand, females greet by kissing each other on the cheek, which may increase the transmission of oral problems. A woman either smiles, greet verbally or place her right hand on her heart as a greeting to a man. However, if she extends her hand, it indicates she is fine to shake hands (Amal Al-Shammari, 2017). Religiously, it is forbidden to greet opposite gender by kissing; however, an elderly person is greeted by kissing his/her forehead as a sign of respect, usually followed by kissing the right hand if he/she is one's parent (Camacho, 2020).

Bargaining with shopkeepers is common in the market except in the malls. Brewing, trafficking, or drinking of alcohol is prohibited. Drinking and driving attracts a prison sentence, fine, and cancellation of driving license. Besides, the importation of pork is prohibited. There is a zero-tolerance to the use and possession of illegal drugs. However, smoking is quite

prevalent among adults, which affects dental care. It has been shown that frequent smoking is one of the risk factors of periodontitis. Poor response to dental treatment after frequent cigarette smoking plays a role in the onset of periodontitis (Shah & ElHaddad, 2015).

Qatari men wear a thobe, which is a long white cloth with underwear of white cut shirt over loose pants and a loose headdress called “gutrah” which is either white or red in the summer or winter, respectively (Roffey, 2019). The white “gutrah” is held on with “agal” which is a black rope. Qatari women wear a black long dress “Abayah” and cover their head with a black headdress called “Shaylah.” Some women use “Niqab” or “Bourqa” which is a face cover with only the eyes left exposed. Foreign visitors are expected to dress conservatively with sensitivity to the Islamic way of life (Roffey, 2019).

Economic and social factors of Qatar

Qatar is a high-income country with the highest per capita income worldwide (The World Bank, 2019). The Institute of International Finance (IIF) reported that economic activity continued to pick up in Qatar despite the diplomatic squabbles with Saudi Arabia, United Arab Emirates, Bahrain, and Egypt (Perumal, 2019). Qatar is experiencing rapid development and modernization with accompanying lifestyle changes and diet modification of the population (Benamer & Grosset, 2009; Musaiger & Al-Hazzaa, 2012). These changes include eating a less active lifestyle and westernised diet which is rich in fat, cholesterol, salt, and sugar with an increasing prevalence of lifestyle-related diseases such as obesity, high blood pressure, diabetes, and dental caries (Benamer & Grosset, 2009; Musaiger & Al-Hazzaa, 2012).

Qatari Education System

It is necessary to understand the Qatari educational context since this study is exploring behavioural prevention strategies for dental caries in primary schools. An elementary traditional Quranic education system "Kuttab" was initiated before 1950s (Nasser, 2017). “Kuttab” involved memorization and recitation of Quran (the holy book) to provide young Muslims with knowledge of the Quran and inculcate in them social ethics and religious codes with Arithmetic and basic Arabic also taught as supplements (Nasser, 2017). The formal education system, along with teachers, was imported from abroad. The class size was large, and there were no indigenous teachers at the time. Over time, Qatari citizens joined the field of teaching. A Ministry of Education was created and staffed citizens from other Arabic countries (Nasser, 2017). The formal system of education began when oil revenues started in 1951. The first boys’ school was opened in 1951, and the first girls’ school was started in 1955 in Doha (Nasser, 2017). The number of schools increased to 192 with about 62,000 students since 1980s and 520 in 2008 with 146,000 pupils (Fanack, 2011). Based on the 2010 survey

data presented by the UNESCO, enrolment in Qatar education system was 92% for boys and girls in primary schools and 93% for girls and 76% for boys in the secondary schools (Fanack, 2011). The first high school and National College of Education were established in 1973. The National College of Education had 57 male and 93 female students in the first year of establishment. In 1977, Qatar University was initiated with four colleges: Education, Humanities & Social Sciences, Sharia Law & Islamic Studies, and Sciences. The College of Engineering was started in 1980 and the College of Business and Economics in 1985 (Fanack, 2011).

Public school education is free for children between six and seventeen years of age who are citizens and foreigners whose parent(s) work in governmental schools. Schools in Qatar exist in three stages, which include primary from grade 1 to grade 6 and takes six years. In addition to preparatory, which is from grade 7 to grade 9 and takes three years, elementary and secondary from grade 10 to grade 12, that makes three years (Brewer, 2007). There are a large number of international private schools, where most expats and some Qataris prefer to send their children. All Qatari children have a free coupon of up to 21 thousand Qatari Riyal and the parents pay any additional expenses out of pocket. Foreign children are either covered by the parent's work or out-of-pocket payment (Brewer, 2007). In 2005, the total governmental expenditure on education was 3.97% of the GDP, and in 2010 was 4.54% (UNESCO Institute for Statistics, 2020). Qatar is positioned as number 41 globally in HDI's 2011 report as countries are ranked based on income, health, and education (UNDP, 2019). The number of students in each school in Qatar is between 400-800 students depending on the geographic location. Every school in Qatar has only one nurse, and some schools do not have a nurse, which has resulted in distributing nurses so that each nurse can serve two or three schools together and/or to call the nurse when needed from another school (AL-Dahnaim, Said, Salama, Bella, & Malo, 2013). This work overload will limit the school nurse to follow up on the students' general health and well-being. Oral health is last to remember and only when an activity requested by either Primary Health Care Corporation or the Ministry of Public Health.

Qatari Health Care System

Traditionally, health services are provided free-of-charge in Hamad Medical Corporation (HMC) and Primary Health Care Corporation (PHCC) to indigenous residents of the State of Qatar (Goodman, 2015). Non-Qatari residents pay a subsidized fee for health services, including hospital accommodation and medications in public hospitals. Higher fees are charged by private healthcare providers. Most Non-Qataris have health insurance cover provided by their companies for treatment in private hospitals or clinics (Goodman, 2015).

Dental health care systems in the State of Qatar are diverse, including public, semi-public, and private providers (Buswell, 2020). This impacts dental service, which affects collaboration in sending the same messages to the community regarding oral health. Also, different schools of dentists may allow different directions in treating patients. It also increases the number of patients in one sector and less in other health care systems, which affects the patients' oral health in terms of not getting near appointments to continue treatment. Qataris and GCC citizens exempted from payment. Several years ago, many private companies started health insurance for their employees. The Ministry of Health began the National Health Insurance Scheme (SEHA) in 2014 but suspended it in 2015 (The Peninsula Newspapers, 2015). According to The Peninsula Newspapers (2015), the government decided to support private insurance companies to provide health insurance to Qatari citizens. Although the Oxford Business Group (OBG) reported the compulsory need to launch a health insurance scheme, there is no public health insurance scheme for Qatari citizens. Qatari people learned that SEHA would cover their private health insurance since 2014. In 2015 the Ministry of Health suspended the SEHA health insurance on Qatari citizens (Singh, 2016). They stayed treated free in all the governmental facilities for medical and dental issues, but they are self-paid in private clinics and hospitals. The non-Qataris have the employer coverage that helped them to be treated in private sectors and symbolic fee payments in public sectors (The Peninsula Newspaper, 2015).

The majority (98%) of dental patients in Qatar were treated in the dental clinic of Hamad Medical Corporation (HMC) (Al-Kuwari, 1988). Since the Dentistry Department in Hamad Medical Corporation out-patient is the only specialized centre, all the community wanted to be treated there. This resulted in a high load of patients and long-wait for appointment. As such, the Primary Health Corporation has expanded the number of health centres in the country upon need and the dental clinics in each of the new health centres. There are 27 health centres with 125 dental clinics distributed across all health centres in Qatar, 75% of which are active (Abdulmalik, 2016). One of the reasons for the long-awaited list is wasted appointments. The percentage of appointments to which the patient did not attend for the year 2019 reached 18%, equivalent to 56 thousand appointments, while the year 2018 reached 17% (Abdulmalik, 2016). Still, there is a high load of patients and long-wait for appointment not solved yet because of the increase of arrivals to work than citizens. The total population of Qatar was 2795484 capita at the end of March 2020 (Planning and Statistic Authority, 2020).

Furthermore, despite rapid modernization, there is no water fluoridation in Qatar, and usually, people drink bottled water or filtered desalinated water with no information reported

on the fluoride content (Almulla, King, Alnsour, & Sajnani, 2016). Therefore, the National Oral Health Design Project 1.9 was set within the overall healthcare provision in Qatar; hence its integration into the National Oral Health Strategy (Ministry of Public Health, 2015). Oral healthcare in Qatar is integrated into both primary and secondary hospital levels of care managed by the PHCC and HMC, respectively (Ministry of Public Health, 2018). Hamad Medical Corporation mainly provides specialized dental care in 3 out of its 8 hospitals while the PHCC provides day-to-day dental services, including health promotion, across 27 primary health centres in Qatar (Ministry of Public Health, 2018).

Actors of Oral Health in Qatar

A range of key stakeholders are involved in oral health policies and programmes in Qatar. These include the representatives of HMC and PHCC who co-chair the National Oral Health Committee as well as representatives of other medical community corporation centres (Ministry of Public Health, 2015). The mandate of the National Oral Health Committee includes immediate overhauling of the current oral health system and mapping out plans for long-term National Oral Health Strategy (Ministry of Public Health, 2015).

There are two totally free dental health providers for Qatari citizens and they are:

- Primary health Care Corporation with over 120 dentists and offers primary dental services, including extractions, fillings, and other general dental services (HMC Annual Report, 2013). The services are provided in 27 primary health centres across Qatar
- Hamad Medical Corporation (HMC) employ 100 general and specialist dentists in several hospitals including Rumailah, AlWakra hospitals; Alkhor hospital, and the Cuben hospital (HMC Annual Report, 2013).

Other public and semi-public dental providers include: Police clinic, Qatar Armed forces, Qatar Petroleum (QP), Aspetar, which is an Orthopaedic and Sport Medicine Hospital. They have less than 50 dentists.

The private sector (SCH Annual Report 2013) consists of the following:

- Large private hospitals: Doha Clinic, AlEmadi hospital, AlAhli hospital.
- About 200 licensed private health facilities

In an effort to tackle oral health problems in the State of Qatar; the “National Oral Health Design - Project 1.9” was added in 2014 to the National Health Strategy (Ministry of Public Health, 2015). The aims of Project 1.9 were: 1) improved oral health for the population of Qatar; 2) a robust approach to oral health promotion, education, and prevention. The main expected outputs of the project include an evidence-based needs assessment of the services for

the population of Qatar and a recommendation for Fluoridation, in line with the international best practice.

The National Oral Health Committee is being managed by a multidisciplinary steering group, the Ministry of Health, the PHCC, HMC, Corniel College, Petroleum Corporation, North Atlantic College, Qatar Armed Force and Police (Ministry of Public Health, 2015). The PI is a member in the Committee as the first and only Qatari dental hygienist. The National Oral Health Strategy is due for implementation at the end of 2016, focusing on implementations that impacts oral health. Qatar, like any other country in the third world, suffers from dental caries and periodontal disease, but the difference is that Qatar is a rich country with no school or community strategy for implementing oral health preventive measures (Ministry of Public Health, 2015).

International experts were also engaged in supporting quality improvement and institutionalization of international best practices (Ministry of Public Health, 2015). Thus, the oral health policy involved actors from all levels of care in the Qatari context. The PHCC was the lead organization of school oral health in Qatar (Ministry of Public Health, 2015).

Process of Oral Health Policy in Qatar

The major processes in the life of a policy include formulation, dissemination and implementation by His Excellency, Mr. Abdullah AlQahtani (Walt et al., 2008). Before 2014, each dental clinic in HMC, PHCC, semi-governmental dental clinics and Private dental clinics work according to its own guidelines. Nothing changed since 2014, when the National Oral Health Design Project 1.9 was added to the National Oral Health Strategy after the approval of the Minister of Public Health at the time, His Excellency, Mr. Abdullah AlQahtani (Ministry of Public Health, 2015). The National Oral Health Road Map was developed with contributions from the members of National Oral Health Committee and reviewed by international experts (Ministry of Public Health, 2014). The National Oral Health Committee also coordinated the dissemination and implementation process.

The School Oral Health Programme started in Qatar before 1979 under the name "the School Day for Oral Health". It was under the Ministry of Education in 15 units around Qatar as part of School Health Department. Then it was transferred to the Ministry of Health under Primary Health Care Department, now Primary Health Care Corporation (PHCC), in 1990. The programme was implemented only in one building from 1995- 2012. In 2012, the school dental clinics were decentralised into 3 primary health centres. The previous school oral health programme was implemented for a period of more than 30 years as a continuous routine

programme without innovations. The previous school oral health programme focused on screening of grades 1 & 4 only. There were no guidelines/policies or patient care pathways, no training programme for the school oral health staff, the scope of existing skillsets & knowledge possessed by school nurses, teachers & parents were unknown, and the referral routes were not defined.

The past school oral health programme involved oral hygiene screening for children at three primary health care centres: AbuBaker Health Centre (Western Region), AlDayan Health Centre (Northern Region) and Mesiamer Health Centre (Central Region). There were five clinics with ten dentists working in two shifts: morning shift for screening and education, and evening shift for treatment. During the examination days, the pupils in the selected grades were invited to visit the school dental clinic at the three health centres. The selected students were usually shown educational videos. Five pupils at a time were then examined by a dentist, and one or two pupils chosen for fluoride application. The students with dental caries were referred to take dentist appointments. Screening and education were conducted throughout the year except during holidays.

Similarly, treatment at the school clinics was suspended during the holiday. Thus, the past programme covered only the kindergarten and two levels out of six grades in primary school. In addition, not all the children had fluoride application. Lastly, treatment was suspended during the holidays. In this way, Qatar presents an interesting case study area to explore the development of behavioural prevention strategies for dental caries within the context of primary schools. This provides a research gap that this study aimed to fill with a focus on oral health among school children in Qatar.

Recently, an on-going plan was commenced to replace the past facility-based programme with a comprehensive oral health programmes covering prevention, intervention, and promotion for children as well as the development of future adolescents' needs. The new programme sought to increase awareness about oral health in the community, especially around children oral health.

In 2016, the existing School Oral Health was restructured in response to several studies that showed a high prevalence of dental caries among pupils in Qatar. The restructured programme was aimed to reduce the burden of oral disease, increase community awareness about the importance of oral health prevention, and improve access to dental services. In 2017, the new School Oral Health Programme (Asnani) business case was approved by the Primary Health Care Corporation (PHCC) board. A pilot programme was conducted from 4th of

February to 31st of March 2018 in 3 schools to target 2300 students: 2 boys' primary schools and a girls' school with kindergarten. The programme used three mobile dental units (MDU) manned by 3 dentists and 3 dental hygienists. The interventions include oral health education, screening (disposable examination sets), and application of topical fluoride & fissure sealants.

The Asnani School Oral Health programme began in November 2018 and was going to target around 130,000 students in both KGs and primary of public schools. It was implemented by the PI and its dental professional team, who enrolled in the Asnani School Oral Health programme at the Primary Health Care Corporation (PHCC) in November, 2018 (The Peninsula Newspaper, 2018). A visit to the new primary health centres would be organised for pupils in kindergarten. At the health centres, pupils were provided with oral health lecture by a dentist or a dental hygienist and then to be taken one by one to the dental clinic for oral examination and fluoride application. Each pupil was given a gift such as toothbrush and toothpaste. The team of Asnani School Oral Health programme, comprising of dentists, dental hygienists and dental assistants visited primary schools with mobile dental clinics (MDCs) & disposable instruments. With parents' consent, pupils at schools received oral hygiene instructions, full mouth screening, preventative dental treatment (topical fluoride & fissure sealants), and referral for dental treatment if needed. All clinical findings were recorded electronically, including full dental charting and DMFT/dmft index.

The Content of Oral Health Policies in Qatar

The oral health programmes in Qatar is based on the National Oral Health Road Map of 2014 – 2020, which serves as the overarching framework for oral health in Qatar (Ministry of Public Health, 2014). The roadmap provides a policy guidance for the “National Oral Health Design– Project 1.9” (Ministry of Public Health, 2014), which is the national oral health strategy for Qatar. The National Oral Health Design Project aimed to enhance access to quality oral health services including health promotion, prevention, early intervention and treatment (Ministry of Public Health, 2015). The National Oral Health Road Map 2014-2020 adopts a framework consisting of 4 pillars and 3 foundation enablers (Ministry of Public Health, 2014) as presented in Figure 4.

The pillars represent the 4 main domains of oral health strategies in Qatar, which include population level prevention, targeted prevention activities, sustainable dental workforce and quality standards. These strategies encompass immediate to long-term activities aimed at creating a robust approach to oral health promotion, education and prevention and improving oral health for the population of Qatar (Ministry of Public Health, 2014)

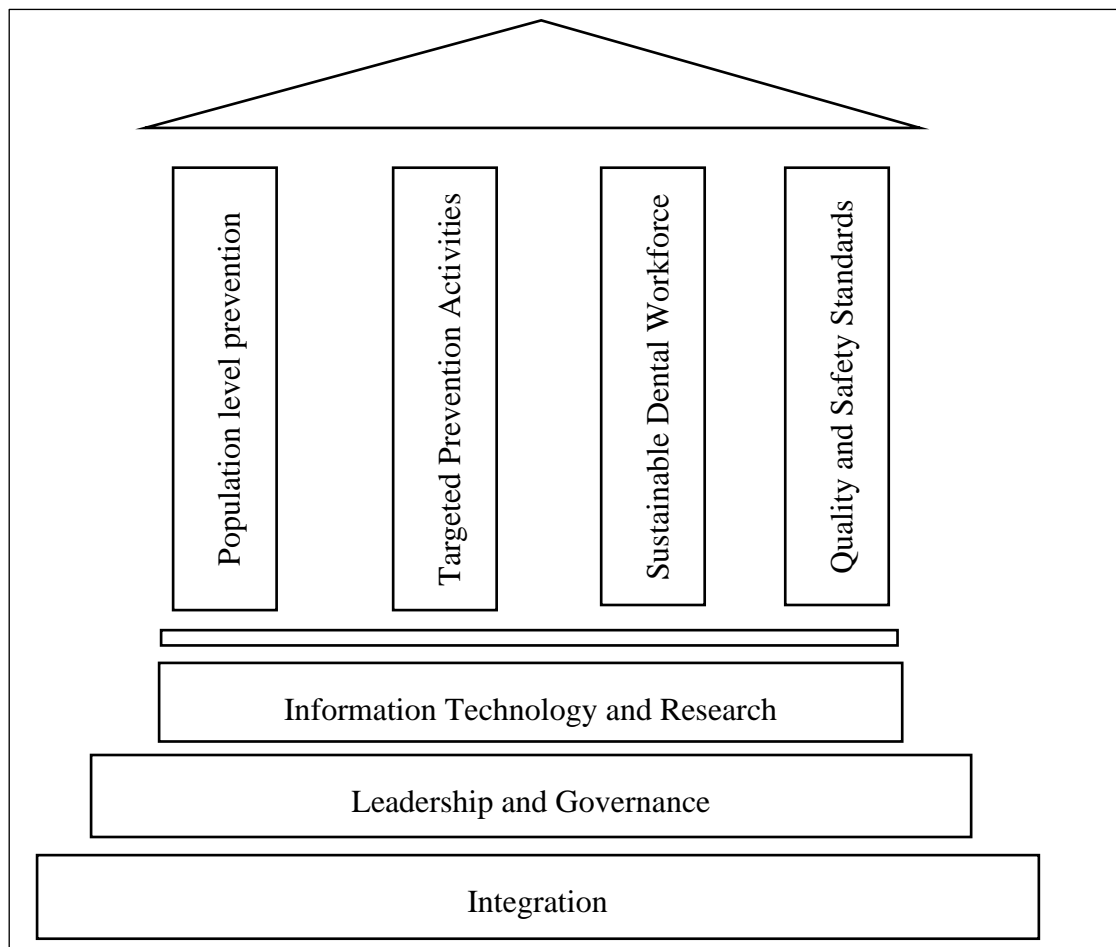


Figure 4. Framework for National Oral Health Strategy in Qatar. Source: Ministry of Public Health (2014).

The population level prevention include epidemiological study of child oral health in Qatar, National Policy Recommendations for Fluoridation as a population wide preventive measure for dental caries and Public Engagement - Oral Health (Ministry of Public Health, 2014). Previous epidemiologic studies revealed high prevalence of oral health disorders in Qatar. Further epidemiological study of child oral health is required to inform future oral health strategic plans and decisions. Fluoridation of tap and locally produced bottled water is a population-wide preventive measure against dental caries. Public awareness campaign about oral health is necessary to promote oral hygiene practices and regular dental visits which are currently below the desired level.

The key aspects that this thesis focused on included oral health, oral health problems, and appropriate strategies that can be implemented to reduce and prevent oral health problems,

such as dental caries among school children in Qatar. This thesis focused only on targeted preventive activities, sustainable dental workforce, and quality and safety standards based on Qatar's national oral health strategy.

Targeted preventive activities are programmes designed for different segments of the population with windows of opportunities for effective prevention. These include oral health initiatives targeted at expectant mothers and infants, pre-school children, school children and individuals with chronic diseases and with common risk factors as oral health disorders. The targeted preventive activities, including school oral health programmes, are designed as a referral pathway to primary health care, thus enhancing early diagnosis and treatment of dental caries and other oral health diseases.

The third domain is the sustainable workforce. Although the population of dentists are high in Qatar, there is overdependence on expatriates. In addition, the distribution of different levels of dental and allied dental professionals is not fit for purpose with relatively high proportion of specialists and abysmally low population of allied dental professionals especially dental hygienists. There is also a higher proportion of dental practitioners in the private sectors compared to the public sectors patronised by the majority of the population. The priority objectives relating to a sustainable workforce include re-orientating the health workforce, raising standards of dental practice and improving self-sufficiency for locally trained dental practitioners in Qatar.

The fourth domain is quality and safety standards. This thesis focused on the quality and safety standards for preventing dental problems among school children in Qatar. The key objectives of quality and safety standards include implementing oral health programmes in school, parental involvement in school activities, and educating children on dental hygiene to improve the standards of oral health practice and improve self-efficacy of school children on oral health hygiene.

In summary, oral health initiatives in Qatar are organised into 4 domains and 11 priority objectives as presented in Table 1.

Table 1: Framework for National Oral Health Strategy in Qatar

	Domains	Objectives
1	Population Level Prevention	Epidemiological Study of Child Oral Health in Qatar
		National Policy Recommendations for Fluoridation in Qatar
		Public Engagement on Oral Health
2	Targeted Prevention Activities	Oral health initiatives for mothers and infants
		Oral health initiatives for pre-school children
		School based oral health prevention initiatives
		Oral health integration with chronic disease management – A common risk factor approach
3	Sustainable Dental Workforce	Raising standards of professional practice
		Re-orienting oral health workforce
		Improve and increase self-sufficiency for dental practitioners in Qatar
4	Quality Standards	Enhanced and improved quality of dental services in Qatar
		Improve safety for patients and dental practitioners in Qatar
		Quality assurance and compliance

Source: Ministry of Public Health (2014)

Thus, school based oral health prevention initiative was recognised as a priority objective of the National Oral Health in Qatar. The initiative was a targeted prevention activity for oral health diseases, including dental caries among school children in Qatar (Ministry of Public Health, 2014). It was also designed as a referral pathway to different public or private dental clinic according to parent choice, thus enhancing early diagnosis and treatment of dental caries and other oral health diseases among school children.

In addition, the roadmap identified three foundational enablers, which are leadership and governance, integration, and information technology and research. Leadership and governance are concerned with clear specifications of responsibilities to facilitate effective oral

health programmes. Integration is intended to align the oral programmes with the National Health Strategy and forge partnership and co-operation between all oral health providers, especially PHCC and HMC. Information technology and research are needed for evidence-based policy and programmes.

Asnani School Oral Health Programme is the PHCC initiative and was developed from the old school oral health programme and implemented on November 7th, 2018 (Najat Alyafei, 2018). The aim of the new Asnani School Oral Health Programme is to: provide oral health education & raise awareness, comprehensive oral health screening, provision of preventative treatment at schools (topical fluoride and fissure sealant), involvement and sensitization of parents about the oral health status of their children through defined channels of communication, utilizing international best practices and strategies for Asnani School Oral Health to reduce dental caries among school children. The oral health programme of Asnani is presented in the following Figure 5.

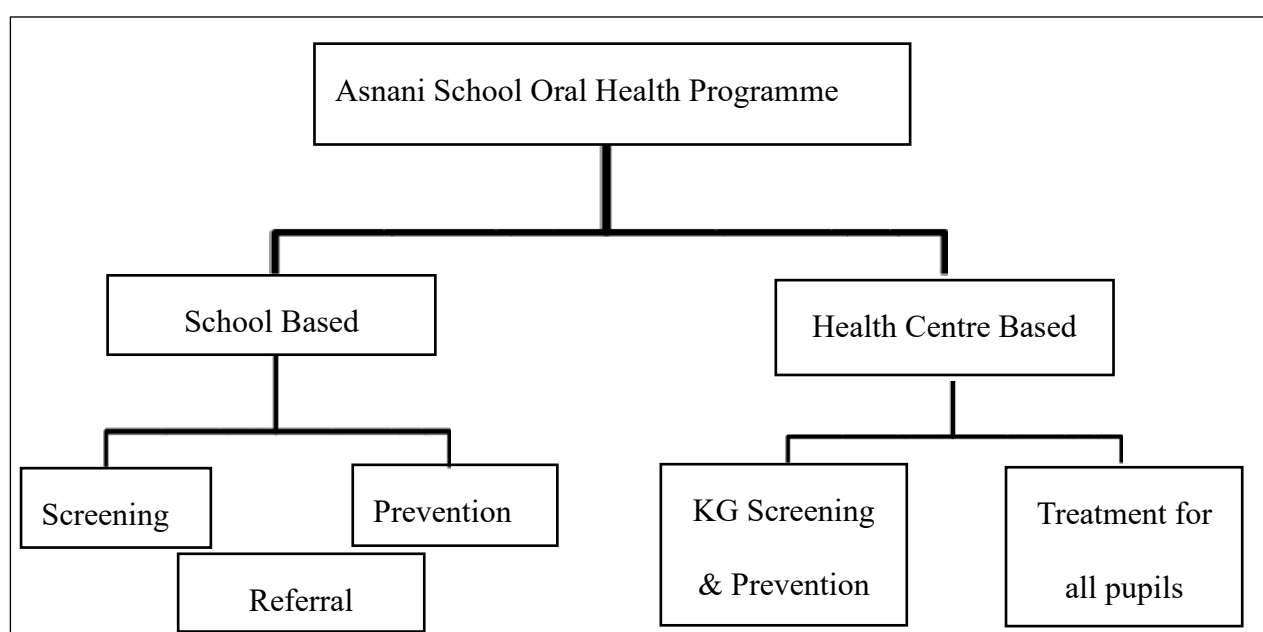


Figure 5. The new School Oral Health Programme (Asnani) structure. Source: Najat Alyafei (2018)

A recent pilot study in three schools conducted by the Public Oral Health Service Section of the Dentistry Department, Primary Health Care Corporation Qatar reported that the prevalence of dental caries among male pupils was 82.2%, 85.1% among female pupils, and 82.4% for overall dental caries as shown in Figure 6 (Najat Alyafei, 2018). This indicates that dental caries remains a public health problem in Qatar as the prevalence of childhood caries is persistently high. This also suggests female children are more affected by dental caries in Qatar, as reported in the previous study (Al-Thani et al., 2016).

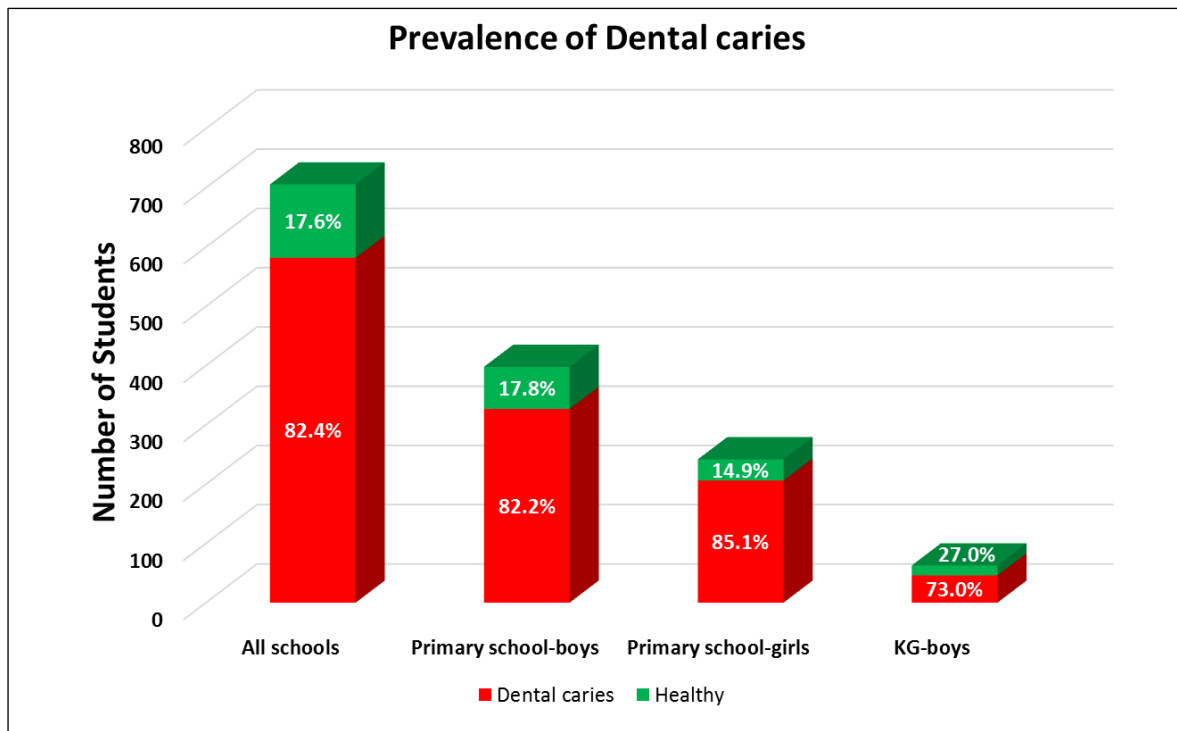


Figure 6. Prevalence of Dental Caries in Qatar. Source: Najat Alyafei (2018)

The study found a mean DMFT of 6.2 and 5.5 among male and female pupils, respectively, as shown in Figure 7 (Najat Alyafei, 2018). The overall mean DMFT was reported to be 5.8, which was higher than the data reported in the National Oral Health Survey and previous studies (Al-Darwish et al., 2014; Alkhtib et al., 2016; Supreme Council on Health, 2011).

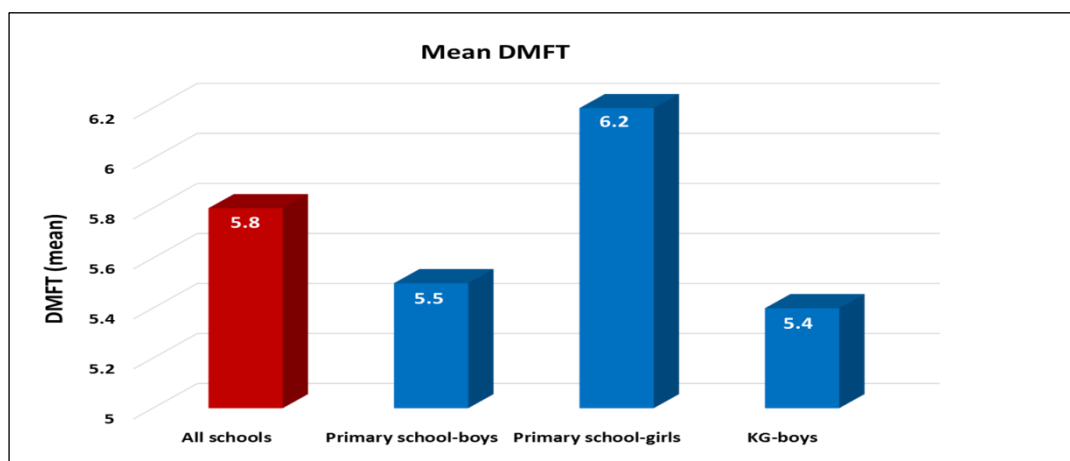


Figure 7. Mean DMFT among Qatari Pupils. Source: Najat Alyafei (2018)

Moreover, about half of the students had severe dental carries with DMFT >5. More females had severe dental caries compared to males, as seen in Figure 8 (Najat Alyafei, 2018).

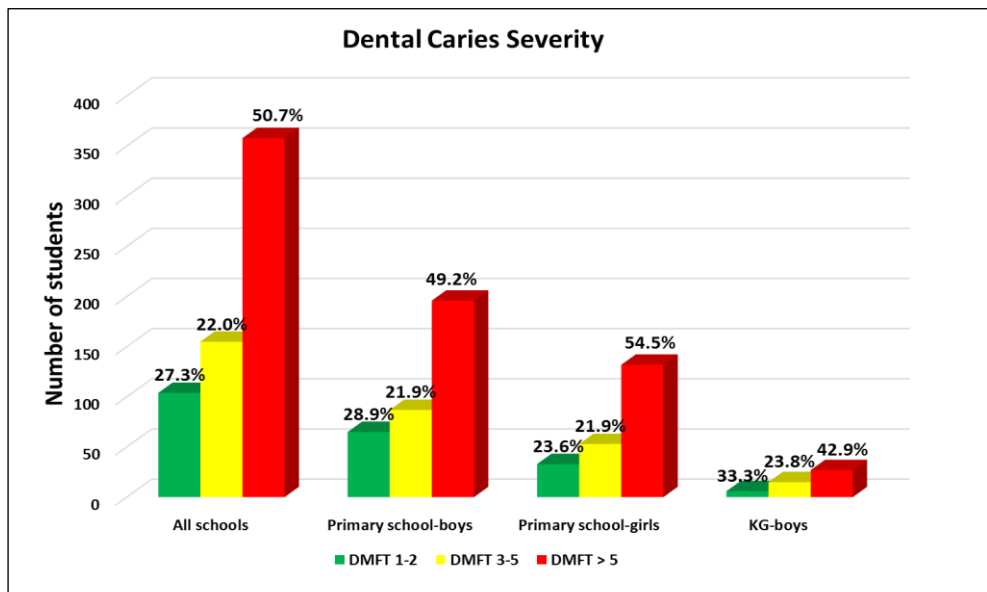


Figure 8. The severity of Dental Caries among Pupils in Qatar. Source: Najat Alyafei (2018)

All the reviewed studies conducted in Qatar show that the prevalence and severity of dental caries amongst children in Qatar were very high (Najat Alyafei, 2018, Al-Darwish et al., 2014; Alkhtib et al., 2016; Bener et al., 2013; Supreme Council on Health, 2011). This underscores the need for prevention strategies to control dental caries in Qatar.

Summary

This chapter has discussed the burden of dental caries globally and in Qatar, where children of all ages and adolescents were affected. It is well presented that oral health hygiene among school children in Qatar remains a big problem. It is documented that school children continue to experience oral health problems, which have been attributed to lack of oral health programmes, lack of parental support on oral hygiene, lack of school awareness of the problem, and lack of knowledge on the benefits of dental visits. As such, Qatar focuses on implementing oral health interventions to reduce cases of dental caries among children in school. These interventions need to be implemented mainly at school and empower parents to assist their children in practicing oral health hygiene, such as tooth brushing and dental flossing at home.

The main aetiological factors of dental caries include intake of sugary snacks and poor oral hygiene. Behavioural prevention strategies are important in reducing the incidence of dental caries. The Policy Triangle (Walt and Gilson, 1994) was used to appraise the National Oral Health Design Project 1.9 (Ministry of Public Health, 2015) with focus on content, context, actors and process. The content was appropriate with school based oral health initiatives recognised as a priority objective. Similarly, the Qatari overall health system context was appropriately considered in the policy. A range of actors are involved through the National

Oral Health Committee led by representatives of the HMC and PHCC. However, only a fraction of school children was covered in the implementation of the past school oral health programme (The Peninsula Newspaper, 2018). This thesis aimed to understand how best to develop dental caries behavioural prevention strategies for children in Qatari primary schools by examining the evidence underpinning behavioural strategies through a number of case studies. The thesis provided valuable information on Qatar's oral health behaviours, which helped determine why school children, especially in primary schools, develop dental caries and other oral health problems by exploring oral health problems in Qatar schools. The thesis sought to provide appropriate strategies that can be adopted in schools and at home to improve oral health behaviours among children to reduce incidences of oral problems. The thesis provided useful information for school policymakers to integrate oral health programmes as part of the curriculum. This aims to educate children on the usefulness of oral health hygiene and to reduce cases of dental caries in Qatar. The policymakers may use this thesis's information for future policy development on the integration of oral health programmes across schools. The development of the theoretical framework for the study is presented in the next chapter.

Chapter Two

Development Of Theoretical Framework

Introduction

This chapter presents the development of the initial theoretical framework for the case study work based on the review of behavioural change theories that have been used in school oral health interventions. According to Yin (2010), reviewing the existing work provided rich information to use on developing a theoretical framework that is utilised to design a specific case study. Most preventive interventions for dental caries promote oral hygiene behaviours (toothbrushing, dental flossing, healthy eating, and regular dental visit), which may not be adopted naturally unless actively motivated (Albino & Tiwari, 2016). The purpose of this preliminary review was to provide an understanding of oral health behavioural motivation in school children and contribute to the development of an initial theoretical framework for the case study. This theoretical framework for the study was developed by reviewing behavioural change theories that have been used, including Social Cognitive Theory, Health Belief Model, Theory of Reasoned Action, Theory of Planned Behaviour and Transtheoretical theory. The theoretical framework identified a tripartite group of factors (personal, behavioural and environmental) that mediate behavioural change. The process through which behavioural change is achieved is situated in the center of the model. The findings of this review will be integrated with the scoping review of international literature on school oral health to develop the overall conceptual framework for the case study. Reviewing the literature and theory in this area was an essential precursor to investigate the changing oral health behaviour in Qatar, which was the foundation of this thesis. Reviewing the existing literature on behavioural change theories provided the basis to select the theoretical framework of the study. Theoretical underpinning provides an understanding of the context, such as the choice of place, time, and processes involved in a programme (Nammontri, Robinson and Baker, 2013).

The behavioural change theories reported in the literature to have been used in school oral health programmes include: Social Cognitive Theory, Health Belief Model, Theory of Reasoned Action, Theory of Planned Behaviour and Transtheoretical Theory.

Social Cognitive Theory

Social Cognitive theory describes the process of learning by observing others (their behaviour and the consequences of the behaviour) within the context of social interactions, experiences, and outside media influences (Albino & Tiwari, 2016). Social cognitive theory originated from social learning theory, which was expounded to self-efficacy theory by

Bandura (1977). The social cognitive theory originated from Social Learning and Imitation Theory that was developed in the 1940s as the theory to learn individual behaviour in response to social motivation (Jenkins, Hall, & Raeside, 2018). Social learning theory was developed by Bandura as the antecedent of Social Learning and Imitation Theory to discuss the way in which people learn through imitations, observations and by modelling other people's behaviours (Jenkins et al., 2018). Social cognitive theory is known to be a comprehensive theory to gain in-depth insights into human behaviour, effect, individual thoughts, and motivation processes. The theory serves a useful framework to determine behaviour of people based on their experiences (Jones et al., 2016). The theory highlights that human behaviour, environmental influences, and personal factors persistently interact to yield significant outcomes (Jenkins et al., 2018). The theory combines concepts of emotional, behaviouristic, and cognitive elements to describe changes in behaviour for the prevention and management of a specific disease (Jenkins et al., 2018). Further, the social cognitive theory emphasizes that people not only learn based on their experiences but also by observing the actions undertaken by others and imitate them for behaviour change (Plow & Chang, 2019). As such, the theory can be applied when discussing oral health care practices. The theory may assist in exploring the factors that contribute to oral health disorders and whether school programmes in private and public schools in Qatar enable preschool and school-age children to observe and implement appropriate behaviours that would improve their oral health. For instance, the model may help to understand whether school programmes educate children to engage in mouth rinsing, tooth brushing, or using other preventing measures as practiced by other people in the school environment. The social cognitive theory is guided by four primary constructs or principles, which are: self-efficacy, reciprocal determinism, observational learning, and reinforcement (Rogers et al., 2005).

The construct of self-efficacy discusses that individual beliefs are achieved in a specific setting in accordance with personal learning and skill enhancement (Erlach & Russ-Eft, 2011). The concept of self-efficacy acknowledges the need for cognitive mediation of processes or actions that can inspire and allow the processing of stimulus to slater specific actions and behaviours. Moreover, self-efficacy stresses that a person can develop a sense of confidence regarding how or what abilities and behaviours so as to perform a particular task, while other people may not have that confidence (Jenkins et al., 2018). Therefore, the construct of self-efficacy is applicable to public health challenges in allowing for effective implementation of appropriate measures or actions. The concept applies to oral health practice to explore the

individual perceived capacity to practice oral health hygiene and actions undertaken by a person to prevent the development of oral health disorders.

The construct of reciprocal determinism states that an individual can be a change agent and a responder to a specific change, which is essential towards the achievement of healthy behaviours (Riley et al., 2016). Reciprocal determinism refers to the reciprocal interaction between personal, behavioural, and environmental factors. The construct emphasizes the interaction between an individual and the environment in response to particular stimuli so as to attain the necessary goals. The construct implies that a person with learned experiences can interact with the external social factors to achieve the necessary goals (Bandura, 2004). Thus, the construct of reciprocal determinism was used in the study to understand the factors that influence oral health among school children in private and public schools in Qatar. The construct was used to explore external and individual factors in the schools that contribute to oral health problems and the role the school plays to ensure that children achieve the necessary oral health. The construct provided an opportunity to explore how school children interact with the available oral health practices in the school environment, and the impacts of such practices in terms of oral hygiene and oral health diseases.

The construct of observational learning holds that a person may observe or witness specific behaviours of other people and imitate them. Observational learning implies that individuals can learn from others and reproduce their behaviours. Further, such individuals can model the behaviours of others with the intent to change their actions (Fryling, Johnston, & Hayes, 2011). The application of this construct in this present study provided the basis to understand whether the health behaviours of school children in terms of oral health are attributed to the behaviours of their teachers and other school members. The construct implied that school children engage in specific actions by observing or modelling the behaviours of other people they interact with (Fryling et al., 2011). Thus, relating to the oral health practices, the construct holds that students can observe, imitate, or model oral health hygiene practiced by their teachers, colleagues, and other school members, which shaped their health behaviours towards practicing oral hygiene. The construct of observational learning also provides the opportunity to gain deeper insights into the impacts of school health programmes in shaping oral health and oral diseases among students.

The construct of behavioural capability refers to the level of an individual's knowledge and skills in relation to the action to be carried out. The construct accentuates that a person has the capacity to practice specific behaviour by applying the necessary skills and knowledge (Joseph, Ainsworth, Mathis, Hooker, & Keller, 2017). To successfully practice a particular

behaviour, a person is aware of what and how to do or practice the behaviour. As such, people can learn from the effects of their behaviour, which also has significant consequences on the environment where they live or reside (Joseph et al., 2017). The construct of behavioural capability is thus applicable to the study to understand the connection between socio-behavioural factors and oral health. The construct helped in understanding behavioural factors and risk factors of oral health in private and public schools. The behavioural capability construct provided the basis to investigate the association of oral health and behavioural factors, which were necessary for recommending appropriate oral health promotion and implementing oral disease prevention interventions.

The construct of expectations entails the anticipated consequences of behaviours. The construct holds that a person has individual behaviours, which can be health or non-health related actions (Carillo, 2010). This construct emphasizes that a person expects the effects of actions undertaken before he or she takes part in engaging in the behaviour, such anticipated effects have significant influences on successful engagement on a specific behaviour (Carillo, 2010). The construct was applicable in the present study on oral health as it provided the opportunity to understand the anticipated consequences of allowing children in schools to engage in oral health practices. The construct assisted in gaining deeper insights into the oral health behaviours in schools and the consequences such behaviours may have in relation to oral health and oral diseases.

The construct of reinforcement accentuates the external and internal responses towards individual behaviours that can impact the possibility of a person to continue or discontinue a specific behaviour (Coulston, Rock, & Monsen, 2001). Reinforcements are internal and external responses to behaviour, which motivate an individual to continue or discontinue the behaviour. Reinforcement is a self-initiated practice, and it can either be positive or negative. According to this construct, a person can initiate a particular behaviour as a change practice for an action. Such behaviour change can negatively or positively impact a person's way of conducting things (Coulston et al., 2001). In relation to oral health, the construct of reinforcement provides the opportunity to describe self-initiated behaviours that positively or negatively impact the potential of school children to practice oral health hygiene. The construct applies to oral health practice to discuss individual behaviour of school children that impacts their ability to continue to discontinue the practice of oral health practices.

The social cognitive theory was thus useful in the study to understand the individual behaviours of children in private and public schools regarding oral health. The theory helped to expound on how the existing school oral health programmes influence the behaviour of

children towards oral health and oral diseases. Children can learn a healthy behaviour, such as tooth-brushing and dental flossing by observing significant others, especially parents and teachers, who they regard as their role models (Yekaninejad et al., 2012). Social Cognitive Theory posits that learning of behaviour is influenced by a reciprocal and dynamic interaction between personal, behavioural, and environmental factors, as shown in Figure 9 (Bandura, 1986).

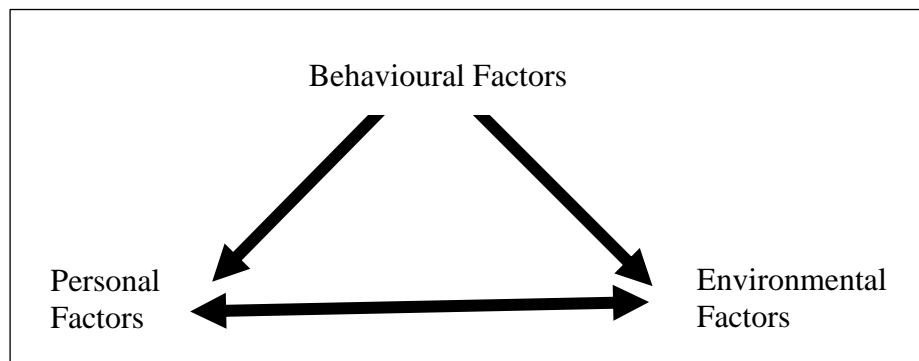


Figure 9. Social Cognitive Theory (Bandura 1986)

The personal (cognitive) factors include the capability (knowledge and skills) of an individual to perform behaviour, the level of perceived self-efficacy with regards to the behaviour and the expectations (anticipated outcome) of the behaviour (Bandura, 2004). The behavioural factors encompass the internal or external responses an individual received after performing behaviour which serves as positive or negative reinforcement for the behaviour. Environmental factors include all conditions in the setting that influence the ability of the individual to successfully undertake an action. In other words, the environment is the social context within observational learning that takes place (Bandura, 2004).

One of the major constructs of Social cognitive theory that has been applied in school oral health is self-efficacy (Albino & Tiwari, 2016). Self-efficacy is the confidence in one's ability to perform a specific task that will result in a positive outcome (Yekaninejad et al., 2012). The most powerful way of achieving self-efficacy is the experience of success, also called enactive attainment (Yekaninejad et al., 2012). For example, the experience of less bleeding may improve self-efficacy with tooth brushing (Haleem, Siddiqui, & Khan, 2012). Self-efficacy may also be attained through vicarious learning i.e., learning from other people's unpalatable experiences (Yekaninejad et al., 2012). Witnessing the loss of teeth by family members may improve oral hygiene-related self-efficacy (Yekaninejad et al., 2012). In addition, verbal persuasion may facilitate self-efficacy. Lastly, the attainment of self-efficacy may be prevented by emotional states. Children engage in behaviours as desired when they

receive positive feedback from peers, parents, and teachers. Thus, children have strong self-efficacy if they observe a successful model similar to themselves (Yekaninejad et al., 2012). Despite the relevance of social cognitive theory on studying oral health, the theory has also been criticised.

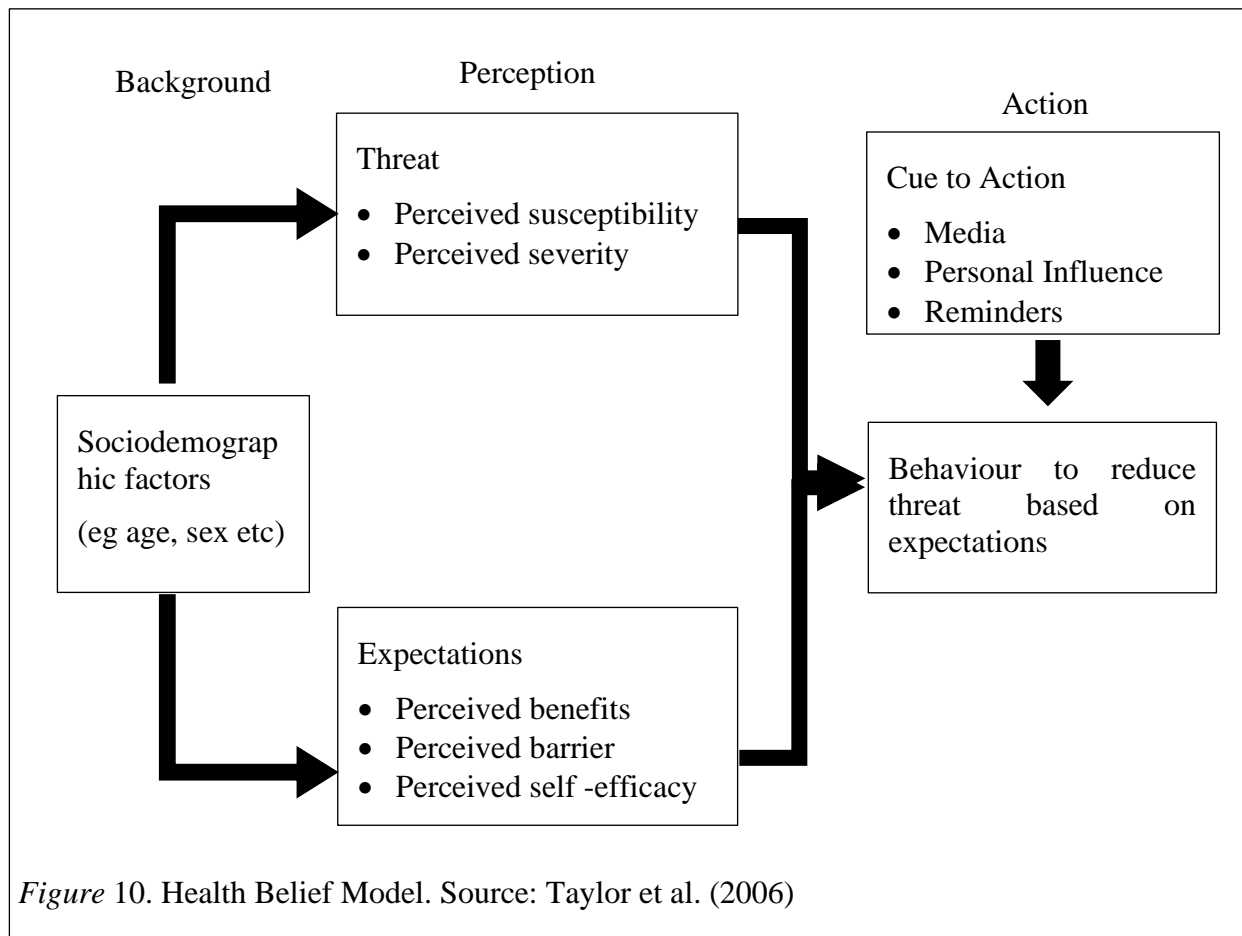
Social cognitive theory has been criticised for assuming that environmental changes automatically causes changes in behaviour and for disregarding biological factors and emotions that may also influence behaviour regardless of expectation or past experience. Further, the theory loosely organised complex array of factors including knowledge, skills, perception, exposure, experience and expectation without explicit indication of relative contribution of each of the factors.

A randomised controlled trial reported that a Social Cognitive Theory-based intervention was effective in improving oral health knowledge, attitude and behaviour as well as oral hygiene of school-children in Pakistan ages 10-11 years (Haleem et al., 2012). Social cognitive theory was used as the theoretical framework for oral health intervention. Vicarious learning was demonstrated by actively involving the pupils in various group activities, such as examining one another's teeth for dental plaque and cavities. Self-efficacy was promoted by making the pupils practise and demonstrate tooth brushing to one another on anatomical models. Reinforcement and social support were inculcated by asking the pupils to appreciate their peers for active participation and desirable change in oral health behaviours (Haleem et al., 2012).

Health Belief Model

The health belief model is a social cognition model, which posits that health behaviour is predicted by individual's perception of threat associated with a condition and expectations of the recommended health behaviour (Taylor et al., 2006). The health belief model was developed by Hochbaum and Roznastak in the 1950s as an education model to study disease prevention behaviours for different health conditions, including cancer (Masoudiyekta et al., 2015). The model was created to train healthcare specialists to acquire the necessary skills for the susceptibility, seriousness, barriers, and cues of actions towards a specific disease. The model accentuates that in the absence of clinical signs and symptoms, a person should believe that disease exists (Masoudiyekta et al., 2018). When people are at higher risks of a particular disease, they realize that the condition has potential effects, believe that implementing prevention programme has positive effects and that the benefits outweigh the barriers, and can engage in health behaviour programmes. It is more likely that such people can accomplish healthy behaviour (Yilmaz, Bebis, & Ortabag, 2013). The Health Belief Model is guided by

six key constructs, which include perceived susceptibility, perceived severity or seriousness, perceived benefits, perceived barriers, self-efficacy, and cues of action (Masoudiyekta et al., 2018). The constructs are crucial because they guide in designing education programmes to improve health awareness. The constructs are particularly useful in health promotion studies because the Health Belief Model serves as a powerful framework to evaluate factors that impact health behaviours and assesses prevention services for health promotion (Luquis & Kensinger, 2019). The flow diagram of Health Belief Model is presented in the following Figure 10.



Perceived threat is a combination of perceived susceptibility to, and perceived severity of the health condition (Taylor et al., 2006). Perceived threat is high when an individual believes that he/she is susceptible to a severe medical condition, and this may motivate him/her to adopt a certain behaviour to reduce the threat. On the other hand, the individual may not be motivated to take action if he/she believes that they are not susceptible to the medical condition or that the medical condition is not severe. Thus, oral health promotions based on health belief model tend to provide information to individuals to help them appreciate their high level of susceptibility or the severity of the condition.

Expectation is a combination of the perceived benefits of, and perceived barrier to taking the health action (Taylor et al., 2006). Self-efficacy was later added under expectations. The predictive power of health belief model was improved when self-efficacy was introduced as part of the composite constructs that make up expectations (Yekaninejad et al., 2012). Perceived benefits of the action are the positive outcomes of the action expected by an individual. On the other hand, perceived barriers are anticipated obstacles that may prevent an individual from successfully undertaking an action. The higher the self-efficacy and perceived benefits, the higher the likelihood of adopting a specific behaviour. However, the likelihood of undertaking behaviour reduces with increasing perceived barriers.

Cues to action from significant others, including teachers, parents, and peers, may prompt the health action (Yekaninejad et al., 2012). Such cues in oral health promotion may include the use of media such as videos and reminders.

Demographic characteristics including age, sex, race, ethnicity, income, and education influence the perception of threats and expectations by individuals (Albino & Tiwari, 2016). Thus, the primary caregiver must believe that the child is susceptible to dental caries, which is a serious condition. Oral hygiene practices can prevent dental caries, and barriers to oral hygiene practices can be overcome. The primary caregiver must also be willing to support the child to avoid sugary snacks.

Health Belief Model has not only been adapted in cancer healthcare services, but also in oral health programmes. The model has been adapted as the best model in oral health education to understand oral health behaviours. Studies have shown that health belief model is a predictor of oral health (Yekaninejad et al., 2012).

A school based oral health programme based on health belief model was found to be effective (Yekaninejad et al., 2012). The intervention attempted to increase the perceived threat of dental caries by providing information about the severity of oral diseases and its association with systemic diseases such as coronary heart disease. Information was also provided to make pupils believe that they were susceptible to poor oral health outcomes. Perceived benefits were demonstrated by providing information about the benefits of tooth brushing and dental flossing. Perceived barriers to toothbrushing and dental flossing were identified, and plans were made to overcome them (Yekaninejad et al., 2012). Self-efficacy was improved using several strategies which include praising and rewarding the pupils for brushing and flossing; dividing toothbrushing and dental flossing to smaller tasks; providing instructions on how to carry out dental flossing and toothbrushing; record-keeping of toothbrushing and dental flossing with a

diary; and getting encouragement and feedback from parents, teachers and other staff (Yekaninejad et al., 2012).

Solhi, Zadeh, Seraj, and Zadeh (2010) conducted a quasi-experiment study to investigate the use of the Health Belief Model in oral health education and its significant consequences on oral health behaviours among children aged 12 years (Solhi et al., 2010). The study sought to determine the effects of the model on correct tooth brushing, flossing, and decayed missing and filled teeth index. The study found that the application of the Health Belief Model while educating children on oral health behaviours improved their likelihood to take oral preventive measures, which enhanced their oral health behaviours (Solhi et al., 2010). Based on the critical constructs of the Health Belief Model, the study revealed that after the implementation of an oral health education programme, individual perceptions of oral health was improved. It was found that individual perceptions in terms of perceived susceptibility, perceived severity, perceived barriers, and perceived benefits were improved (Solhi et al., 2010). Proper brushing of teeth and flossing among children demonstrated increased perceptions, which indicates an increased perceived severity and perceived barriers, and a reduction in decayed missing and filled teeth index, and an increased oral health index reflects increased perceived benefits (Solhi et al., 2010). The findings on the effectiveness of Health belief Model on oral health behaviour are supported in a more recent clinical trial by Jeihooni, Jamshidi, Kashfi, Avand, and Khiyali (2017), which investigated the efficacy of health education programme with respect to the use of Health Belief Model on oral health and dental hygiene behaviours among pregnant women in Fasa city. The study found that oral health behaviours were improved as the perceptions of pregnant women on benefits increased (Jeihooni et al., 2017). Also, the study showed that the perceived barriers were reduced after educational intervention. In terms of perceived self-efficacy, there was a significant increase in the perceived self-efficacy after the educational programme, which showed that oral health education improves self-efficacy towards dental hygiene behaviour (Jeihooni et al., 2017). Further, the perceived susceptibility was increased which was characterized by a lower mean score of decayed missing and filled teeth indexes among pregnant women (Jeihooni et al., 2017). Based on these findings, it is evident that the application of the Health Belief Model is a very effective and powerful approach to develop health education programmes for improved oral health and dental hygiene behaviours.

Moreover, the Health Belief Model has been used to study dental behaviours based on school oral health programmes. Rahmati-Najarkolaei, Rahnama, Fesharaki, Yahaghi, and Yaghoubi (2016) conducted a cross-sectional study to explore potential factors that influence

dental health behaviours among students. The study was conducted in a district school in Teheran, Iran, in which 400 male students in high school were randomly selected. The researchers used the Health Belief Model, in which the construct of the model was the primary measure. Based on the data analyzed, the study demonstrated that perceived susceptibility, perceived benefits, and perceived severity were high among students, which showed that the students had knowledge about oral health practices (Rahmati-Najarkolaei et al., 2016). Besides, perceived severity, perceived self-efficacy, and cues of action were also high. The study concluded that reducing the perceived barriers while promoting efficacy on oral and dental hygiene is crucial to improve oral and dental hygiene in schools (Rahmati-Najarkolaei et al., 2016). The study thus indicated that the application of the Health Belief Model in-school oral health and dental hygiene is effective in determining perceived barriers of oral health and adopts appropriate measures to improve students' oral health. Another study that employed Health Belief Model examined the relationship between tooth brushing behaviour and dental caries among school children from primary schools in Sisattanak district, Vientiane, and the beliefs of guardians about oral health behaviour (Phanthavong et al., 2019). The study revealed that the prevalence of dental caries among school children was high, which accounted for approximately 82% (Phanthavong et al., 2019). Tooth brushing behaviour was increased based on the increased self-efficacy of guardians about tooth brushing. The study indicated that the self-efficacy of guardians was high, which enabled school children to brush their teeth twice a day, which improved their oral health behaviour. However, the health belief model has been criticized for proposing a stepwise behavioural change progression and suggesting that provision of information is sufficient to mediate behavioural change (Taylor et al., 2006). Moreover, apart from recognising environmental cues to action, the health belief model does not explicitly account for the roles of environmental context in behavioural change.

Theory of Reasoned Action and Theory of Planned Behaviour

The Theories of Reasoned Action and Planned Behaviour regard intention as the most immediate determinant of behaviour (Taylor et al., 2006). The theory is summarized in the following Figure 11.

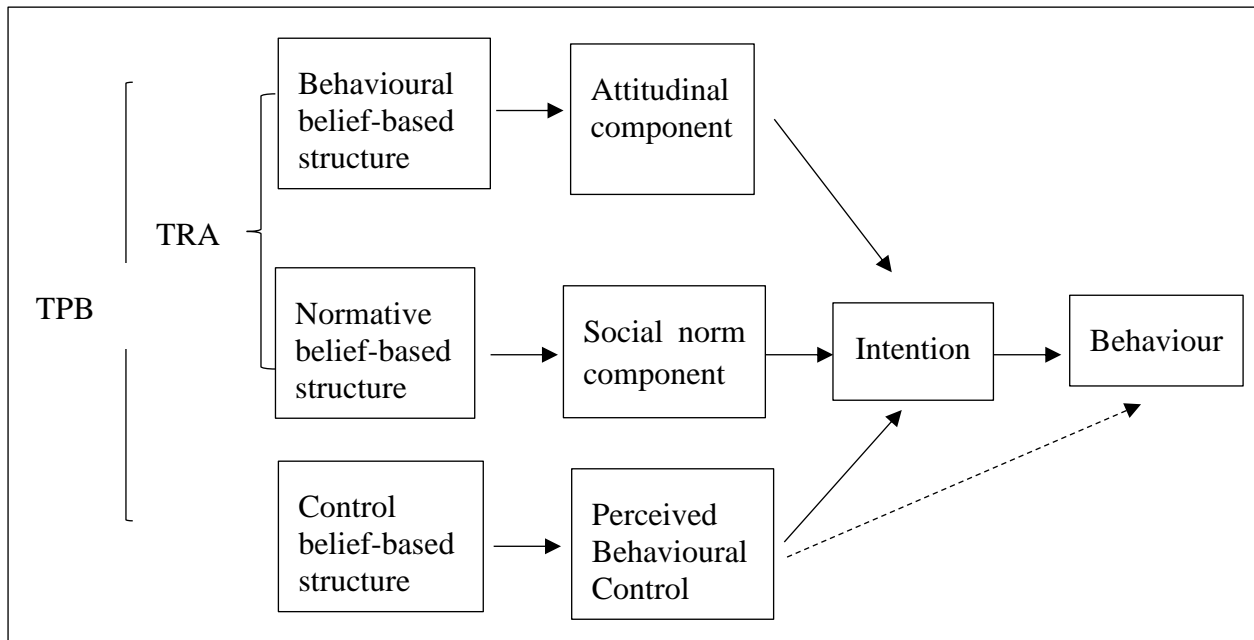


Figure 11: Theories of Reasoned Action and Planned Behaviour. Source: Taylor et al. (2006)

According to the Theory of Reasoned Action, the intention is predicted by behavioural attitude and subjective norm (Albino & Tiwari, 2016). Behavioural attitude is the product of personal belief in the likelihood that an action will produce a certain outcome and personal evaluation of the outcome (Albino & Tiwari, 2016). In other words, the attitude of an individual towards a recommended health action is determined by the individual's belief that the action will be beneficial to health (perceived benefit) and individual's evaluation of the outcome in terms of its desirable consequence. If an individual believes that an action will be beneficial and considers the consequence as desirable, the individual is likely to have positive attitude towards such recommended action (Albino & Tiwari, 2016).

Subjective norm is the product of belief about the behavioural expectation by significant others and the extent to which an individual is willing to comply with the expectations (Taylor et al., 2006). Thus, the intention of an individual to carry out an action is influenced by the belief of the individual about what is expected of him/her by the society and their willingness to comply with such expectation. An individual is likely to have the intention of carrying out an action if it is regarded as an expectation of the society, and the person is willing to comply.

In addition, the Theory of Planned Behaviour posits that intention and behaviour are also predicted by perceived behavioural control, which is a product of perceived self-efficacy and barrier to actions (Albino & Tiwari, 2016). The Theory of Reasoned Action has been used in oral health studies to explore oral health behaviours in schools. A study among 436 parents and caregivers of kindergarten children in the US reported that subjective norm, perceived behaviour control, and intentions are significant predictors of a healthy diet, oral hygiene, and dental attendance. However, the attitude was a significant predictor for only dental attendance.

Previously conducted studies support the usefulness of using Theory of Reasoned Action in oral health programmes to support oral health behaviours (Luzzi & Spencer, 2008; Syrjala, Niskanen, & Knuuttila, 2002). Syrjala et al. (2002) conducted a cross-sectional study to investigate the frequency of brushing teeth and incidences of dental caries among diabetic patients based on the Theory of Reasoned Action. The frequency of tooth brushing and dental caries was assessed based on the construct of the theory, which included intentions, attitudes, subjective norms, and behavioural and normative beliefs (Syrjala et al., 2002). The study showed that attitudes and subjective norms positively influence individual intentions to practice tooth brushing, which led to reduced cases of dental caries or decayed dental surfaces. Further, the study established that the intentions to brush have positive effects on the frequency of tooth brushing among diabetic patients. The dental attitude was also associated with improved intentions to brush teeth and self-efficacy towards oral hygiene, which contributed to reduced decayed dental surfaces (Syrjala et al., 2002). The study thus concluded that employing the Theory of Reasoned Action in oral health is crucial because it offers an opportunity to adequately describe oral health behaviour in terms of tooth brushing, flossing, and decayed dental surfaces. The randomized controlled clinical trial by Luzzi and Spencer (2008) supported the application of the Theory of Reasoned Action and Theory of Planned Behaviour in public oral health practices. The researchers examined the relationship between dental attitudes and oral health beliefs among public users of dental services and visiting intentions to dental services and oral behaviours based on the Theory of Planned Behaviour. The study revealed that public dental service users had positive attitudes, self-efficacy, and subjective norms towards visiting dental care settings (Luzzi & Spencer, 2008). This indicates that self-efficacy, perceived control, attitudes, and subjective norms of dental service users are the primary predictors of their intentions to practice oral health and oral health hygiene. The theory of reasoned action and the theory of planned behaviour have also provided the opportunity to study oral health with focus on the factors that shape the ability to or not to practice dental check-ups.

A study by Anderson, Noar, and Rogers (2013) examined the oral health among young adults, and in particular their ability to practice dental check-ups based on the theory of reasoned action and the theory of planned behaviour. The study examined the factors that influence the ability of young adults to use or not to use dental care services and the significant impacts on overall health status. The theories were used to determine the intentions and behaviours of young adults towards routine check-ups for dental care. Based on the theory of reasoned action, attitudes and subjective norms towards dental check-up practices were assessed (Anderson et al., 2013). The study revealed that the young adults had strong attitudes and normative influences, which resulted in their intentions to engage in oral health hygiene practices and related behaviours, which include flossing, tooth brushing, and visiting dental care services. With respect to the theory of planned behaviour, the intentions and subjective norms of adults towards dental check-ups were assessed based on the principles of perceived power and perceived behavioural control. Thus, the study found that subjective norms were the key predictors of routine dental check-ups among young adults (Anderson et al., 2013). Based on the principle of perceived power, the study demonstrated that the majority of adults had strong intentions to engage in routine check-ups, which suggested the use of the theory of planned behaviour in understanding the factors that influence oral health practices. Moreover, the principle of perceived behavioural control indicated that individual attitudes towards dental services influence the ability to seek routine dental care services. The study showed that some young adults had attitudes to engage in oral health behaviours of brushing and flossing (Anderson et al., 2013).

Based on the previously conducted studies regarding the theory of reasoned actions and the theories of planned behaviour, the theories are useful in studying oral health hygiene and related behaviours. The theories provide the opportunity to explore the factors that influence oral health and oral health diseases.

Based on the relevance of the theory of reasoned action and the theory of planned behaviour, the theories have also been used in school oral health programmes to understand dental behaviours in schools. This is evident in the study by Dumitrescu, Wagle, Dogaru, and Manolescu (2011) that examined the efficiency of using the theory of planned behaviour to predict the intentions to enhance oral health behaviours among medical students. In the study, the primary measures were attitudes, intentions, subjective norms, perceived behavioural control, knowledge of oral health, and the current behaviours of oral health hygiene. Student's attitudes on oral health behaviours and perceived behavioural control predicted the intention to

practice oral health (Dumitrescu et al., 2011). Based on the constructs of the theory of planned behaviour, the study showed that the attitudes, perceived behavioural control, and knowledge on oral health predict the intentions to improve the behaviour of students to practice oral hygiene (Dumitrescu et al., 2011). The study disclosed that students' intentions had a positive association with their ability to practice oral health practices. It was established that intentions positively influence cognitive and affective attitudes, behavioural control, and improved students' knowledge of oral health (Dumitrescu et al., 2011). The study thus supported the efficacy of the theory of planned behaviour in improving dental health behaviours of students. Application of the theory of planned behaviour in-school oral health behaviours revealed the efficacy of the model, which permits elucidation of the effects of school interventions and documentation of factors related to evidence-based practice to improve oral health practices in schools (Dumitrescu et al., 2011). Besides, the use of the theory of planned behaviour in school oral programmes provides an oral health education that focuses on improving awareness, knowledge, and attitudes of students and school staff while removing any barriers that may hinder their ability to seek daily dental health care services (Dumitrescu et al., 2011).

Similarly, a randomised controlled trial by Davison, McLaughlin, and Giles (2019) supported the efficiency of the theory of planned behaviour in studying oral health behaviours in schools. The study was conducted in primary schools in Northern Ireland to predict and discuss the intentions and motivations of school children to brush their teeth. The constructs of the theory were used in the study to explain oral health behaviour among primary school children. The application of the theory of planned behaviour yielded significant results that explained the oral health behaviour of brushing in primary schools. The study showed that there was strong self-efficacy among primary school children, which improved their intentions, attitudes, perceived behavioural control, and subjective norms towards brushing their teeth (Davison et al., 2019). The use of the theory of planned behaviour was an essential framework in the study because it provides the basis to examine the intentions of primary school children towards tooth brushing. The theory was a useful approach in understanding oral health behaviour in terms of brushing and provided the foundation for doctors and scientist to design appropriate oral health interventions aimed at supporting tooth brushing, mouth rinsing, and flossing behaviour in children, which is crucial in preventing oral diseases, such as caries and related infections.

The Theory of Planned Behaviour has been criticized for not accounting for factors such as fear, threat, mood, and past experience as well as environmental and economic factors.

Some researchers have rejected the efficiency of theory in explaining human social behaviours. These researchers assumed that despite the intention of a person to practice a specific behaviour, the theory of planned behaviour does not account for other behavioural factors, such as fear and threat (Ajzen, 2011; McEachan, Conner, Taylor, & Lawton, 2011). The researchers also assumed that regardless of normative influences, the theory does not consider economic factors and environmental factors, which can influence the intentions of an individual to practice a particular behaviour. Besides, other researchers believe that the theory of planned behaviour is not effective in studying individual behaviours because the construct of perceived behavioural control lacks detail information on the actual control over individual behaviour (Armitage & Conner, 2001; Brannon & Feist, 2010).

Further, the researchers criticised the theory of planned behaviour and denied the significance of its consciousness as an essential agent or predictor of behaviour. They assumed that human behaviour is only driven by unconscious mental processes, such as implicit attitudes (Armitage & Conner, 2001). The majority of critics, however, support the basic assumptions of the theory of reasoned action, but they questioned the adequacy of the theory when measuring individual attitudes toward the desired behaviour and subjective control (Ajzen, 2011).

Transtheoretical Theory

The Transtheoretical model is a stepwise model that describes the readiness of an individual to adopt a new health behaviour (Taylor et al., 2006). The model provides explanation on how individuals change their behaviour, their readiness for change and their experiences during the process of change. Readiness for change consists of individuals' current thoughts, feelings, and attitudes regarding their intention to institute changes in oral health habits as presented in the following Figure 12.

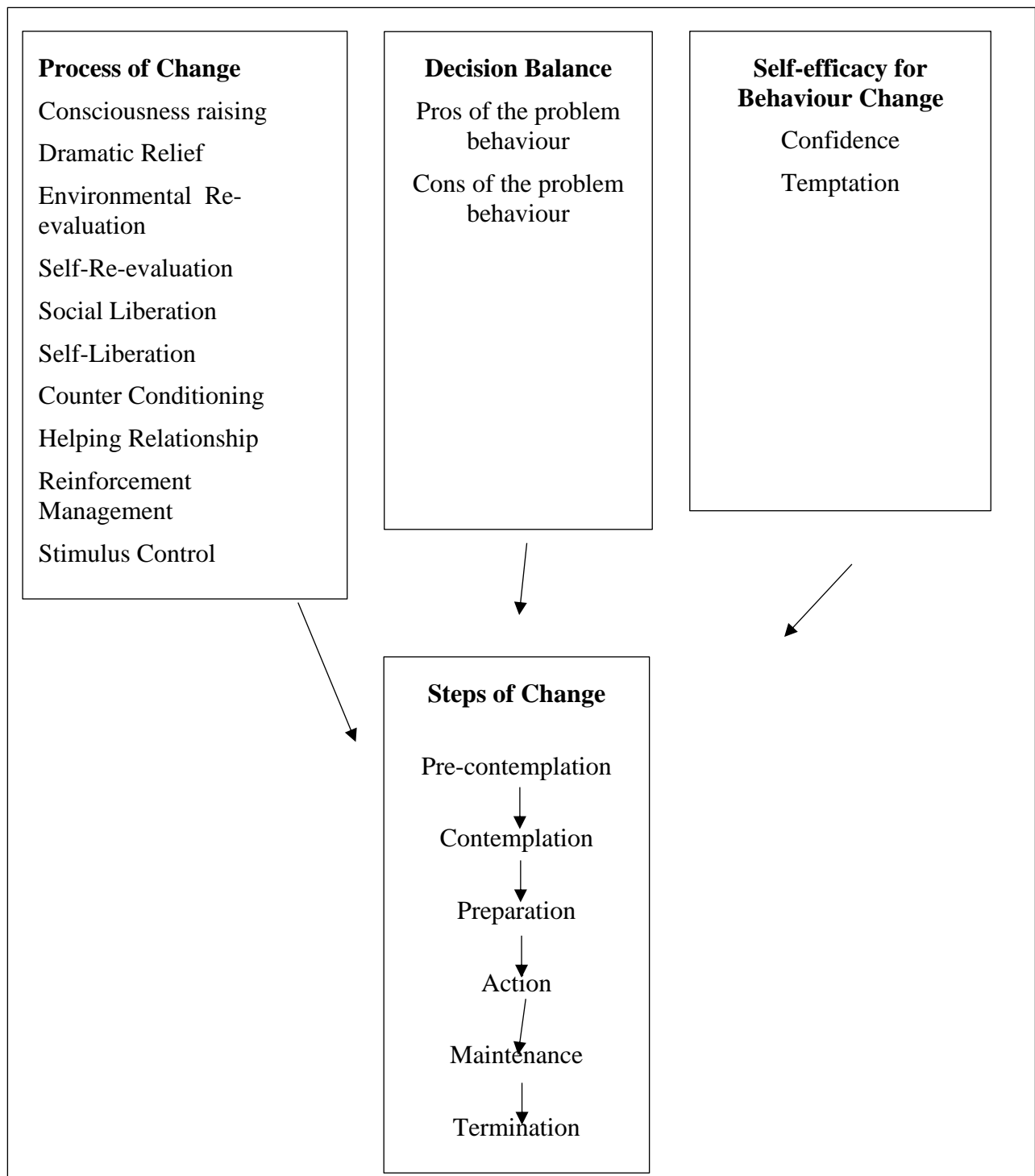


Figure 12. Transtheoretical Model. Source: Taylor et al. (2006).

The six stages of change identified in the model include: pre-contemplation, contemplation, preparation, action, maintenance, and termination (Taylor et al., 2006). Precontemplation is the stage when an individual has not started considering change of lifestyle. An individual begins to consider the need for a change at the contemplation stage. In the preparation stage, an individual is determined to make a change and exerts effort to put in

place necessary conditions for change like acquiring relevant knowledge. The actual change is carried out during the action stage. In the subsequent stage, an individual maintains the change achieved for a reasonable period of time. At the termination stage, the newly adopted behaviour has become natural for the individual (Taylor et al., 2006). Thus, transtheoretical model requires individual assessment to determine the current stage in the spectrum.

The individual advances to the next stage of change if motivated through an appropriate process of change. The processes of change include consciousness raising, dramatic relief, environmental re-evaluation, self-re-evaluation, social liberation and self-liberation (Taylor et al., 2006). Others include: counter-conditioning, helping relationships, reinforcement management, and stimulus control. When information is provided, the individual will consider the pros and cons of the behaviour before making a decision. In the same vein, a child might be at any of the stages with regards to oral health behaviour and different processes of change may be required to move a child towards the maintenance/termination stage. The movement between the stages of change is not unidirectional. Sometimes an individual may oscillate between the stages (Taylor et al., 2006).

The transtheoretical theory has been found useful in studying oral health behaviour. A study by Tillis et al. (2003) used transtheoretical theory to investigate oral self-care behavioural change among individuals from dental care practices. The theory was used to explore whether such individuals can engage in dental self-care practices as a way to reduce oral health problems. The study findings showed that having a dental experience is crucial in improving decision making to engage in the interdental cleaning process. Individuals with enough dental experiences develop a strong commitment toward oral self-care practices and verbal behaviour, such as tooth cleaning. Also, the study indicated that commitment to oral self-care is crucial as it provides the basis to use appropriate interventional techniques and strategies to improve oral health hygiene (Tillis et al., 2003). As such, the study revealed significant benefits of applying the transtheoretical theory in oral health. Application of the theory assists in understanding behavioural change of a client, which would allow the practitioners to choose and implement appropriate interventional strategies to move people along the continuum of behavioural change in terms of oral health practices (Tillis et al., 2003). The transtheoretical model has shown significant benefits in studying dental health behaviour in schools.

A recent study that investigated interdental cleaning behaviour has also supported the application of the transtheoretical model in oral health practices (Hashemian et al., 2012). The study was conducted to test the efficacy of the theory in understanding dental cleaning among

students. The educational intervention programme was designed to improve teeth cleaning behaviour among students. The study findings illustrated that education intervention on oral health positively impacts students' improvement in interdental cleaning behaviour (Hashemian et al., 2012). The intervention increases perceived benefits and self-efficacy but decreases the barriers to dental cleaning and improvement of the gingivitis index among students. The intervention programme was thus found to positively impact the student stages of behavioural change and serve as a potential predictor of interdental cleaning to prevent gingivitis index (Hashemian et al., 2012). Based on the findings attained, it can be suggested that the transtheoretical model can be used as an essential approach to developing interdental cleaning interventions in schools. Another study by Morowatisharifabad, Fallahi, Nadrian, Haerian, and Babaki (2011) that investigated the application of the transtheoretical model in oral health behaviour in schools supported the assumption that the model can be used to improve the self-efficacy of students towards dental cleaning. The study was conducted among senior high school students from different schools in Yazd city, Iran. The study sought to test the efficacy of the transtheoretical model in improving self-efficacy of senior high students towards interdental cleaning behaviour. Using the transtheoretical model, there was an increase in the stages of practicing interdental cleaning practices among the students (Morowatisharifabad et al., 2012). The study findings indicated that students' awareness of perceived barriers to oral cleaning behaviour increased following the implementation of the intervention, and students were able to overcome barriers. Based on such findings, Morowatisharifabad et al. (2012) concluded that the application of the transtheoretical model in interdental cleaning behaviour is the best predictor of oral health practices and behaviours in schools. As a consequence, the transtheoretical model is a useful theory to determine the students' stages of oral or interdental cleaning behaviour changes. The model can assist in developing a theory-based and evidence-based intervention programmes and strategies to support and improve oral cleaning behaviours with a focus on self-efficacy of students in schools. Further, Kasila, Poskiparta, Kettunen, and Pietilä (2008) applied transtheoretical theory's stages of change model to motivational counselling of school children. Dental health hygienists led change discussion which addressed readiness for change and making changes. One year after the onset of the programme, the schoolchildren became aware of their need for change with regards to dietary habits. Thus, it could be said that the children have been moved from pre-contemplation stage to at least the contemplation stage through consciousness rising (Kasila et al., 2008).

Based on the previously conducted studies regarding social cognitive theory, health belief model, the theory of reasoned action, the theory of planned behaviour and transtheoretical theory, the theories provide the basis to develop a theoretical framework on oral health hygiene and related behaviours. The theories provide the opportunity to explore specific factors that impact oral health and oral health diseases.

Theoretical Framework

The researcher noted the factors influencing the oral health behavior change among children varies due to the different types of schools that children attend, varying views of oral health among parents and teachers, and the differing views regarding the oral health education and awareness programmes. A hybrid theoretical framework will capture all the aspects that may influence how change is adopted or implemented regarding oral health among Qatari children. Therefore, the theoretical framework will follow the Transtheoretical Model, Social Cognitive Theory, the theory of planned behavior, the Health Belief Model, and reasoned action theory. Combining the above theoretical frameworks contributed to the three identified aspects that influence oral health-related behavioral change. Bandura explained that the Social Cognitive Theory is a framework for describing the factors that influence a person's experiences based on personal aspects, actions of other people, and environmental factors. Hence how the personal and environmental aspects influence their oral health behavior was obtained through adopting the theory. In the Health Belief Model, and perception and expectation are described as the main determinants of behavior. Adopting it into the study's theoretical framework enabled the researcher to identify how perception and expectation influence oral health among children. The theory of reasoned action aids in identifying behavioral control and intention aspects. Including such aspects aided the primary investigator in identifying how the school children's surrounding environment influences their oral health behaviours. Besides, the transtheoretical model posits the various steps that a person has to follow to attain change. Hence, including the transtheoretical model in the theoretical framework helped the researcher identify the most effective change processes that would lead to positive oral hygiene improvements. Based on the literature reviewed on behavioural change theories, the factors that formed the theoretical framework are presented in figure 13.

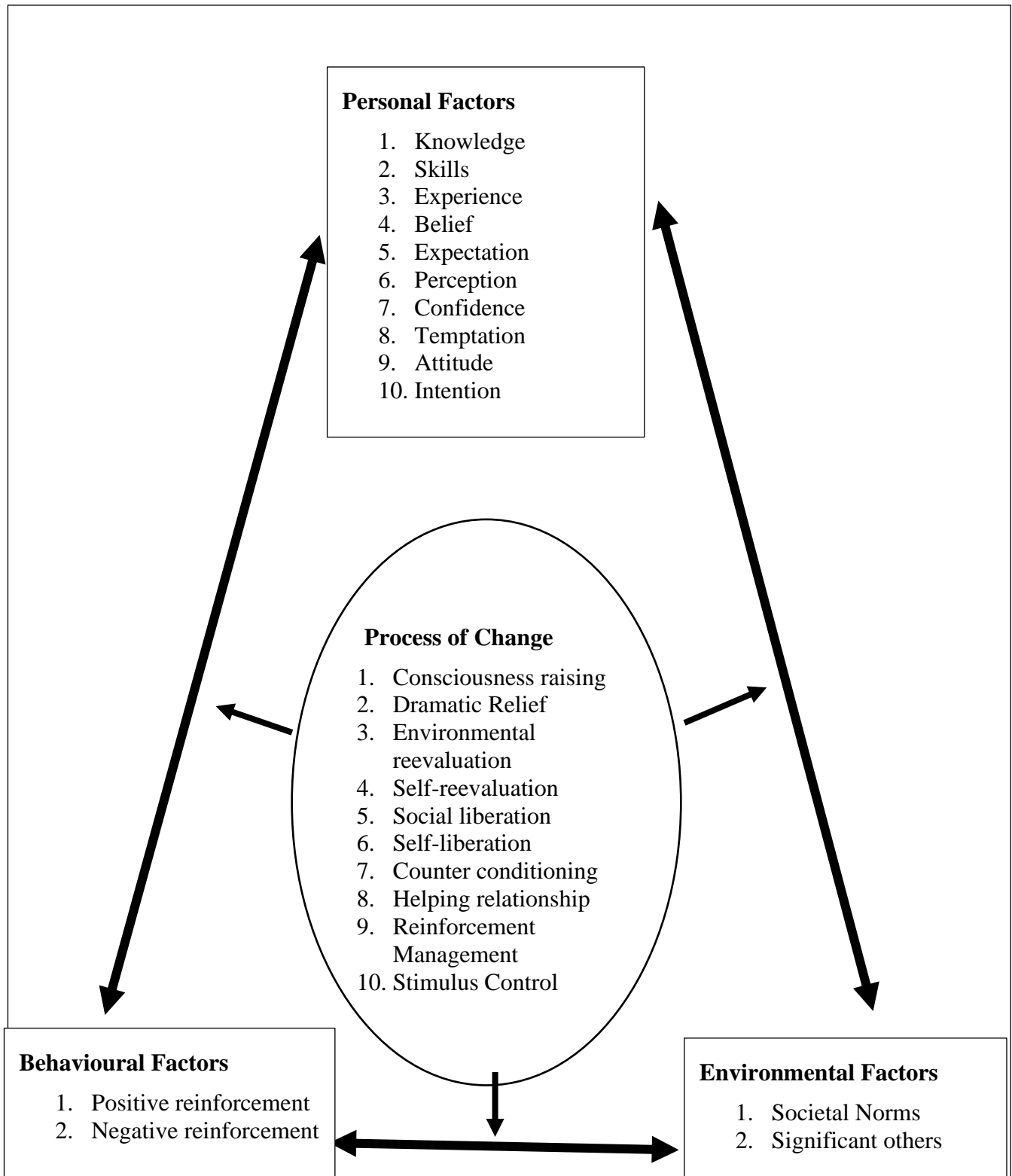


Figure 13. Theoretical framework

Summary

The theoretical framework for the study was developed by reviewing behavioural change theories which have been used including Social Cognitive Theory, Health Belief Model, Theory of Reasoned Action, Theory of Planned Behaviour and Transtheoretical theory. The theoretical framework identified a tripartite group of factors (personal, behavioural and environmental) that mediate behavioural change. The process through which behavioural change is achieved is situated in the centre of the model. The findings of this review will be integrated with the findings of scoping review of international literature on school oral health to develop the overall conceptual framework for the case study. The scoping review is presented in the next chapter.

The theoretical framework selected for the study was appropriate to investigate oral health practices in private and public schools in Qatar. The study advanced the principles or constructs in the social cognitive theory, health belief model, theory of reasoned action, theory of planned behaviour, and transtheoretical theory. The theories were used by seeking to determine the oral health practices in private and public schools in an effort to improve oral hygiene and reduce dental conditions among school children. Additionally, the study used the theories to determine factors that affect oral health programmes in schools and the role of teachers and parents in determining the perceived benefits and perceived barriers of oral health promotion in schools. The study, thus, advanced the theory of health belief model as well as the theory of reasoned action and theory of planned behaviour by determining the perceived benefits, perceived self-efficacy, perceived barriers, and perceived vulnerability of children's oral health problems.

CHAPTER Three

Phase 1: Scoping Review

Introduction

This chapter presents the methodology and findings of the scoping review. Levac, Colquhoun, and O'Brien (2010) explained that scoping review is a well-known approach in health research. Scoping review was used in this study as a methodological framework to review research evidence about a health problem. It used as a mapping process where evidence was summarized to show the depth and breadth of the of a research problem being studied. The purpose of the scoping review was to provide a conceptual review of the evidence in the international literature to guide the empirical case study work (Arksey & O'Malley, 2005). In this study, the scoping review focused on 'drilling down' within particular primary school contexts, both public and private settings to explore the research question on oral health behaviours. A review of international literature on school based dental caries behavioural prevention programmes was conducted using a scoping review approach. This chapter provides a discussion on the scoping review approach used to find international literature on school-based dental caries, approach and methods, study design, search strategy, included studies, and data extraction and analysis. The chapter also presents themes from the review, which included types of behavioural prevention strategies, the effectiveness of behavioural prevention programmes, and determinants of the effectiveness of school-based oral health prevention strategy.

Objectives of the Scoping Review

The objectives of the scoping review were:

- i. To review international literature on school based dental caries behavioral prevention programmes
- ii. To understand the types of behavioural prevention strategies used to reduce oral health problems
- iii. To explore the effectiveness of behavioural prevention programmes
- iv. To Explore the determinants of the effectiveness of school-based oral health prevention strategy

Approach and Methods

Scoping review methodology was adopted for this study after considering alternative approaches, including the traditional literature review and systematic review. The traditional literature review is a popular method that has been used for a long period of time as a method

of critiquing and summarizing literature. This approach usually involves a critical appraisal of evidence from a range of literature relating to the topic of interest (Jesson, Matheson, & Lacey, 2011). The traditional literature review usually gives a descriptive summary of the literature with little or no attempt at synthesizing evidence. The advantage of this method is that it can be completed rapidly as it does not usually require an exhaustive search of the literature. Traditional literature review only uses a limited number of available literature (Jesson et al., 2011). However, this may introduce bias, and the outcome of the review may not reflect the general viewpoints of the literature (Jesson et al., 2011).

The systematic review method was originally introduced as a method of synthesizing data on the effectiveness of interventions. This is usually combined with a meta-analysis of homogenous quantitative data (Boren & Moxley, 2015). Over time, the systematic review method has been developed to also synthesize qualitative evidence using a variety of methods such as thematic synthesis and framework synthesis. The systematic review approach aims at the exhaustive search of the literature, transparent selection of studies, and scientific synthesis of evidence (Jesson et al., 2011). Systematic review strives to reduce bias by using explicit and reproducible procedures. The systematic review process is usually rigorous and time-consuming. The systematic review approach was not adopted for this study as a single systematic review was inadequate to address the review questions, which are rather broad (Boren & Moxley, 2015).

Scoping review was used in the study over systematic review because it is a process of summarizing and synthesizing a range of evidence comprehensively in order to inform policy, practice, programmes, and future research priorities (Colquhoun et al., 2014). Unlike systematic reviews, scoping reviews integrate a wide range of evidence without quality assessment of included studies (Levac et al., 2010). Scoping reviews are also different from traditional literature reviews because it involves an analytical synthesis of evidence (Levac et al., 2010). Thus, scoping reviews harness the strength of both systematic reviews and traditional literature reviews. A framework for scoping review identifies the following stages of scoping review (Arksey & O'Malley, 2005).

- i. Identifying a broad research question
- ii. Identifying relevant studies
- iii. Study selection
- iv. Charting the data
- v. Collating, summarising and reporting the results

Scoping review is quite useful in mapping available research and addressing broader questions that cannot be addressed by systematic review. Levac et al. (2010) proposed a number of ways to enhance each stage of the scoping review. Although scoping review is usually concerned with a broad research question, Levac et al. (2010) suggested that the scope of the review should be clearly defined based on the concept, the target population, and the outcome of interest. In identifying relevant studies, Levac et al., (2010) recommended that this should be guided by the research question and the scope of the study. They also recognized that limiting the scope may be unavoidable, but this needs to be justified. Levac et al. (2010) suggested an iterative process of selecting the study and searching for more evidence. They also disaggregate the fifth stage into three steps: descriptive and thematic analysis of the data, reporting based on the research question, and discussion of the findings in relation to the overall purpose of the research, including implications for future research and policy. Levac et al. (2010) contended that consultation with relevant stakeholders based on the findings from the literature is an essential part of scoping review.

Study Design

A review of international literature on school-based dental caries behavioural prevention programmes was conducted using a scoping review approach (Arksey & O'Malley, 2005; Levac et al., 2010). Levac et al. (2010) explained that scoping review is a familiar approach used to review research evidence on health and provides a good basis to clarify and enhance the theoretical framework that helps in supporting the consistency of findings that other authors have reported.

Search Strategy

The literature search was completed with the use of reputable or relevant databases, including Medline, EMBASE, Global Health, PsycINFO, and Health Management Information Consortium (HMIC) via OVID interface and CINAHL via EBSCOhost interface. PubMed and ProQuest were also searched. The search strategy was adapted from a review of primary school-based dental caries prevention (Cooper et al., 2013). Search terms relating to randomised controlled trials such as controlled clinical trial, placebo, trial, randomly and group were excluded. This was done to broaden the scope of the review and to include non-experimental studies, which could provide further insights into school-based dental caries behavioural prevention programmes. The keywords used in the search strategy are presented in Table 2. A detailed literature search strategy is presented as Appendix 1. Truncation and adjacency searching were used to improve the sensitivity and specificity of the search.

Table 2. Example of Keywords and Search Terms

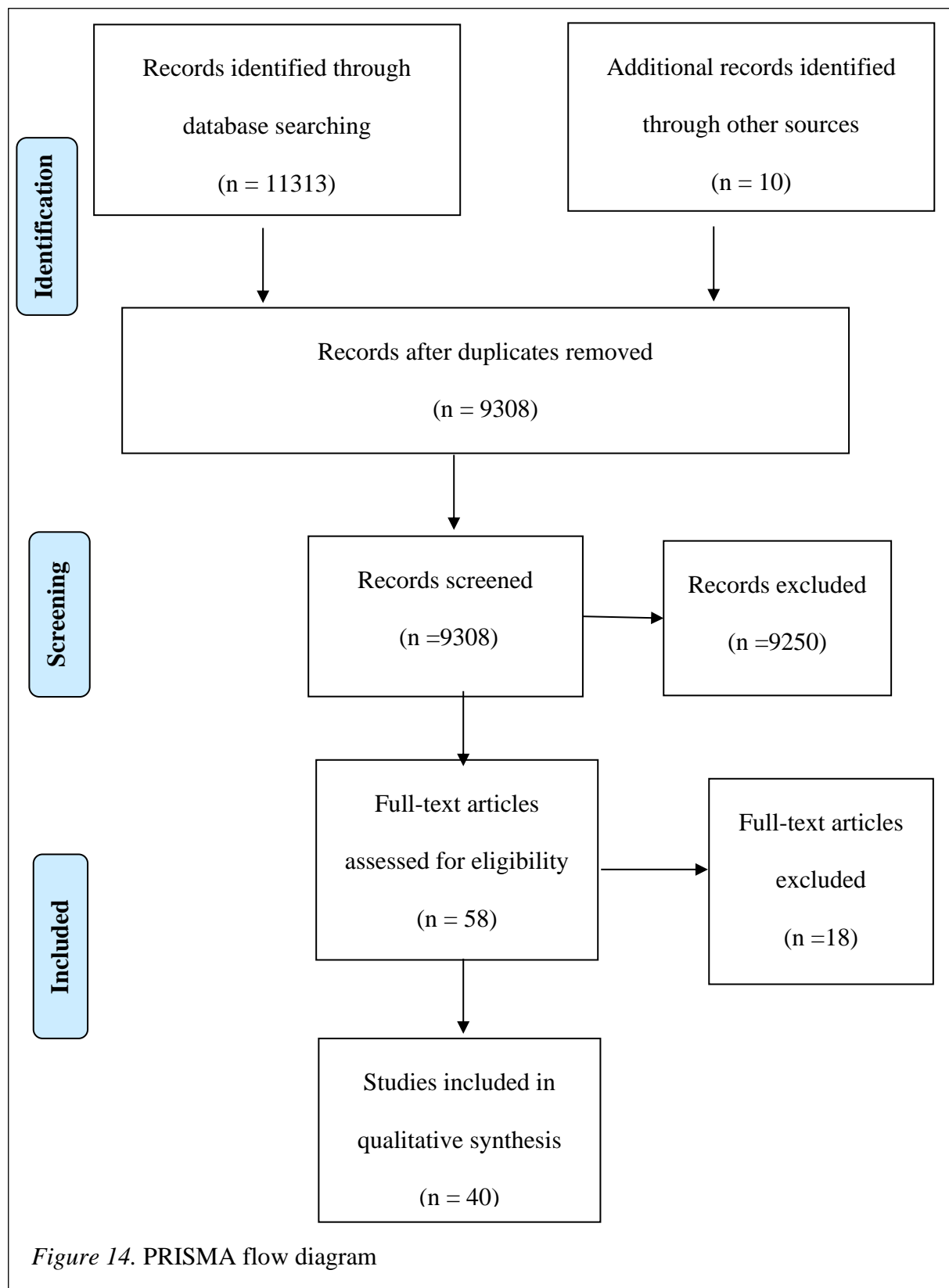
Keywords	Search terms
Dental caries	dental adj5 (cavit\$ or caries or carious or decay\$ or lesion\$ or deminerali\$ or reminerali\$)
Oral health	(mouth adj6 health) or (oral adj6 health) or (dental adj6 health) or (teeth adj6 health)
School children	"school age child\$" or "school-age child\$" or "4-11 year\$ old\$"
Health promotion	(dental or oral or mouth or teeth) and (instruct\$ or advice or advis\$ or educat\$ or teach\$ or train\$ or promot\$)

Study Selection

Duplicates were deleted using Endnotes Reference Management Software. Additional duplicates not detected by Endnotes were manually deleted. Studies relating to primary school-based behavioural prevention programmes were selected in two stages. In the first stage, titles and abstract of the studies were screened to identify relevant studies based on the following screening questions:

- i. Does the study focus on dental caries?
- ii. Does the intervention focus on oral hygiene behaviour? (brushing of teeth, dental flossing, reduction of candy intake)
- iii. Are the participants involve school children?
- iv. Is the study in English Language?
- v. Was the study published between 2007 and 2017?

Studies were not excluded based on their design. Original research papers, literature reviews, reports and policy statements and guidelines were all included. In the second stage, full texts of papers selected during title and abstract screening were reviewed to identify eligible studies. The PRISMA Flow Diagram in Figure 14 shows the selection process for the study.



Included studies.

A total of forty papers were included in the review. Sixty-three of the studies were primary studies with different study design including randomised controlled trial, quasi-experimental study, cohort study and cross-sectional study. Three of the studies were a

systematic review of behavioural interventions that promote twice daily tooth-brushing and reduced snacking on sugary foods among school children aged 4-12 years (Cooper et al., 2013). The last study was a literature review of behavioural interventions for childhood caries at individual, family and community levels including school based programmes (Albino & Tiwari, 2016).

The summary of 40 studies included paper is presented in Table 3 and the full information table of studies is presented in Appendix 17. They were primary studies conducted in different countries of the world in Asia, Europe, Africa and America. Three studies were a traditional literature review, and another was a systematic review of literature.

Table 3. Summary of included studies

S/N	Authors	Country	Methods	Summary of Findings and Comments
1	Angelopoulou et al., 2015	Greece	Traditional one-off lecture on oral health issues compared to 3-month education by teachers.	Oral health behaviour and attitude improved at 6 months but not significantly in both groups.
2	Daouda et al., 2016	Senegal	A cohort of public school children followed up from with periodic education, and primary care.	Mean DMFT was not statistically different between first and sixth grade.
3	Am, Cooper et al., 2013	Different countries	Systematic review	Some evidence of positive impact on children's knowledge.
4	Yekaninejad et al., 2012	Singapore	Group randomised trial	Improved toothbrushing and flossing on including parents.
5	Mohamadkhah et al., 2013	Iran	Quasi-experimental study	Oral health knowledge and toothbrushing improved.
6	Shenoy and Sequeira, 2010	India	A comparative study.	3-week education was more effective.
7	Damle et al., 2014	India	A comparative study.	Intervention group had reduction in mean plaque score.

8	Hebbal et al., 2011	India	A cluster-randomised controlled trial	Knowledge score in the audio-visual group increased and plaque score reduced.
9	Naidu and Nandlal, 2017	India	An intervention study with health education.	Knowledge, and oral health improved.
10	Gonzalez-Del-Castillo-McGrath et al., 2014	Mexico	Randomised controlled trial	Motivational interviewing of parents was more effective.
11	Haleem, Siddiqui and Khan, 2012	Pakistan	Cluster randomised control trial	All strategies were effective.
12	D'Cruz and Aradhya, 2013	India	A double-blind intervention study.	Oral hygiene practices improved in the intervention group.
13	Angelopoulou, et al., 2014	Greece	A comparative study	Experiential learning was more effective.
14	Bhardwaj et al., 2013	India	A longitudinal study.	Overall mean plaque score and gingival score decreased.
15	Mohammadi et al., 2015	Iran	A comparative study.	Motivational interview was more effective.

16	Pakpour et al., 2014	Iran	Cluster-randomized controlled trial.	Adolescents who received loss-framed message reported improved oral health.
17	Jain et al., 2016	India	Before and After study that assessed effectiveness of oral health training of teachers.	Significant improvement in oral health knowledge and practices was noted.
18	Doichinova and Mitova, 2014	Belgium	Oral hygiene education and motivation of 30 children aged 6-12.	The toothbrushing skills and oral hygiene index improved after the intervention.
19	Lai et al., 2016	Taiwan	Prospective cohort study.	Long-term effectiveness on oral health practices.
20	Mohamadkhah et al., 2014	India	Quasi-experimental study.	Knowledge, and oral hygiene behaviours improved.
21	Olubunmi and Olushola, 2014	Nigeria	An interventional study.	Oral hygiene improved.
22	Chandrashekar et al., 2014	India	An intervention study comparing oral health education by teacher, dentist and teacher.	Supply of oral hygiene aids contributed to behavioural change among the children.
23	Gupta, 2008	USA	Programme evaluation of oral health education component of school sealant programme.	The programme led to increased oral health knowledge among the children.

24	Macnab et al., 2008	Canada	Before and after study on oral health education.	Oral hygiene practice improved.
25	Saied-Moallemi et al., 2009	Finland	Comparison of class based oral health puzzles to parent-led no intervention among 9-year olds	Parent-led interventions were more effective.
26	Petersen et al., 2016	Thailand	An intervention study	Plaques and Dental caries incidence reduced.
27	Tai et al., 2009	China	Cluster randomised control trial.	More children in the intervention schools adopted regular oral health behavioural practices.
28	Takeuchi et al., 2017	Tonga	Evaluation of oral health programme.	Improvement in oral hygiene behaviour(toothbrushing).
29	Tarvonen et al., 2017	Korea	Longitudinal study	Decreased prevalence of dental caries.
30	Chachra et al., (2011)	India	A comparative study.	Improvement in knowledge and practice of oral hygiene.
31	Albino and Tiwari (2016)	Different countries	A literature review of behavioural interventions.	Most interventions that utilized motivational interviewing were successful
32	Macpherson et al., 2013	UK	Evaluation of National Supervised Toothbrushing Programme in Scotland.	Uptake of the programme correlated with decrease in dental caries.

33	De Farias et al., 2009	Brazil	Randomised control trial.	Lower plaques and higher oral health knowledge.
34	Halawany et al., 2018	Saudi Arabia	Before and after study.	Improvement in knowledge and self- reported behaviour
35	Habbu and Krishnappa, 2015	Different countries	Systematic review	Improvement in oral hygiene and gingival health, dental caries, oral health knowledge, attitude and behaviour in few studies
36	Gambhir et al., 2013	Different countries	Systematic review of ten papers	Knowledge, attitude and oral hygiene could be significantly improved through dental health education.
37	Lai et al., 2016	Taiwan	Prospective cohort study	Better overall plaque score in the intervention group, and better dental health and practices.
38	Kaewkamnerdpong and Krisdapong, 2018	Thailands	Survey	Better brushing habits and low sweets intake.
39	Aishah Alsumait et al., 2019	Kuwait	A cross-sectional study	Low carries cases were noted.
40	Hamlet Gasoyan et al., 2019	Armenia	Before and after study and a cross-sectional research.	Lower level of caries among the children.

Data extraction and analysis

The information extracted from the selected papers includes:

- i. Author and year of publication
- ii. Methodology of the study
- iii. Characteristics of the study population including age sample size, sex, grades etc
- iv. Context including type and location of school
- v. Description of the intervention including component, delivery strategy, duration etc
- vi. Outcome of the intervention
- vii. Determinants of effectiveness or otherwise of the intervention

Thematic analysis method was adopted to identify, analyse and report patterns of data in this scoping review (Arksey & O'malley, 2005; Levac et al., 2010; Miles, Huberman, & Saldaña, 2014). Thematic analysis is mainly used to examine specific patterns and themes of meaning within a particular set of data. This thematic analysis focuses on identifying patterns that are combined to generate new themes (Nowell, Norris, White, & Moules, 2017). Using this approach in reviewing existing work helps in organizing and providing a rich description of a set of data and theoretically interpret the meaning within the data (Nowell et al., 2017). As recommended in the literature by Braun and Clarke (2006), thematic analysis was conducted in 6 steps:

- i. Familiarization with the data (literature): The selected papers were thoroughly read repeatedly until the depth and breadth of the content became familiar.
- ii. Generating initial codes: The initial codes were generated by highlighting the most basic meaningful ideas and elements of the literature in relation to school based dental caries behavioural prevention programmes. Coding of the literature was done manually.
- iii. Searching for the themes: This involved interpretative analysis of the codes, sorting them into potential themes and collating all meaningfully related codes. A thematic map was used at this stage.
- iv. Reviewing themes: At this stage, the potential themes were refined following the grouping of codes. This involved collapsing similar themes and disaggregating very broad codes.

- v. Defining and naming themes: The refined themes were named and defined by describing which aspect and scope of the data each theme captures.
- vi. Producing a report: This involved producing an organised, logical and concise account of the review findings within and across themes with the aim of answering the review questions. In other words, the themes relating to the contextual mechanisms for preventing dental caries among primary school children were transformed to theoretical propositions. Thus, as an outcome from this phase, theoretical propositions (Yin, 2014) were generated to be tested within multiple empirical ‘cases’ in Qatar.

Findings: Themes from the Review

The main themes identified for this thesis were: Types of behavioural prevention strategies, the effectiveness of behavioural prevention programmes, and determinants of the effectiveness of school-based oral health prevention strategy.

Types of behavioural prevention strategies

Different types of behavioural prevention strategies for dental caries reported in the literature as components of school oral health include traditional oral health education (Chachra, Dhawan, Kaur, & Sharma, 2011; Daouda, Aida, Mbacké, & Mamadou, 2016), oral health education with digital media (Hebbal, Ankola, Vadavi, & Patel, 2011; Mohamadkhah, Amin Shokravi, Faghihzadeh, & Ghaffarifar, 2013; Shenoy & Sequeira, 2010), motivational interview (Gonzalez-Del-Castillo-McGrath, Guizar-Mendoza, Madrigal-Orozco, Anguiano-Flores, & Amador-Licon, 2014; Mohammadi, Hajizamani & Bozorgmehr, 2015), experiential learning (Angelopoulou, Oulis, & Kavvadia, 2014; Angelopoulou, Kavvadia, Taoufik, & Oulis, 2015), oral health puzzles (Saied-Moallemi, Virtanen, Vehkalahti, Tehranchi, & Murtomaa, 2009), supervised oral hygiene (Macnab, Rozmus, Benton, & Gagnon, 2008; Tarvonen et al., 2017) and supply of oral health aids (Naidu & Nandlal, 2017).

Traditional oral health education programme usually involves lectures delivered in a traditional classroom environment using chalkboard or power point presentation (Chachra et al., 2011; Daouda et al., 2016). This is often combined with practical demonstration of tooth-brushing using anatomical models. The oral health education kit used in the research by Chachra et al. (2011) comprised of various items. Teaching materials on oral health education in the local Hindi language were used with the incorporation of pictorial illustrations for children between 10-16 years and short stories for those aged 5-9 years. Demonstrations on proper tooth brushing entailed the use of 2% mercurochrome, cheek retractor, looking mirror, and a soft toothbrush. Rinsing of fluoride from the children’s mouth required the use of NaF

powder, a 2gm capacity plastic spoon, plastic cups, jug, and stirrer (Chachra et al., 2011). The dental caries preventive package comprised of:

- i. Lectures on oral health education where the children were not only taught the essence of oral health but also how to improve and maintain good dental hygiene.
- ii. Practical demonstrations on how to properly brush one's teeth and how to remove plaque were provided to all the children.
- iii. Every 15 days, 0.2% of NaF was used to rinse the mouths of all the participating children.
- iv. Children were also provided with knowledge of the relation between sugar and dental caries. Also, they were guided on the intelligent use and consumption of sugars to prevent dental caries (Chachra et al., 2011).

According to the research by Chachra et al. (2011), the number of caries among the participating children was measured before and after the intervention using the Moller's (1996) Index. The choice of the Index was selected because it is the internationally accepted sensitive Index used in recording the number of dental caries in populations. The authors adopted the traditional community-based oral health education programme because of its effectiveness and the low costs of implementation to prevent dental diseases like dental caries and tooth decay (Chachra et al., 2011). The traditional approach in the study by Chachra et al. (2011) provides the best ways of improving the knowledge of children on oral health. Such knowledge makes children appreciate the importance of maintaining high standards of oral hygiene. The approach led to the achievement of the research's aims and objectives, as stated out by Chachra et al. (2011).

The traditional approach in oral health education was also adopted by Daouda et al. (2016). The authors sought to investigate the effectiveness of a dental caries prevention programme that was implemented for elementary school children in Senegal. To achieve the research's aims and objectives of their study, Daouda et al. (2016) adopted a methodology that suited the oral health education programme in the selected cohort. Daouda et al. (2016) mentioned that the method used in the study focused on education and communication (IEC) based on learning procedures of dietary advice, fluoride use, brushing methods, systematic visits, and primary dental care. The IEC briefings for children were also done periodically. During the same period of the study, primary care was provided to the children and entailed extraction and descaling of teeth. The IEC material used in the study consisted of flip albums that provided illustrations of morphology and evolution of oral health diseases like caries and

gingivitis (Daouda et al., 2016). Manual scaling activities in the study had fluoride application, which is the next process in the implementation process. The traditional approach that the study followed is cheap because it mostly involves the naturally available resources. For instance, dental examinations of all the participating children were done while sitting on a bench in natural light (Daouda et al., 2016).

Oral health education that included digital media was found to be common in three articles. Digital media used in oral health education involved use of modern technologies to perform the study activities, which contradicts the traditional approach that uses physical media with no technologies involved (Chachra et al., 2011; Daouda et al., 2016; Hebbal et al., 2011; Mohamadhah et al., 2013). The prevalence of technology all over the world has thus become beneficial in various sectors, with researchers seeing the need to adopt it while implementing their research in oral health education procedures (Shenoy & Sequeira, 2010). The most common modern technology identified from the reviewed articles was the use of video during the delivery of oral health education (Hebbal et al., 2011; Mohamadhah et al., 2013; Shenoy and Sequeira, 2010). Shenoy and Sequeira (2010) provided dental education as part of the research study. The audiovisual aids used by the authors include charts, photo albums, slide projectors, dentiform models, plaster models, and posters. Audiovisual aids had data on the structural functionality of teeth, the significance of a balanced diet, treatment modalities, etiology, and preventive measures for dental caries, essentiality of tooth brushing technique, and the impact of a person's dental health on the general body health of a person. The use of aids helped the authors to determine the effectiveness of dental health education in improving dental health, practices, knowledge, and gingival health status among school-going children in different socioeconomic classes (Shenoy & Sequeira, 2010).

Similarly, Hebbal et al. (2011) aimed to provide dental health education to children as a strategy for preventing dental caries and other oral health diseases among the participants. In the course of their study, the authors noted that the best way for education sessions to be successful, videos had to be adopted to help give the participants a clearer picture on what they should be aware of, do, and avoid regarding their dental health care (Hebbal et al., 2011). Hebbal et al. (2011) conducted their study in three schools located in Belgaum City under the same socioeconomic status. The participating schools were randomly split into Group I, Group II (experimental), and Group III (control). Groups I and II were taken through a comprehensive programme done in one session, and participants taught on the dental diseases' etiology, and prevention. Oral health education in Group I and Group II covered

areas like dentition types, brushing procedures, dental caries etiology and preventive measures, and the role of fluorides. Group III acted as the control group, and the participants in this Group were not involved in any educational information sessions. The difference in the tactics used in Group I and Group II was in the methods used to ensure that different tactics used in the DEH performed on the participants are investigated in regards to whether they affect the eventual results of the study or not. In Group I, the participants underwent the DEH programme with the use of audiovisual aids to illustrate the various topics.

In contrast, Group II participants were taken through the topics of the comprehensive programme using blackboards, chalk, and chart and pictorial illustrations (Hebbal et al., 2011). Among two reviewed articles, motivational interviews were found to be used as a method in the oral health education programmes that the researchers followed in their studies (Gonzalez-Del-Castillo-McGrath et al., 2014; Mohammadi et al., 2015). Motivational interviews utilization in the health sector requires that a researcher first explores the health education need of the targeted participant at the individual level. After the health education need is identified, the researchers tailored their health education strategies to suit the participants' pre-identified needs (Gonzalez-Del-Castillo-McGrath et al., 2014). The effectiveness of moral interview-based educational programmes in reducing dental caries and plaques was investigated by Gonzalez-Del-Castillo-McGrath et al. (2014). Motivational interviews (MI) can be described as a psychopedagogic tool whose objective is to intrinsically motivate patients in the achievement and retaining of behavioural changes (Gonzalez-Del-Castillo-McGrath et al., 2014). In the research, participants were children and their mothers. The researchers divided the mothers of the participating children into experimental and control groups. Both groups underwent informative audiovisual sessions for 45 minutes on the etiological consequences of dental caries and how to prevent them. Only the mothers placed in the experimental Group underwent motivational interviewing that involved two members of the study who were counselors and had MI training and certification skills. The aim of the motivational interview in the present study was to identify the oral health needs that require improvement and those that need to be reinforced, and the establishment of therapeutic alliances. Therefore, Gonzalez-Del-Castillo-McGrath et al. (2014) concluded that the use of motivational interviews in oral health education programmes led to better results in the prevented caries and plaques, unlike when the traditional approach is followed.

Mohammadi et al. (2015) also used MI as the basis to determine whether oral health education is effective or not in improving individual knowledge on oral hygiene. The authors

aimed to investigate the impact of implementing oral health education programmes that use the MI method on the general dental health of preschool children (Mohammadi et al., 2015). Participating schools were randomly divided into control and test groups. The parents and children who fell in the control group got a traditional oral health education programme, whereas the test group followed the MI education method. Planning of the MI education programme was done via the adoption of the Professor Wenstain protocol, validity assessments performed through backward and forward translation, and through cross-cultural adaptations. MI was done on parents in the presence of their child, especially those whose children portray significant oral health problems, for 45 minutes (Mohammadi et al., 2015).

Another common aspect of the reviewed articles was the use of experiential learning in oral health education programmes. Generally, to achieve successful experiential learning, projects and real-life scenarios are incorporated into the health education procedures (Angelopoulou et al., 2014; Angelopoulou et al., 2015). Experiential learning provides an alternative method in an oral health education programme to replace the traditional lecturing approach. Traditional lecturing by a health professional in oral health education has the advantage of improving knowledge of oral health. However, it may be disadvantageous because of its ineffectiveness in changing the attitudes and oral health behaviour of a person. Experiential learning uses direct experience to provide knowledge, hence has a higher chance of not only improving the knowledge in oral health but also in changing one's attitude and behaviour in oral health (Angelopoulou et al., 2014). The research study was done by Angelopoulou et al. (2014) adopted experiential learning (EL) in their experimental Group, whereas their control group underwent the traditional lecturing approach. The EL intervention occurred in the classroom and required the teacher to follow a specific course structure as outlined in a manual, used a book, and also a CD. The teacher-guided a brainstorming session that discussed the various attitudes and feelings that the students may have regarding oral health. The participants in this Group were assigned oral health-related issues projects with frequent visits to pharmacies, dentists, and veterinary surgeons (Angelopoulou et al., 2014). Following the projects, the participants presented their findings using posters, theoretical plays, role-playing, and songs. The traditional lecturing group did not receive any intervention (Angelopoulou et al., 2014).

Angelopoulou et al. (2015) aimed to investigate whether the use of EL in oral health education programmes has led to better improvements in oral hygiene among children in comparison to when traditional lecturing approach was used. The authors followed the same

procedures of Angelopoulou et al. (2014) in the interventions that the participants in the EL groups underwent. The study found that children in the EL process during oral health education had better attitudes, behaviours, and knowledge of oral health. However, the use of EL among children may not suit children under the age of 10; hence the applicability of this method in oral health education programmes is limited to those above the age of nine. Angelopoulou et al. (2015) selected children aged ten years as the participants of the study because they were eligible to EL as they had logical thinking skills and were able to engage in teamwork. To achieve sustainable improvements in the attitudes, behaviours, and knowledge of oral health among children, EL health education programmes were done frequently (Angelopoulou et al., 2015).

Oral health education may also be presented as puzzles in which, when a participant solves it, gains knowledge and understanding of various aspects relating to their dental health. Oral health puzzles use in education programmes were presented by Saied-Moallemi et al. (2009), who posited that in such a method, students are requested to try and resolve various puzzles pertaining to oral health in a game form. The author explained how they used puzzles in their oral health education programme effectively, hence leading to the achievement of their study objectives. Seven illustrative puzzles were used as learning techniques and entailed the use of fluoride toothpaste in combination with frequent toothbrushing (Saied-Moallemi et al., 2009). The health counsellor in the participating schools was advised on the importance of the puzzles and how they would be used to improve the oral hygiene behaviours of children. Within a month, the researcher mentioned that three to four sessions each lasting 30-45 minutes were used to provide time for the children to resolve the puzzles. Depending on how fast the puzzles were resolved, teaching on oral health was also altered to either become faster or slower. Upon completion of one puzzle, the health counsellor's task was to explain the oral health message that it contained. Posters were also placed in the classroom that suited the message on each puzzle, hence helping the students to have a better grasp on the oral health knowledge being displayed (Saied-Moallemi et al., 2009).

Supervised oral hygiene was also reported frequently. This usually involved tooth brushing under the supervision of teachers or parents. Oral hygiene aids included a supply of toothbrushes and toothpastes, which was often done in combination with other prevention programmes (Saied-Moallemi et al., 2009).

Effectiveness of behavioural prevention programmes.

The outcomes assessed in the studies included oral health knowledge, oral health attitude, oral health behaviour (tooth-brushing, dental flossing, avoidance of sugary candy, dental visit), oral hygiene (reduction in dental plaque) and dental caries (Decayed, missing and filled tooth [DMFT] and DMFS).

All the thirteen studies that assessed oral health knowledge reported improvement in oral health knowledge following oral health promotion irrespective of the approach. On the other hand, 7 out of 9 studies that assessed attitude reported significant improvement in attitude following oral health promotion programmes. Similarly, 16 out of 18 school oral health promotion programmes were reported to be effective in improving oral health behaviour especially tooth brushing. In addition, 17 out 18 school oral health programmes documented reduction in dental plaques following oral health programmes. However, only 13 studies on school oral health promotion programme were documented to have improved dental caries. Thus, the literature indicated that school oral health promotion is highly effective in improving oral health knowledge, attitude and practice. In addition, there is also some evidence that school oral health promotion may be effective in reducing dental caries. The next section, therefore, focuses on exploring contextual factors that may enhance effectiveness of behavioural prevention strategies for dental caries. Table 4 presents the summary of the reported effectiveness of school oral health promotion programme in the included papers.

Table 4. Effectiveness of School-based Oral Health Prevention Strategies

S/N	Authors	Knowledge	Attitude	Practice	Plaques	Caries
1	Angelopoulou, Kavvadia, Taoufik, & Oulis, 2015	√	X	x	√	x
2	Daouda, Aida, Mbacke, & Mamadou, 2016	-	-	-	-	x
3	Am, Cooper et al., 2013	√	X	√	x	x
4	Yekaninejad et al., 2012	-	-	√	-	-
5	Mohamadkhah et al., 2013	√	√	x	-	-
6	Shenoy and Sequeira, 2010	√	√	√	-	-
7	Damle et al., 2014	-	-	-	√	x
8	Hebbal et al., 2011	√	-	-	√	-
9	Naidu and Nandlal, 2017	√	√	√	√	√
10	Gonzalez-Del-Castillo-McGrath et al., 2014	-	-	-	√	√
11	Haleem, Siddiqui and Khan, 2012	-	-	-	√	√
12	D'Cruz and Aradhya, 2013	√	-	√	√	-
13	Angelopoulou, Oulis and Kavvadia, 2014	√	√	√	√	√

S/N	Authors	Knowledge	Attitude	Practice	Plaques	Caries
14	Bhardwaj et al., 2013	-	-	-	√	x
15	Mohammadi, Hajizamani and Bozorgmehr, 2015	-	-	-	√	-
16	Pakpour et al., 2014	-	√	√	√	-
17	Jain et al., 2016	√	-	√	-	-
18	Doichinova and Mitova, 2014	-	-	√	√	-
19	Lai et al., 2016	√	-	√	√	√
20	Mohamadkhah et al., 2014	√	√	√	-	-
21	Olubunmi and Olushola, 2014	-	-	-	√	-
22	Chandrashekar et al., 2014	-	-	-	√	x
23	Gupta, 2008	√	-	-	-	-
24	Macnab et al., 2008	-	-	√	-	√
25	Saied-Moallemi et al., 2009	-	-	-	√	-
26	Petersen et al., 2016	-	-	-	√	√
27	Tai et al., 2009	-	-	√	√	-

S/N	Authors	Knowledge	Attitude	Practice	Plaques	Caries
28	Takeuchi et al., 2017	-	-	√	-	√
29	Tarvonen et al., 2017	-	-	-	-	√
30	Chachra et al., 2011	√	√	√	-	√
31	Albino and Tiwari 2016	-	-	-	-	x
32	Macpherson et al., 2013	-	-	-	-	√
33	De Farias, De Araújo Souza and Ferreira, 2009	√	-	-	√	-
34	Halawany et al., 2018	√	-	√	-	-
35	Habbu and Krishnappa, 2015	√	√	√	√	√
36	Gambhir et al., 2013	√	√	√	√	x
37	Lai et al., 2016	√	-	√	√	x
38	Kaewkamnerdpong and Krisdapong, 201	-	-	√	-	-
39	Aishah Alsumait et al., 2019	√	√	√	-	√
40	Hamlet Grasoyan et al., 2019	√	-	√	-	√

Shenoy and Sequeira (2010) used Dental Health Education (DHE) to improve oral hygiene practices among participants who were children aged between 12 to 13 years. In terms of participants' knowledge in oral health aspects, the questionnaires after the intervention indicated higher percentages of correct responses. Also, knowledge of oral health and how long tooth brushing should be done improved among the participants. Relating to the oral hygiene aids, the number of children using toothpaste and toothbrushes increased. The frequency of tooth brushing practices also increased with the majority of children brushing twice daily, unlike before the intervention was implemented. In one group of the participants, the study found 42% of the children started to brush their teeth for at least two to three minutes after the intervention, while in the other group only 37% of them has done that. Frequencies in the change of toothbrushes and mouth rinsing practices also increased when the baseline to 36-week evaluation was completed. The authors concluded that implementing the DHE programme at three-week intervals was more effective than at six-week intervals. The reason for such a conclusion was because the intervention improves oral health hygiene in the short run but may prove to be inadequate in the long term especially when oral hygiene aids are not made available at low costs (Shenoy & Sequeira, 2010).

Hebbal et al. (2011) aimed to investigate the rates of knowledge and plaques among 12-year-old children in Belgaum City before and after the oral health education programme. The participants were divided into three groups, with the first group receiving a comprehensive programme on dental disease aetiology and prevention with the use of audio-visual aids. The second group used traditional learning materials whereas the third group did not undergo any informational session. The mean knowledge score for group one was 7.94, for group 2 was 7.86, and group 3 was 7.74 at the beginning of the study. After the intervention, the mean knowledge score for group one was 14.42, for group 2 was 12.7, and 9.58 for group 3. Analysis of the results was done using the Newman-Keuls Multiple Comparison tests, a posthoc test, which indicated that the difference in oral health knowledge before and after the intervention was statistically significant among the three groups (Hebbal et al., 2011). Mohamadkhah et al. (2014) also proved in their study that lecturing elementary school children on oral health behaviours aids in improving their dental health. The education strategy adopted by the authors was effective in improving the oral self-care health behaviours. The results showed that there was an increase in oral health behaviours with tooth brushing twice a day increasing by 69%, tooth flossing by 34%, mouthwash use by 69%, regular dentist visits by 6% (Mohamadkhah et al., 2014). Mohamadkhah et al. (2014),

therefore, concluded that lecturing on oral health was not only a cheap method, but was also effective in promoting oral health behaviours to prevent dental diseases.

Behavioural prevention strategies of oral health diseases may include the use of EL methodology as posited by Angelopoulou et al. (2015). The authors' study aimed to investigate the difference between EL and traditional lecturing as used in oral health education to improve oral health knowledge, attitudes, and behaviours while also in the meantime changing dental plaque, caries, and gingival health. Oral health knowledge in the participants' groups improved both at six months (EL group $p=0.022$) and 18 months (EL group $p=0.001$). Oral health behaviours and oral attitudes among the participants in the EL group indicated notable improvements at six months; however, at 18 months, the behaviours decreased without statistically significant changes. Moreover, oral hygiene improved, whereas gingivitis levels increased at six months but decreased at 18 months. The caries index increased in the EL ($p=0.013$) and the TL ($p=0.010$) groups at 18 months (Angelopoulou et al., 2015). Saied-Moallemi et al. (2009) also posited that the use of oral health education strategies is beneficial to both the children and their parents. The authors noted that parents have a significant role in ensuring that the oral health of their children is at the best level.

Research findings of the study by Saied-Moallemi et al. (2009) indicated improvements in oral health regarding gingivitis prevalence. Parent -aid positively affected the bleeding score, with boys having a mean of 4.17, and girls at 4.31. Acceptable oral hygiene by the participants was more frequent among the children who were grouped with their parents ($P<0.001$), and those in the combined group ($P<0.05$); gingival health was also better ($P<0.001$) unlike in the control group (Saied-Moallemi et al., 2009). The authors found that the education intervention procedures led to the success of the project as demonstrated by the gingival health of the participating pre-adolescents with untreated or uncared for gingivitis.

Cooper et al. (2013) systematically reviewed articles on oral health improvement interventions used for preventing caries. One study reviewed by the authors indicated that 0.65 % of dental caries were prevented through school-based oral health behavioural interventions. The findings in the review by Cooper et al. (2013) indicated that the use of primary school-based behavioural interventions promoted tooth brushing twice a day and reduced snacking on sugary foods. Similarly, Habbu and Krishnappa (2014) also systematically reviewed current evidence on oral health education on interventions implemented from 2005 to 2011. The authors found evidence proving that behavioural interventions effectively aid in the prevention of oral health diseases. Based on the review, Habbu and Krishnappa (2014) noted that to achieve better improvements in the oral health of

children, dental health education needs to be systematically synthesized and modified to capture up-to-date information that is tied to the scientific standards in research. Daouda et al. (2016) also investigated how to prevent dental caries among children from first grade to sixth grade. In first grade, the results of the study reported a 31.6% prevalence of decayed permanent teeth with those DMFT being 2.23. In sixth grade, the prevalence was at 51% and DMFT at 0.36 (Daouda et al., 2016). As for the children's primary teeth, the prevalence in first grade was 75% and DMFT at 2.23 while in sixth grade, the prevalence was 12%, and df/t was 0.19 (Daouda et al., 2016). The results of the study also indicated that using IEC messages in oral health education and monitoring of children's behaviours regarding the maintenance of oral hygiene is effective in preventing dental disease among the children (Daouda et al., 2016).

Yekaninejad et al. (2012) provided the results of their study that aimed to improve the oral health of Iranian children. Self-efficacy perceptions among the children improved after they participated in the educational intervention. The children also, started to appreciate the benefits of good oral behaviours like tooth brushing and flossing; hence less attention was given to barriers (Yekaninejad et al., 2012). Gingival health was also found to significantly improve after the intervention in addition to improvements in general oral hygiene practices (Yekaninejad et al., 2012). The secondary outcomes in the research by Yekaninejad et al. (2012) indicated significant changes in oral hygiene practices and the Community Periodontal index, and in the components of the Health Belief Model. Behavioural interventions on oral health education programmes implemented in schools were also proven to successfully improve the oral health of children in addition to bridging the gap between low-income class and high-income class. Damle et al. (2014) evaluated and compared the oral health status and impact of both oral health education, and supervised tooth brushing among children hailing from the rural and urban sections of Maharashtra in India. The findings of the study indicated reductions in the mean plaque and gingival scores in children grouped in the study group in comparison to those in the control group.

Moreover, the authors also noted increases in the mean of DMFS and DMFT scores throughout the study from observations of the children who had participated in Damle et al.'s (2014) study. The study results indicated that the adopted behavioural intervention was a success because both the school-going children and their parents benefited from the study. Children changed their ways of engaging in excellent oral health behaviours in addition to acquiring knowledge on how to avoid dental diseases. Parents enhanced their knowledge in good oral health by participating in the research (Damel et al., 2014).

Naidu and Nandlal (2017) indicated how dental health education programmes might be effective in improving oral health through enhancing behavioural changes. Follow-up results of the study showed that knowledge on the use of toothbrush and paste was effective in cleaning teeth, which increased from 99.14% to 100% (Naidu & Nandlal, 2017). Also, the study showed that knowledge on tooth brushing twice a day was 94.9% in younger children and 97.84 in older ones, and knowledge that sugar is the cause of tooth decay increased to 96.94% in younger children and 98.92% in older ones (Naidu & Nandlal, 2017). In terms of practice, the use of circular tooth brushing methods increased from 0.30% to 86.24% in younger children and 0.65% to 91.38% in adult children (Naidu & Nandlal, 2017). This meant that the use of vertical and horizontal tooth brushing methods decreased. Also, the percentage of those adhering to the no more than three times sugar consumption per day increased to 95.72% in the younger ones and 95.0% in the older ones (Naidu & Nandlal, 2017). In terms of attitude, both younger ($P>0.05$) and older ($P<0.05$) children had positive attitudes towards treating dental decay through controlling the consumption of sugar and sweets (Naidu & Nandlal, 2017). The results also indicated a decrease in the mean plaque and gingival scores after the implementation of the study. Regarding DMFT, dental caries reduced by 7.89% in younger children and by 23.52% in the older children. Relating to caries reduction in DMFS and DMFT, percentage reduction was 102.05% for older children and 103.50% for the younger ones for DMFT, and 97.95% for older children and 100% for 6-8-year-olds for DMFS (Naidu & Nandlal, 2017). Thus, Naidu and Nandlal (2017) supported that the dental health programme may be implemented in schools because it positively affects the oral health of children.

Haleem et al. (2012) divided their participants into five groups; teacher-led, peer-led, dentist-led, self-led, and one that served as a control group. All groups received oral health education except for the control group. The various issues assessed by the authors to ascertain how effective their study was included knowledge about gingivitis and oral cancer/oral submucous fibrosis (KGO) index, oral health behaviour (OHB), oral hygiene status (OHS), oral health knowledge (OHK), and combined knowledge, behaviour and oral hygiene status (KBS). The authors reported significant gains in the three educator-led groups; OHK score at 23-27% increase, KGO score at 21-32% gain, OHB score at 30-37% increase, OHS score at 8-13%, and KBS score at 21-26% increase (Haleem et al., 2012). The self-led group had OHB, KGO, and OHK scores increasing from 4-6% (Haleem et al., 2012). The results of the study indicate that the use of oral health education regardless of whether it is self-led, teacher-led, dentist-led or peer-led leads to the prevention of dental diseases due to

improvement in oral health knowledge, behaviour, hygiene status, and KGO index (Haleem et al., 2012).

D'Cruz and Aradhya (2012) noted a 123.3% change in their first experimental group, 132.3% change in the second experimental group, and 28.1% change in the control group in comparison to the baseline knowledge after the programme was implemented. In terms of changes in oral hygiene practices, the authors realized a 21.9% change in the first group and 37.2% change in the second group (D'Cruz & Aradhya, 2012). Mean plaque scores also decreased after the intervention by 22.8%, 28.5%, and 9.1% for experimental group I, experimental group II, and the control group, respectively. The noted improvements in the results of the study by D'Cruz and Aradhya (2012) indicated that the use of behavioural interventions in schools might help in improving the oral health of children. Similarly, Bhardwaj et al. (2013) noted that behavioural interventions lead to reductions in gingival and plaque scores. The reason for the changes identified in the study results may be attributed to the changes in tooth brushing frequencies and in tooth brushing techniques (Bhardwaj et al., 2013). Short-term oral health education programmes implemented in schools proved to be effective not only in improving the oral hygiene of the children but also in improving gingival health. Therefore, the authors suggested that oral health education programmes need to be reinforced more, and the prices of hygiene aids should be reduced to provide better outcomes for more extended periods (Bhardwaj et al., 2013). In the research study done by Pakpour, Yekaninejad, Sniehotta, Updegraff, and Dombrowski (2014), the authors noted that the adolescents exposed to loss-framed messages showed better oral self-care intentions, attitudes, clinical outcomes, and behaviours compared to those not exposed to any intervention or those exposed to gain-framed messages.

The effectiveness of behavioural prevention programmes in improving oral hygiene among school children is evident in the research findings of the study undertaken by Jain et al. (2016) in Udaipur City, India. The results of the study indicated that after training, all teachers started using a toothbrush and toothpaste for cleaning their teeth, whereas 93.2% of children adopted the combo to clean their teeth (Jain et al., 2016). Post-training results also indicated that 77.8% of teachers and 49.5% of children started to brush their teeth twice daily (Jain et al., 2016). A significant increase in knowledge among the children and the students was also noted after they underwent oral hygiene training. The increase in knowledge that the participants had was on proper tooth cleaning, the importance of fluoride toothpaste, and toothbrushes used (Jain et al., 2016). Doichinova and Mitova (2014), in their assessment of oral hygiene habits in children aged 6-12 years, mentioned the need for oral behavioural

improvement strategies. Common problems among children who do not observe oral health include insufficient frequency of oral care, poor tooth cleaning, and brushing of teeth in only one direction (Doichinova & Mitova, 2014).

Motivating and training children on oral health is essential in the improvement of their oral hygiene. Improvement in oral hygiene care in children aids in the prevention of dental caries (Doichinova & Mitova, 2014). Moreover, children are quite forgetful and may tend to be sluggish regarding the maintenance of oral hygiene habits; thus, they need to be continuously motivated and trained. Therefore, the authors noted that oral health education and training has both aided in the establishment of good oral habits among children and led to the enhancement of oral health knowledge in their parents (Doichinova & Mitova, 2014).

Gasoyan et al. (2019), conducted a study on the effectiveness of a school-based dental disease preventive programme in 14 rural schools located in nine villages in America. The authors adopted a repeated cross-sectional study design to achieve the study's aims. Based on the results of the researchers, behavioural prevention measures are effective in increasing knowledge of oral health hygiene among parents. The results of the study indicated that in 2013, the prevalence of tooth decay in the children's primary dentition was 98.75% for 6-7-year-olds and 82.56% for decays in permanent dentition (Gasoyan et al., 2019). The measurement of tooth decay among children was done after one year since the project was implemented. After three years, the results indicated a reduction in the prevalence of dental caries (Gasoyan et al., 2019). Hence schools should consider adopting oral health behavioural interventions over a long period of time. Behaviour change among children is a complicated issue; thus, researchers need to consider implementing behaviours over a prolonged period of time to give room for the switch toward the recommended oral hygiene behaviours (Gasoyan et al., 2019). The first method of reducing dental caries is through tooth brushing and fluoridated toothpaste. However, despite the advantages of using the tools to reduce tooth decay and improve oral hygiene, the project may become costly. Costs may become a burden in terms of shortage of funds to purchase toothbrushes and toothpaste that can sustain them during the period of implementing the research because Gasoyan et al. (2013) performed their study over a long period. Policymakers in society should, therefore, consider the income-level of a given population when implementing oral health behavioural interventions either in schools or in society.

School-based oral health programmes were also supported by Alsumait et al. (2019), who evaluated the Kuwait National Programme. Generally, the children who participated in the programme had better dental health. Alsumait et al. (2019) believed that oral health

improvement through the reduction in caries occurs through the use of fissure sealant and fluoride varnish. Fissure sealants and fluoride varnish can best be explained as the best strategies, which despite being costly and being done at least twice a year, leads to a significant reduction in dental caries by all people in a given society. The results by the authors indicate that there is no relation between enrolling in the programme and the oral health relative quality of life of the participant (Alsumait et al., 2019). Also, participating mothers had their knowledge of oral health increased. Still, the research faced a limitation where they could not determine whether the gained knowledge had an impact on oral health knowledge, practice, OHRQoL, and practice (Alsumait et al., 2019). Therefore, when researchers are implementing school-based oral health intervention programmes, they need to consider how they can improve the quality and applicability of their findings. Gambhir et al. (2013) performed a systematic review of various school dental health education programmes' effectiveness in India. The authors noted that the success of a health education programme is determined by various factors, including the strategy used, didactic materials and audio-visual aids. Response to the oral health programme also affects its success; for instance, when teachers are trained, they assist in project reinforcing and following-up and maintain high motivation. The authors also noted the vitality of having parental support and motivation when school-based programmes are being implemented (Gambhir et al., 2013).

Halwany et al. (2018) also concurred with other researchers that the use of school-based behavioural OCE interventions effectively improves the oral hygiene of the participants. After the intervention, knowledge levels increased by 11.24 %, whereas self-reported behaviours posited a 25% increase. The authors also noted that the most significant change that they got was related to knowledge change at 1.3% in third-grade students, and 28.3% among first graders (Halawany et al., 2013). Following the implementation of the project using an interactive presentation, the children developed an interest in learning, in addition to being entertained. After the study ended, the participating children were noted to have a better knowledge of oral hygiene, including the causes and prevention of tooth decay. When a child has better knowledge on oral health, they get motivated to adopt brushing habits, and requesting their parent to be taken to the dentists increased in frequency (Halawany et al., 2018). Similarly, based on the research findings by Halawany et al. (2018), any behavioural oral health education programme following any methodology leads to temporal change in behaviour and acceptance of the change to reflect proper oral hygiene practices.

Oral health behavioural programmes have been demonstrated to be effective in reducing the prevalence of dental diseases (Macpherson, Anopa, Conway, & McMahon,

2013). The authors investigated the impact of using the ChildSmile project on five-year-old nursery school children in Scotland and in reducing oral health disparities in the community. The intervention led to a decrease in tooth decay among the children; the authors mentioned that measures of such benefits need to be done after some time for adequate changes to become noticeable (Macpherson et al., 2013). In the research, proper tooth brushing, including its recommended frequency, was maintained through the provision of toothbrushes and fluoridated toothpaste to the children at their homes and in the nursery class (Macpherson et al., 2013). The researchers also noted that ChildSmile had been implemented in almost all nursery schools across Scotland; the approach is consistent because it follows clearly stated out guidelines and is regularly monitored. Moreover, the introduction of a national oral health improvement programme has provided ways for Scotland to reduce the oral health inequalities among nursery school children (Macpherson et al., 2013).

Community-based educational interventions on proper oral health are cheap methods that can be used in the improvement of oral hygiene practices. Practical demonstrations of how to remove dental plaques and proper tooth brushing made the children brush their teeth after major meals, hence led to reductions in periodontal and dental caries (Chachra et al., 2011). The illustration of how to use Mercurochrome to reduce dental plaque was demonstrated to the participants. Still, cautionary measures were mentioned that such practices should be done with the aid of an adult. The use of fluoride toothpaste daily and an additional fortnight use of freshly-prepared Naf provided significant reductions in dental caries which has been mentioned by previous researchers to be effective by 30-50% only when 50-60% of fluoridated toothpaste and 0.2% fortnight use of Naf are adopted (Chachra et al., 2011).

Similarly, children who participated in the study by Chachra et al. (2011) adopted the behaviour of consuming sugary food only three times per day based on the evidence that dental caries is caused through increases in sugar intake frequencies rather than the amount of sugar one takes (Chachra et al., 2011). All people may adopt this restriction regardless of age because dental caries does not affect children alone. Majority of the population in India comprises of people living in rural areas where dentists are rarely available. Therefore, Chachra et al. (2011) trained teachers on oral disease preventive actions that children can be taught. Future researchers should, therefore, implement their research using a method that is suitable to the population that they are addressing to ensure that the education programme is effective. For instance, the intervention in rural areas in India cannot be dentist-led because the ration of dentist to population is 1: 320000. In the study, some groups were dentists led

while others were teacher-led; the dentist-led group was more effective in comparison to the other groups (Chachra et al., 2011).

Primary school children who participated in the dental caries prevention intervention in the Democratic Republic of Korea provided by Tarvonen et al. (2016) had the mean number of untreated dental caries and decayed primary teeth significantly reduced after the intervention. Follow-up of participants after they received toothbrushes and fluoridated toothpaste, supervised tooth brushing and oral health education indicated a reduction in the number of decayed deciduous teeth (Tarvonen et al., 2016). The researchers noted that the early prevention of dental diseases has an impact on their oral health and overall quality of life. When a child adopts proper oral hygiene practices at an early age, dental diseases are prevented earlier, reducing their risk of getting oral diseases during their adulthood. An educational programme that involves parents is also more effective as seen in the method adopted by Tarvonen et al. (2016). The authors included the education of parents in their study, which led to the improvement of dental health among children because it ensured that oral hygiene practices adopted in schools were also followed at home. Social volunteers in areas where dentists are not available may be educated on oral health improvement strategies, which are then passed to children in educational facilities (Tarvonen et al., 2016).

Based on the findings and suggestions by Tarvonen et al. (2016), different oral disease prevention strategies need to be implemented among children while they are still young and should involve teachers and parents to improve their effectiveness.

Takeuchi et al. (2016) evaluated the effectiveness of the 'MaliMali programme in promoting oral health in children learning in schools located in the Tonga kingdom. The efficacy of the MaliMali Programme in its initial stage led to an increase in the number of children enrolled in it, with a 99% increase being noted in 2011. DMFT and DMF scores decreased after the programme was implemented (Takeuchi et al., 2016). To maintain oral health promotion activities that suited Tongan schools, various strategies were implemented. For instance, some schools may be closed due to irregularities in the weather, making it difficult for oral health maintenance tools like fluoridated toothpaste to reach students (Takeuchi et al., 2016). The advantages of the MaliMali Programme were evidential, as seen in the improvement of oral health among children in Tonga schools. Therefore, the findings by Takeuchi et al. (2016) indicated that MaliMali was not only feasible but also acceptable to children and schools in the promotion of oral health behaviours. Among children, researchers and policymakers need to promote oral health practices and behaviours through making oral hygiene tools like toothbrushes and fluoridated toothpaste easily available.

According to Macnab et al. (2008), a collaborative school-based oral health prevention programme effectively makes children have better oral health. In schools, children brush their teeth more frequently than at home. Therefore, parents need to be trained on oral health improvement strategies that they can use to help their children maintain good oral health hygiene practices at home as well as at school. Moreover, the authors also noted that when a child knows that they are being monitored, they adhere to proper oral hygiene practices (Macnab et al., 2008). Therefore, in the programme implemented by Macnab et al. (2008), the participating children got support, education sessions, and follow-up results from visits to dental health professionals. During the implementation of the programme, the authors noted that most children developed caries during their early childhood; hence implementing an oral health programme when children are still young ensures that dental diseases are curtailed before the child grows. Moreover, Macnab et al. (2008) suggested that new mothers use chlorhexidine varnish, a process proven by other researchers to lead to the reduction of dental caries significantly. It is, therefore, viable to conclude that a collaborative oral health improvement programme efficiently reduces the prevalence of oral diseases. In a first nation community, to improve oral health among children, oral health needs to be supported by the community, universities, schools as well as personnel.

Chandrashekar, Suma, Kiran, and Manjunath (2012) sought to identify the differences between a dental health education programme done by dentists and that offered by teachers in terms of their effectiveness. DHE done by dentists in India infrequently occurs because of the low number of dentists to children ratio, whereas the DHE done by teachers occurred frequently. Both dentist-led and teacher-led DHEs were effective in promoting oral and gingival health among children in rural schools; however, the improvements were more significant in the teacher-led intervention in comparison to the dentist-led programme (Chandrashekar et al., 2012). When a teacher monitors and motivates a child in an oral health improvement intervention, the child is most likely to adopt good oral health practices as part of their behaviours, hence improving their gingival health. Moreover, in developing countries like India, schools should be provided with affordable toothpaste and toothbrushes because they cannot afford them due to the low incomes of parents living in rural areas in particular (Chandrashekar et al., 2012). In countries that do not have a national oral health policy or school-based dental health interventions in place, teachers may be trained on oral health to ensure that the children being instructed by the trained teacher get improved oral health (Chandrashekar et al., 2012). A developing country may also benefit from DHEs just like developed countries despite the gains not being big enough to match up to the countries with

better health infrastructures in place. A common feature in both developed and developing countries is the presence of teachers; hence developing countries may train teachers on oral hygiene who subsequently educate children leading to improvements in oral health behaviours and attitudes among children.

Olubunmi and Olushola (2013) sought to evaluate the effectiveness of oral health education, implemented through using a video on dental health, on children from low-income families. Among the participating children, their oral hygiene increased by 28.6% for the video-educated group, whereas the verbal-educated group reported 23.4% oral hygiene improvements. The authors mentioned that the videos used were in the local language of the involved children, which made the local health messages better understood (Olubunmi & Olushola, 2013). Oral health behavioural interventions may successfully lead to improvements in the oral health of children when videos used in the methodologies have illustrations that make one understand how to perform say tooth brushing in real life. In the setting in which Olubunmi and Olushola (2013) based their study, the participating children accepted the video, hence making it easier for them to adopt the oral health improvement strategies that may improve their oral health. Verbal health education is combined with the use of dental health education videos to prompt better outcomes in the quality of oral health among children from low-income countries. Lai et al. (2016) provided results that indicated that the use of intensive oral hygiene programme in schools leads to positive long-term developments in the oral hygiene habits, dental knowledge, periodontal status, plaque scores, and experience of caries among children ages 10 to 11 years. To prevent dental illnesses, the researchers noted that it was better to promote dental flossing and not tooth brushing because of the better-expected outcomes regarding the prevention of dental diseases (Lai et al., 2016). Implementation of an OHE encourages children to make more frequent dental visits aimed at preventing dental diseases, unlike before they were exposed to oral health education. The effectiveness of the study is seen in how the involved children, despite not receiving any oral health education after the end of the OHE programme, still maintained high standards of oral hygiene 4-16 years later (Lai et al., 2016). Also, a prolonged intervention gives room for the observation of conditions that warrant frequent check-ups. For instance, children after the intervention made frequent visits to the dentists to have their teeth checked for clinically detectable plaque forms, which their parents and teachers may not identify through merely looking at their mouths (Lai et al., 2016). Based on the results attained, the study found that oral hygiene programmes need to be longitudinal and well-targeted to ensure that the benefits accrued are sustainable in the long-term (Lai et al., 2016).

Petersen et al. (2015) also sought to investigate the effectiveness of oral health promotions, just like Olubunmi and Olushola (2013), Lai et al. (2015), Siddiqui and Khan (2012), and Naidu and Nandlal (2017). The difference in the research done by Petersen et al. (2015) and Lai et al. (2015) was the location of the children being targeted and the period in which the oral health programme was implemented. Lai et al. (2015) performed a follow-up of ten years, whereas Petersen et al. (2015) did a follow-up of two years in Southern Thailand. Petersen et al. (2015) noted a 16.8% reduction for the enamel and dentine parts and a 34.1% reduction for the dentine threshold in caries among the children placed in the intervention group. The OHE being investigated by Petersen et al. (2015) involved a combination of interventions like education, tooth brushing techniques, monitoring of tooth brushing using provided toothpaste and adherence to oral hygiene practices at home and school. The advantages associated with frequent tooth brushing using fluoridated toothpaste led to significant improvements in the oral health of children (Petersen et al., 2015). Based on the evidence, enhanced toothpaste formulation use among children who have participated in an OHE ensures that they are at reduced risk of getting oral health diseases (Petersen et al., 2015). Therefore, when OHE programmes are being implemented in schools, much attention needs to be focused on improving tooth brushing using fluoridated toothpaste as the basis for ensuring that the programme successfully leads to improvements in the quality of oral health of children.

De Farias, De Araújo Souza, and Ferreira (2009) investigated the impact of children-targeted oral health education programmes on dental health practice and awareness in a Brazilian public school setting. The authors noted that with the implementation of the programme, various changes were noted in the oral health behaviours of children (De Farias et al., 2009). Also, the oral health of children increases with significant differences being identified in the gingival bleeding index (GBI), and the visible bleeding index (VBI) in the participating children after the intervention was implemented (De Farias et al., 2009). The oral health awareness among the children who participated in the study was significantly higher hence making them practice oral hygiene habits more than those who have less information on oral health (De Farias et al., 2009). The researchers also provided suggestions that policymakers and various researchers may use in the improvement of oral hygiene among children. The suggestions provided by De Farias et al. (2009) include incorporating OHE programmes as part of school activities in the school routine and implementing oral health programmes for longer periods to ensure that oral health practices are adopted by the children, hence promoting their quality of life.

Behavioural prevention programmes as mentioned by various researchers have been proven to improve the oral health in children effectively (Angelopoulou et al., 2015; Hebbal et al., 2011; Lai et al., 2015; Petersen et al., 2015; Saied-Moallemi et al. 2009; Shenoy and Sequeira, 2010). Therefore, when oral health problems are encountered among children, behavioural prevention programmes may adopt to improve their oral health. However, researchers need to be aware of the determinants of the effectiveness of school-based oral health prevention strategies before implementing the programmes.

Determinants of effectiveness of school based oral health prevention strategy.

This section provides the factors that determine the level of effectiveness of an oral health prevention strategy. Researchers need to be aware of such determinants for use in improving the quality of results of the behavioural intervention strategy that they wish to implement. The various determinants, as depicted in the following sections include the choice of a behavioural prevention strategy, the involvement of parents and teachers, engagement and active participation of children, use of teaching aids, the combination of interventions and regular or periodic oral education programme.

Choice of behavioural prevention strategy. The literature suggests that the effectiveness of school-based oral health programmes may be influenced by the type of behavioural prevention strategy. Motivational interview was reported to be more effective for dental caries prevention compared to traditional oral health education and other behavioural prevention strategies (Albino & Tiwari, 2016; Gonzalez-Del-Castillo-McGrath *et al.*, 2014; Mohammadi et al., 2015). In a community trial, Mohammadi et al. (2015) found that the plaque index was reduced among pupils who received oral health education and motivational interview with their parents compared to pupils who received oral health education alone with their parents ($p < 0.001$). Similarly, pupils whose mothers received initial traditional oral health education followed by periodic individual motivational interview had a greater reduction in plaques (34.3 vs. 20.6; $t = -3.12$, $p = 0.002$) compared to pupils whose mothers who only received the initial traditional oral health education in a randomised controlled trial (Gonzalez-Del-Castillo-McGrath et al., 2014). The experimental group developed less new caries (2.12 vs. 3.5, $t = 7.39$, $p < 0.001$) and experienced less severity of dental caries (median intensity of 2 vs. 3, $U = 1594$; $p < 0.0001$) (Gonzalez-Del-Castillo-McGrath et al., 2014). A literature review also identified MI as the most successful of behavioural interventions for dental caries prevention (Albino & Tiwari, 2016).

Several factors might have contributed to the effectiveness of MI for oral health promotion among school children. Firstly, MI is a personalised intervention with the oral

health educational intervention tailored to individual need. Secondly, parents are usually involved in motivational interviews for school children. Finally, MI groups are usually exposed to periodic reinforcement. The parents in the MI group in the first study received periodic reminder calls, while parents in the second study had 6 sessions of motivational interview (Gonzalez-Del-Castillo-McGrath et al., 2014; Mohammadi et al., 2015).

Other studies has also found traditional health education to be less effective compared to EL and oral health education with digital media (Angelopoulou et al., 2014; Angelopoulou et al., 2015; Hebbal et al., 2011; Mohamadkhah et al., 2013; Shenoy & Sequeira, 2010). Specific contextual factors, such as active participation of children, might have been responsible for the variation in effectiveness across different types of strategies. Thus, contextual factors rather than the type of strategy affect the outcome of school oral health promotion. A well-organized traditional oral health education which is engaging (and regular) with parents involved, might be as effective as motivational interviews ((Angelopoulou et al., 2014; Angelopoulou et al., 2015; Hebbal et al., 2011; Mohamadkhah et al., 2013; Shenoy & Sequeira, 2010). The contextual factors that contribute to the effectiveness of dental caries behavioural prevention programmes will be discussed subsequently under relevant themes. Daouda et al. (2016) noted that the use of IEC messages to promote oral health behaviours has also been proven to improve the effectiveness of educational interventions. The strategy suggested by Daouda et al. (2016) was different in comparison with that presented by different authors supporting either experiential learning or traditional lecturing (Angelopoulou et al., 2014; Hebbal et al., 2011; Mohamadkhah et al., 2013; Shenoy & Sequeira, 2010). However, Douada et al. (2016) suggests a behavioural intervention that only leads to changes in behaviour, but does not indicate whether it successfully lowers DMF/T. Based on the research by D'Cruz and Aradhya (2012), the lecture method in oral health education is the most effective in providing educational motivation. Pakpour et al. (2014) investigated the difference between the effectiveness of low-framed messages and gain-framed messages in improving oral health among adolescents in Iranian secondary school. The results of the study indicated that loss-framed messages yielded better results than the gain-framed messages (Pakpour et al., 2014). Loss-framed messages led to higher increases in attitudes towards brushing behaviours, oral health-related quality of life, intentions to brush, plaque reductions and improvements in gingival health (Pakpour et al., 2014). The authors provide a suggestion that in a population entailing collectivists' cultural contexts, a school-based educational programme needs to use loss-framed health promotion messages (Pakpour et al., 2014).

Involvement of parents and teachers. Involvement of parents has been reported to enhance the success of school oral health education (Damle et al., 2014; Petersen et al., 2016; Saied-Moallemi et al., 2009; Tai, Jiang, Du, & Peng, 2009; Yekaninejad et al., 2012). In a community trial in Iran, school children whose parents received oral health education leaflet and a brushing diary for supervising the child's tooth-brushing had a more acceptable oral hygiene (reduced plaque) compared to school children who only solved puzzles at school under the supervision of health counsellors (Saied-Moallemi et al., 2009). In another study in India, students who had oral health education and tooth brushing under supervision of parents, had a better oral hygiene (reduced plaque) compared to pupils who had oral health education alone without involvement of parents (Damle et al., 2014). The reason for Damle et al. (2014) for choosing to include parents in their research study was prompted by the poor knowledge of oral health among the parents in the rural area of Arnala in Thane District. The authors noted that the parents influenced the oral hygiene practices of their children, as seen in how their lack of regular tooth brushing and use of toothpaste made their offspring to emulate them. Some of the identified oral health cleaning habits in the area included the use of babool, neem, or twigs in place of a toothbrush, and burnt cow dung powder, and charcoal in place of toothpaste (Damle et al., 2009). Despite that the strategies were successful, the overall body health of using the items in their oral health was at risk. Due to the evident success of oral health behavioural interventions with the inclusion of parents, Damle et al. (2014) focused on sensitizing parents on oral hygiene and proper tooth brushing techniques, which helped in sustaining the project implementation techniques in the home setting. Thus, parents could play a critical role in oral health promotion through the supervision of tooth brushing at home. Parents can also reinforce the oral health promotion messages at home and serve as oral health role models for their children.

In a cluster-randomized trial conducted in Iran, students whose teachers and parents were given health education booklet had a more significant improvement in oral health behaviour (brushing and flossing) compared to students who had oral health education without the involvement of teachers and parents (Yekaninejad et al., 2012). Parents were responsible for the development and shaping of healthy behaviours in their children, hence their knowledge and oral health behaviours had a significant impact on the habits that their children picked up. Besides, parents facilitated oral health practices in their children. On the other hand, school staff and teachers served as role models, provided support, and were committed to oral health practices, which was beneficial in making students appreciate the vitality of observing oral hygiene practices in a school setting (Yekaninejad et al., 2012). The

results of the study indicated that in the comprehensive intervention group that involved both school staff and parents, the children reported more cognitive variables in comparison with the intervention group, which included only their parents (Yekaninejad et al., 2012). Another study in Denmark reported that a comprehensive school oral health promotion programme comprising of oral health education, teacher-supervised tooth brushing and supply of oral hygiene aids (toothbrush and toothpaste) led to 16.8% reduction in dental caries among participating pupils compared to 12.6% reduction in the pupils who had no intervention (Petersen et al., 2016). Thus, the involvement of teachers may also enhance the success of school oral health promotion. It may be easier to integrate oral health promotion into the usual school programme when it is delivered by teachers.

Cooper et al. (2013), in their systematic review on the effectiveness of using primary school-based behavioural interventions to reduce dental caries, also noted the value of involving parents and teachers in such strategies. The home environment is essential in increasing the efficacy of any oral health improvement intervention. According to Cooper et al. (2013), a parent plays a crucial role in ensuring that a child maintains proper hygiene as instructed in the intervention while at home. Also, the parent aids in enforcing behavioural transition from knowledge acquisition, development of skills and adoption of the behaviours. Proper training of parents on how to aid in the implementation of dental disease prevention strategies influence how effective a strategy may become (Cooper et al., 2013). Daouda et al. (2016) also emphasized the need for including teachers and mothers in future studies on dental caries prevention programmes. The authors concluded the need for teacher and parent involvement since their research failed to reduce DMF/T among the participants (Daouda et al., 2016).

The research by Naidu and Nandlal (2017) was successful as it involved teachers at the implementation process since they were the best-suited personnel to impart oral health education to school children daily. Haleem et al. (2012) divided the participants in their research to groups with three of them being educator-led. The results of the study indicated that in comparison to the control group, the three-educator-led interventions effectively enhanced oral health behaviour, knowledge and hygiene status of the participants. The control group involved self-learning by the participants, which indicated lower improvements, unlike peer-led and educator-led strategies. Teacher-led strategies were seen to be more effective in improving oral health education in comparison with dentist-led interventions; however, peer-led interventions provided better outcomes (Haleem et al., 2012).

Bhardwaj et al. (2013) conducted a study that did not involve parents in their oral health improvement strategy. The authors found that children did not adhere to the oral health practices as suggested by the intervention both at school and at home. This showed that parents need to be involved in oral health education programmes to enhance the programme's implementation processes at home. Also, including the parents may increase the duration that benefits accrued from the study last. For instance, tooth brushing behaviours and frequencies may be adopted by the children as part of their usual routines despite the end of the programme. In addition, involving school personnel and teachers may help in creating an environment that motivates children to follow oral hygiene practices in their daily lives (Bhardwaj et al., 2013). Jain et al. (2016) also supported the involvement of parents and teachers in ensuring the effectiveness of oral hygiene programmes. The authors indicated that teachers play a crucial role in ensuring efficient implementation of oral health improvement programmes; hence they need to be trained on oral health knowledge and practices by a professional dental health educator. In the project by Jain et al. (2016), teachers provided oral health education to the children; hence their prior training ensured that children effectively adopted oral health knowledge and practices.

Moreover, the support and commitment of the teachers were great predictors in the determination of whether the research would be successful or not (Jain et al., 2016). Thus, researchers need to consider the various aspects surrounding teachers who are aiding in the implementation of behavioural oral health interventions. The quality of life in children is enhanced when they adopt oral health practices into their lives, which is likely to occur when a teacher is the one training them on oral hygiene (Jain et al., 2016). When a parent is involved in the construction of a school-based oral motivation strategy, the success rate of a programme may increase due to the constant motivation that participating children get (Gambhir et al., 2013). Moreover, teachers were also trained in oral health hygiene behaviours and practices, which make it easier for researchers to implement OHE in schools. The combination of teachers and parents in the implementation of OHE programmes in schools increased the rate of success that may accrue from such research (Gambhir et al., 2013). In the research by Petersen et al. (2015), the involvement of teachers and parents in oral health intervention led to sustainable oral hygiene behaviours after the end of the intervention. The training that teachers get on oral health practices increases their confidence in providing oral health education to pupils during the intervention and after its end.

Parents in the intervention investigated by Petersen et al. (2015) got illustrations on proper tooth brushing techniques through posters; hence they were able to improve the

chances of success of the behavioural strategy because they aided their children in implementing oral hygiene practices in the home setting. When teachers were involved in oral health education strategies, the children enjoyed and practiced tooth brushing more frequently and effectively because educators had a way of instilling behaviours in their students in an exciting way, unlike when only dentists lead the implementation process (Petersen et al., 2015). The intervention on oral health prevention strategies in Thailand involving teachers as the persons monitoring tooth brushing adherence as well as in the appropriate procedure led Petersen et al. (2015) to achieve the aims of the education intervention, in addition to identifying the effectiveness of using fluoridated toothpaste. De Farias et al., (2009) also suggested that parent-teacher collaboration in oral health education improves the success of the intervention and ensures that the accrued benefits are enhanced and maintained even after the programme. Gasoyan et al. (2019) also included parents in the school-based dental programme in rural Armenia. In the study, parents were educated on oral health hygiene and were encouraged to monitor their children as to whether they adhered to tooth brushing twice a day while at home. Parents aided the success of the intervention because they ensured that monitoring of tooth brushing was done, hence guaranteeing efficiency in the adoption of proper oral hygiene practices and behaviours (Gasoyan et al., 2019).

Engagement and active participation of children. Engagement and active participation of children may enhance the success of the school oral health programme. In a study that compared the traditional oral health education and EL through direct live experience, including oral health projects and extramural visits, oral health knowledge improved significantly ($P < 0.001$) in both groups at 6 months and 18 months post-intervention (Angelopoulou et al., 2014). However, oral health behaviour ($P < 0.001$) and attitude ($P < 0.05$) improved significantly at 6 months, but not at 18 months in both groups. Moreover, the incidences of plaque and dental caries reduced significantly for the EL group at 18 months during post-intervention ($P < 0.05$) (Angelopoulou et al., 2014). Another comparative study found that children who were exposed to EL had significantly better oral hygiene (reduced plaques) compared to children who received traditional oral health education after 6 months, but not sustained at 12 and 18 months (Angelopoulou et al., 2015). Besides, both groups had improved oral health knowledge, attitude and behaviour at 6 months, but only improved oral health knowledge was sustained at 18 months within the groups (Angelopoulou et al., 2015). These results indicate that active participation and engagement of children enhances the effectiveness of oral health programme and highlights the need for continuous or periodic

oral health education for sustained improvement in oral health knowledge, attitude, behaviour and hygiene. Doichinova and Mitova (2014) posited that children might have deficiencies in their oral hygiene habits; hence it is necessary to assess their oral health behaviours and educate them on how to improve them.

Engagement of children indicated an increase in the effectiveness and success rate of oral health behavioural interventions (Doichinova & Mitova, 2014). Also, it is worth noting that for oral health hygiene habits to be sustainable, children need to be continuously motivated. Gasoyan et al. (2019) also supported the engagement of children in education programmes as a way of improving the chances of success of the implemented intervention. The authors in their research prompted the participating children to adhere to oral hygiene practices because they were being monitored and evaluated after a given period (Gasoyan et al., 2019). Therefore, researchers may consider engaging children more on a one-on-one basis to obtain their personal opinions on oral health hygiene, and what they think should be done to improve their oral hygiene health. Most studies impose a strategy on the participants with minimal contact with the children on their opinions; this mainly occurs because children are perceived to either be too young to make essential suggestions to the behavioural intervention or lack the knowledge on oral hygiene.

Use of teaching aids. The use of audio-visual aids has been reported in successful school oral health programmes (Hebbal et al., 2011; Mohamadkhah et al., 2013; Olubunmi & Olushola, 2014). A significant increase in knowledge and reduction in dental plaques were reported after oral health education with audio-visual aids among primary school children in India (Hebbal et al., 2011). Improvement in oral health knowledge and behaviour was also reported after an oral health education film (Mohamadkhah et al., 2013). Similarly, an improvement in oral hygiene was reported in Nigeria after school children were educated with audio-visual aids (Olubunmi & Olushola, 2014). In rural areas, the cheapest method needs to be used in dental health education strategies; hence Olubunmi and Olushola (2013) used videos on dental health education to educate the participating children on appropriate oral health hygiene. To ensure a better understanding of the video by the children, the data was in the Yoruba language. Using instructional materials in the local language as suggested by Olubunmi and Olushola (2013) concurs with the research by Chachra et al. (2011), who wrote the instructional materials used in the behavioural intervention in the Hindi language. Using videos in the local Yoruba language is beneficial to the success of the behavioural intervention programme among the 11-12 years because it made them understand the local health message (Olubunmi & Olushola, 2013). In the oral health education intervention

suggested by Halawany et al. (2018), the researchers used a four-minute animation video and a lecture presentation in addition to four education corners. The first corner aided the children to learn about how to brush their teeth circularly through demonstrations using a toothbrush and a jaw model. Teeth models provided the researchers with methods on the different types of teeth, their functionalities and their number (Halawany et al., 2018). The fourth corner entailed the use of an educational booklet for both the parent and their child. In the schools that participated in the study, posters and educational materials were used to remind children how to care for their teeth properly. The use of education booklets, animation videos, and lecturing presentations led to the successful improvement in the knowledge and oral behaviours of the targeted children (Halawany et al., 2018).

Similarly, the use of anatomical models for practical demonstration has also been reported in association with successful school oral health programmes (Amato, Barbosa, Kobayashi, & Gavião, 2014; Chachra et al., 2011; D'Cruz & Aradhya, 2013; Naidu & Nandlal, 2017). Chachra et al. (2011) explained that the participants in their study aged 10-16 years used teaching materials that comprised of albums in the Hindi language in the form of coloured photographs. Moreover, the authors noted that when dental plaque removal using 2% mercurochrome in the mouth of a volunteer made children to frequently request their parents to perform the same procedure on their teeth. Improvement associated with the use of teaching aids, including audio-visuals and anatomical model may be due to increase in engagement, concentration and comprehension among the children.

Combination of interventions. Most successful dental caries prevention programmes involved a combination of interventions. A cluster randomized controlled trial in China found a significantly lower mean plaque and DMFS after 3 years of school-based health promotion in Yichang City, China including regular oral health education for children and mothers, oral hygiene poster presentation and oral hygiene contest (Tai et al., 2009). In addition, more children in the intervention schools adopted regular oral health behavioural practices such as brushing their teeth at least twice a day, visiting the dentist within the past calendar year, and using fluoride toothpaste (Tai et al., 2009). Oral health education combined with supply of oral hygiene aids (toothbrush, toothpaste) is also reported to be more effective than traditional oral health education alone (Chandrashekar et al., 2012). A combined intervention leads to better improvements in the oral health of children during the implementation of oral diseases behavioural prevention programmes. Haleem et al., (2012) adopted a behavioural intervention that increased the children's KGO index, OHB, OHS, OHK and KBS. The improved aspects, according to Haleem et al., (2012), generally led to better improvements

in the oral health of the involved children because they were keen on all aspects surrounding dental health.

D'Cruz and Aradhya (2012) combined the lecturing method with practical illustrations on proper oral hygiene practices, hence improving control of plaques and improving gingival health in children. Practical examples during oral health education programmes provide hands-on training on flossing, rinsing and tooth brushing drills; thus, they act as tools of motivation in oral health promotion activities (D'Cruz & Aradhya, 2012). Similarly, Kaewkamnerdpong and Krisdapong (2018) noted positive associations between the environment where oral health programmes are being implemented and the oral behaviours and dental caries prevalence in children. According to the authors, schools where sugary foods were sold had children suffering more caries, whereas those schools where meals had low sweets meaning fewer caries. In schools that adopted integrated oral health education strategies, children were at higher chances of brushing their teeth three times a day (Kaewkamnerdpong & Krisdapong, 2018). Habbu and Krishnappa (2014) noted that when educational and behavioural-change methods in oral health education are used, it benefits the participants. This is because it doesn't only improve their oral health behaviours but also enhances their knowledge of oral health and makes them have positive attitudes towards oral health. Gasoyan et al. (2019) also concurred with Habbu and Krishnappa (2014) and Kaewkamnerdpong and Krisdapong (2018) on the use of combined interventions to improve the success of oral health dental programmes. Petersen et al. (2015) provided results indicating that the implementation of an enhanced school oral health programmes effectively leads to a reduction in the prevalence of dental caries among children. Therefore, behavioural interventions need to involve a combination of interventions and be integrated into the regular education programmes in schools to improve their chances of effectively developing oral hygiene among children.

Regular or periodic oral education programme. Evidence from the literature suggest that either periodic or regular school oral health programmes are often successful (Cooper et al., 2013). Even when a one-off oral health education programme is effective, its impact is not sustained without regular reinforcement. A dental caries prevention programme among a cohort of elementary school children in Senegal which involved a periodic oral health education from first to sixth grade, improving oral hygiene behaviour was a success (Daouda et al., 2016). The results in the research by Daouda et al. (2016) were satisfactory because the research aims were attained; however, there was a lack of a continuing programme after the elementary school for the participating children. Thus, long-term prevention of dental caries

coupled with the children's lack of motivation to adhere to good oral hygiene behaviours due to the absence of monitoring, are not well addressed. Integration of oral health education into a normal school timetable allows a regular access to oral health education and enhances the success of oral health programmes (Jain et al., 2016).

According to Haleem et al., (2012), improvements in oral health through regular school-based behavioural interventions are best noted when results are recorded periodically. Haleem et al. (2012) had five groups in their study and were assessed to ascertain the effectiveness of the research in four stages. Their first evaluation was done after the first education session ended, whereas the second occurred six months afterward. Evaluation III and IV happened after the project's reinforcement phase, in other words three and six months, respectively. The results of the authors indicated that for oral health education improvements to be sustainable, repetitions and reinforcements of interventions need to be implemented, Haleem et al., (2012). D'Cruz and Aradhya (2012), just like Daouda et al. (2016) emphasized that reinforcing oral health information is essential and determines whether an oral health education programme will be successful or not. Gambhir et al. (2013), in their systematic review, also noted that the best results from a school-based OHE programme are best realized when findings are measured after a long period of time. Behaviours in humans take time to be inculcated in one's mind before being registered as normal essential behaviour that one needs to follow (Gambhir et al., 2013). Halawany et al. (2013) obtained valuable results despite that the OHE programme was implemented in the school in a short period. De Farias et al., (2009) noted that the advantages attained in their research were efficient; however, the oral health behaviours were not sustainable due to the short four-month period in which the intervention was implemented. The authors, therefore, thought that researchers need to implement an oral health behavioural prevention programme regularly for long periods by incorporating the programme into the school's routine educational activities (De Farias et al., 2009).

Literature Gap

Various researchers have investigated different school-based oral health prevention programmes (Alsumait et al., 2019; Bhardwaj et al., 2013; Lai et al., 2016). However, in Qatar, there exist no oral health policies or school-based behavioural interventions for children. Existing literature has not mentioned any oral education programme for children based in Qatar. Hence, for the oral health behavioural programme to work in Qatar, there is a need for parents, teachers, children, and policymakers to work together in developing and implementing oral health intervention. One limitation of implementing the oral health

behavioural intervention in Qatar is the environment surrounding the children. In Qatar, the custom of Ramadan's religious month and cultural practices that the citizens engage in hinder the success of oral health prevention interventions; no studies have covered how the negative forces may be avoided in the development of efficient oral health programmes for children in Qatar. Lastly, there is no literature indicating the existence of a national programme for improving the oral health of children in Qatar. Therefore, the case study explored dental caries' behavioural prevention strategies in Qatari primary schools to understand the successful way of developing an effective school-based oral health programme. Also, the factors that were investigated to use in improving the behavioural interventions for use in Qatari primary schools to reduce dental caries included school oral health policy, the involvement of parents and teachers, regulation of children's diet, the inclusion of oral health in the curriculum and regular oral health programme.

Overall Summary of Scoping Review Finding

The review identified various types of behavioural prevention strategies reported in school oral health literature including traditional oral health education (Chachra et al., 2011; Daouda et al., 2016), oral health education with digital media (Shenoy & Sequeira, 2010; Hebbal et al., 2011; Mohamadhah et al., 2013), motivational interview (Gonzalez-Del-Castillo-McGrath et al., 2014; Mohammadi et al., 2015), experiential learning (Angelopoulou et al., 2014; Angelopoulou et al., 2015), oral health puzzles (Saied-Moallemi et al., 2009), supervised oral hygiene (Macnab et al., 2008; Tarvonen et al., 2017) and supply of oral health aids (Naidu & Nandlal, 2017). From the studies reviewed, it was found that oral health behaviour lies within an individual, and through evidence-based and effective self-care, oral health problems can be managed. Implementing public policy and education on oral health hygiene is crucial in enhancing understanding of oral health diseases and oral health practices. The scoping review of existing studies also demonstrated that maintaining oral health is mainly attained through tooth brushing and dental flossing for the prevention of plaques, as well as periodontitis and gingivitis. Moreover, the studies reported on the effectiveness of behavioural prevention strategies based on the following outcomes: knowledge of oral health, attitude to oral health, oral health practices (healthy eating, tooth-brushing, dental flossing, dental visit), plaques control and caries prevention (DMFT). Finally, the review identified some possible determinants of oral Behavioural Prevention Strategy effectiveness, which include engagement and active participation of pupils and parents, the involvement of significant others, the regularity of intervention, the use of teaching aids and a combination

of interventions. These are diagrammatically represented in Figure 15. The Figure shows the determinants of BPS, which played a crucial role in oral health. The figure also shows that pupils should be active participants in oral health to reduce dental problems. Involving pupils and parents in school oral health programmes is the key intervention to improve oral health. The figure illustrates that teaching aids are useful to improve awareness and the ability of pupils to engage in oral health hygiene.

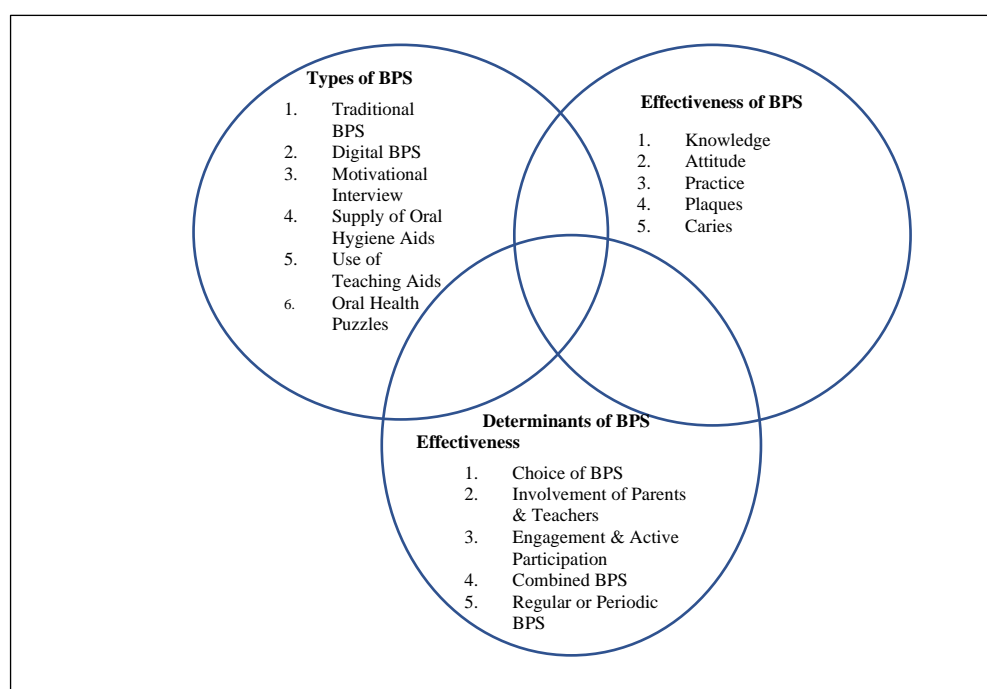


Figure 15. Theoretical propositions

The determinants of Behavioural prevention strategy effectiveness were developed into theoretical propositions for the case study based on Yin (2014). The theoretical propositions are shown on Table 5.

Table 5. Theoretical Propositions

Theoretical Propositions	Source
Involvement of parents and teachers enhances the success of school-based dental caries behavioural prevention programmes	Tai et al., 2009; Yekaninejad et al., 2012; Damle et al., 2014; Saied-Moallemi et.al., 2009; Petersen et.al., 2016
Active engagement of pupils in oral health promotion programmes that actively engage pupils are more likely to be effective	Angelopoulou, Oulis and Kavvadia, 2014; Angelopoulou et al., 2015
Periodic and regular oral health promotion programmes produce a sustained improvement in oral hygiene	Daouda et al., 2016; Gonzalez-Del-Castillo-McGrath et al., 2014
The use of teaching aids enhances the success of oral health education programmes	Hebbal et al., 2011; Mohamadkhah et al., 2013; Olubunmi and Olushola, 2014
Combination of multiple interventions leads to a better oral hygiene outcome	Tai et al., 2009; Chandrashekar et al., 2014;
Oral health behaviours are influenced by personal, environmental and behavioural factors	Theoretical Model

These theoretical propositions were tested using multiple case studies approach as recommended by Yin (2010), which are discussed in the next chapter.

Summary

This chapter provides a scoping review on the identified three inter-linked recurring themes from the literature on school-based behavioural prevention strategies, which are types of a behavioural prevention strategy, the effectiveness of behavioural prevention strategy and determinants of behavioural prevention strategy effectiveness. The chapter provides engagement and active participation of pupils, the involvement of significant others, the

regularity of intervention, and the use of teaching aids and a combination of interventions as the primary determinants of the effectiveness of oral behavioural prevention strategy.

Chapter Four

Phase 2: Qualitative Case Study Methodology And Methods

Introduction

A qualitative case study approach was adopted to properly address the objectives of this study. A qualitative case study is mainly used to explore social issues by examining cases within a given system, which allows the researcher to study and provide detailed information on the actual meaning of the problem (Yin, 2010). Also, a qualitative case study is mainly used to obtain in-depth information by exploring the perceptions of people with enough information about the problem in question (Creswell, 2014). A qualitative case study was used here to explore oral health in Qatar primary schools through the perceptions of teachers, pupils, parents, and school nurses. The case study was helpful as it allowed for an in-depth exploration of the topic in question. In particular, the qualitative case study was used to explore the following objectives:

- i. Understand how oral health behavioural prevention strategies operate in the contexts of public and private primary schools in Qatar
- ii. Explore *why* oral health knowledge and behaviour of primary school pupils in Qatar remains intransigent despite oral health programmes in schools
- iii. Explore the contexts and mechanisms that underpin the motivation of primary school pupils and their parents in Qatar to improve their oral health behaviour.
- iv. Understand how changes in oral health behaviour may be sustained among primary school children in Qatar.

Based on scientific beliefs, a qualitative case study allows for an in-depth investigation of an event to explore the main cause of the underlying problem (Yin, 2014). A case study approach is an exploratory and descriptive analysis of a problem, which allows the researcher to provide detailed information that provides the actual meaning of the event (Stake, 2013; Yin, 2014).

As such, a qualitative case study was employed in this thesis to conduct an in-depth investigation of oral health and provide the underlying principles of oral health diseases in Qatar. A qualitative case study approach was adopted to address the study's objectives properly.

This chapter discusses and justifies the use of a qualitative case study approach in this study. The chapter is organised using sub-themed sections, which include: study method, study design, theoretical propositions, conceptual framework and sampling and recruitment procedure. Other subsections covered in this chapter are data collection, data analysis, ethics, timetable and milestones and summary of the chapter.

Philosophical Underpinnings

The case study approach was based on the constructivist paradigm, which posits that truth is relative and is based on an individual's subjective construction of meaning (Baxter and Jack, 2008). In this study, the adoption of the constructivist paradigm allowed collaboration between the researcher and the participants who were the key stakeholders of school oral health in Qatar. Adom, Yeboah, and Ankrah (2016) explained that the constructivist paradigm is mainly used by researchers who seek to find the real meaning of a problem or understand the world by exploring the experiences of people affected by the problem. The paradigm allows the researchers to engage in and conduct the study to acquire knowledge and understand the problem in question (Adom et al., 2016). Thus, the case study approach gave prominence to the views and voices of the most important stakeholders of school oral health in Qatar (Baxter & Jack, 2008). Baxter and Jack (2008) explained that a case study method is mainly used in a qualitative study to explore complex problems within their natural context. This method is a valuable approach or tool for researchers to develop theories or themes that adequately address the complex phenomenon under investigation. Thus, a framework was developed in this study through a case study approach for dental caries prevention strategy in Qatari schools with significant inputs of the stakeholders, and adequate consideration of contextual factors. The literature recommends that cases should be bounded to limit the scope of the study and avoid an unreasonably broad research question. A few ways suggested in the literature include the use of time, place, activity, definition and context (Miles & Huberman 1994; Stakes 1995; Yin 2003). Definition and context were used to limit the scope of this study to school-based behavioural prevention strategies for dental caries. This case study was bounded to only behavioural prevention strategies rather than all dental caries prevention strategies. Only strategies that promote oral hygiene (twice-daily tooth brushing and dental flossing), and healthy eating among school children were considered. Thus, the boundaries pre-identified what would be studied and what would not, as well as the breadth and depth of the study (Baxter & Jack, 2008).

Case Study Approach and Methods

A case study approach is mainly used to provide a multifaceted and in-depth understanding of a research problem in its natural or real-life context (Adom et al., 2016). The approach provides a broader appreciation of the problem through empirical inquiry in which perceptions or lived experiences of people are explored to give actual meaning (Stake, 2013). A case study is mainly used as the best design of a qualitative research method in which the approach helps to study the problem in its actual context. The case study approach also applies to the mixed method in which the approach helps to explore the complex issues by exploring the perceptions of people to find real meaning based on qualitative data collected (Yin, 2014).

Study method.

The study used a qualitative research method to address the research objectives. A qualitative research method was chosen as the best method because it focuses on exploring people's perceptions to provide better understandings of the phenomenon, which was the aim of the study reported in this thesis (Yin, 2013). The study was explorative, which sought to explore dental caries behavioural prevention strategies for children in Qatari primary schools. The qualitative research method was also selected to assist in exploring the underpinning behavioural strategies and to illuminate contextual factors in the primary school and home environment and their interplay in oral health hygiene among students. This was done by exploring the perceptions of students, parents, teachers, assistants and nurses. Creswell (2014) explained that a qualitative research method is applicable when seeking to study a phenomenon based on the perceptions of people. The approach is mainly applicable when seeking factual data or information to address the research problem by seeking opinions, perceptions, attitudes, preferences or lived experiences of people with enough background of the phenomenon being studied. As a consequence, a qualitative research method was the best method for the present study to explore perceptions of pupils, parents, teachers and school nurses of oral health and oral hygiene programmes in private and public schools. The method served as a powerful approach to investigate the research problem from the standpoint of the chosen participants.

Hammarberg, Kirkman, and de Lacey (2016) explained that researchers use a qualitative method when seeking to answer research questions with the use of non-numerical data. A qualitative research method was also suitable for this present study because it allowed for an in-depth exploration of the focused topic by interacting with the people ascribed to the problem either through open-ended interviews or by observing the behaviours of such individuals, and using the data to provide the actual meaning and better insights into the

problem being investigated. The qualitative research method was suitable to obtain non-numerical data through open-ended or face-to-face communication with pupils, parents, teachers and school nurses to bring about the actual meaning of school oral health programmes and contextual factors that enhance behavioural prevention strategies for dental caries. A qualitative research was chosen against other quantitative and mixed-method approaches.

A quantitative research method was not suitable for the study because this approach mainly focuses on the use of numerical data to answer the research questions by determining the correlations or relationships between different variables (Hammarberg et al., 2016). Further, a quantitative method was not the best method for the study because it focuses on testing or confirming the hypotheses. This method seeks to test the hypotheses based on percentages or distribution by age, gender, professional, education level, among others (Boeren, 2018). As a result, the quantitative method was not used in the study because the study did not seek to test or confirm the hypotheses based on numerical data.

Further, a mixed-method was not used in the study because it requires quantitative data, which were not necessary for the present study. McKim (2017) explained that a mixed-method combines both qualitative and quantitative approaches in which one of the methods is used to address the weaknesses of another. The mixed-method approach allows for the collection of qualitative data, followed by quantitative data to support the findings. The method requires that the quantitative data are collected to expound on qualitative findings so that meaningful information is collected to address the research topic (McKim, 2017).

Study design.

The study utilized a case study approach, focused on Yin (2003; 2014). A case study design is one of the qualitative research designs used when exploring perceptions of people of a research problem. The design is used to provide an in-depth description of the problem based on the experiences of an individual, group of people, institution or community (Yin, 2014). As a consequence, a case study design was the best design for this qualitative study to describe in-depth the perceptions of pupils, parents, teachers and nurses of oral health programmes and dental caries. Overall, the key advantage of case study work is that the approach has a 'holistic view of a specific phenomenon, with a rounded picture' based on the use of multiple sources of data and thus, facilitating wider generalizations (Yin, 2014). It is appropriate in addressing 'how' & 'why' questions and providing an in-depth understanding of the phenomenon in a 'real world' context (Yin, 2014). The case study approach was particularly useful for exploring a complex phenomenon, such as dental caries prevention

strategies, which are influenced by multiple contextual factors, as discussed in the previous chapters. Yin (2014) provided significant information on case study design and was used as the appropriate author to justify the selection of the case study as the research design of the project. Also, Yin (2014) has conducted extensive research on qualitative studies over a long period of time.

Before selecting the case study approach, alternative methodologies were considered including cross sectional survey and experimental study. Cross-sectional design is useful for studying disease prevalence and generating hypothesis (Levin, 2006). Cross-sectional survey is relatively easier and less expensive to perform compared to other methodologies. However, cross-sectional survey is not suitable for answering complex “why” and “how” questions as intended in this research. Experimental approach, such as randomised controlled trial, is also an alternative approach for answering “how” and “why” questions (Knight, 2010). Experimental design uses several techniques to reduce bias such as randomisation and blinding to eliminate bias. However, experimental study design was not chosen because it addresses narrow research questions with parameters that can be controlled by the researcher (Knight, 2010).

Yin (2003) recommended the use of a case study approach in research scenarios. Firstly, when a research is aimed at answering “how” and “why” questions. Secondly, Yin (2003) proposed that a case study should be used when the behaviour of those involved in the study cannot be manipulated. In addition, Yin (2003) advocated the case study approach when it is believed that the contextual conditions can influence the phenomenon of interest. Finally, when it is difficult to delineate the case from the context, a case study is also advised. This study aims to find out “why” school oral health strategies have not been effective in reducing childhood caries in Qatar, and how school-based strategies could be used to control childhood caries. The case study approach was chosen because the school-based oral health strategies cannot be understood without considering the home context where oral health activities take place, and the school context where oral health promotion strategies are implemented. It would have been impossible to fully understand school-based oral strategies without considering these contexts.

A case study design was employed as the appropriate design for this study to facilitate the investigation of the phenomenon in question in its natural setting or in its real-life situation. Yin (2009) explained that case studies are commonly employed by researchers to deeply understand the problem in real-life situations. The case study approach facilitated the inquiry of the real-life phenomenon based on the chosen research settings. Therefore, using

the case study design enhanced the inquiry on the perceptions of students, parents, teachers and nurses from private and public schools in Qatar. The study used private and public primary schools as the research sites to describe oral health programmes and dental caries based on real-life experiences of the chosen group of individuals. One public school nominated by the Ministry of Education and One private school in Qatar, selected purposefully based on the willingness of the school to participate, were selected as the research sites in which five students, five parents, five teachers and one nurse from each school were recruited. A case study design was employed in the study to compare the data collected from the two research sites, which helped in preventing biased results because of different contextual factors of oral health programmes that existed in the selected schools. Yin (2013) explained that the case study design emphasizes perceptions of the phenomenon as they naturally occur to provide a better understanding without interfering with the situations in which they take place. Additionally, a case study design provides a more robust and intensive narrative of an individual, or a group of people ascribes to the problem. Therefore, the case study design was the best design chosen for the study in order to provide an intensive investigation of the problem, and to yield more robust decisions about oral health programmes and contextual factors associated with dental caries in private and public schools in Qatar.

The selected case study design also suited the research interrogations. According to Yin (2009), the case study design is the best approach when performing a qualitative exploratory study on a real problem in which the ‘why’ and ‘how’ questions are being investigated. As such, the use of case study design facilitated the achievement of research goals by collecting qualitative data on how oral health behavioural prevention strategy and contextual factors influence oral health behaviour in the lens of public and private primary schools in Qatar. The case study design also facilitated the inquiry on why school-based oral health strategies failed to improve oral health knowledge and behaviour of primary school pupils in Qatar based on the perceptions of students, parents, school staff or teachers and school nurses. Yin (2014) identified the types of case study designs; single case study, single case study with embedded units, and multiple case study designs. A single holistic case is suitable for studying a case of interest because it is unique or representative of other cases. A single case with embedded units involves separate analyses of subunits within a larger case. This allows within- and between-case analysis. In multiple case studies, a range of ‘cases’ may be investigated to explore the research question (Yin, 2014). A multiple case study is used to investigate several cases with different contexts, thus allowing within- and between-setting analyses. Thus,

multiple case-study designs allow an in-depth examination of similarities and differences. Significantly, a multiple-case design enables comparison and is considered as a more robust approach (Yin, 2014). The use of multiple case studies and triangulation are at the core of rigour in the case study approach, combined with reflection and theoretical propositions underpinning the investigation to increase ‘credibility’ (Yin, 2014). However, multiple case studies are usually more time consuming and expensive.

As part of the multiple-case design adopted in this study, oral health strategies in a public school context and a private primary school context were investigated to understand why prevalence of dental caries was high among primary school children in Qatar, and how dental caries prevention could be effectively achieved through school-based programmes.

A multiple case study design was chosen over other qualitative designs, including ethnography, phenomenology and grounded theory designs. Ethnography design is commonly used when exploring the characteristics of a particular culture. As such, the researcher has to engage in the cultural practices of a particular group in order to study the people to gain a deeper understanding of their lives and the specific aspects of their culture (Grossoehme, 2014). This ethnography design mainly focuses on the use of observations by observing the behaviours of a group of people from a particular setting for an extended period to gain deeper insights into their cultural characteristics (Najafi, Latifnejad Roudsari, Ebrahimipour, & Bahri, 2016). As a result, ethnography was not the appropriate design in the study because exploring the cultural characteristics of a specific group of people was not the focus of the study. Besides, phenomenology design was not the best design in the study because it mainly emphasizes the exploration of lived experiences of a given event or social phenomenon (Grossoehme, 2014). According to Yin (2011), phenomenology design is commonly applied when identifying a specific problem based on the subjective experiences and lived experiences of people. The design is generally used by researchers to describe, in-depth, the characteristics of the social phenomenon being explored. Besides, the phenomenology design is positioned to assist the researchers in learning the problem from the experiences of other people. The scholars or researchers study the lived experiences of an individual and use the responses to describe the phenomenon (Neubauer, Witkop, & Varpio, 2019). Thus, phenomenology was not selected as the study design because it concentrates only on the perceptions rather than lived experiences. Similarly, the grounded theory design was not the best approach for the study because it only focuses on theory development, which was the main aim of the study. Grounded theory is mainly associated with the development of theories using qualitative data collected to explain the phenomenon (Grossoehme, 2014).

When using the grounded theory design, the researchers conduct interviews with the participants and used the responses to generate new theories. The researchers used abstract theories developed to describe the phenomenon (Yin, 2011). As a consequence, grounded theory was not the best design for the present study because the focus of this study was not to develop new theories.

A multiple case study design was chosen over a single case study approach because the study involved the participation of more than one participant. The study focused using multiple sources to obtain data, in which pupils, teachers and parents were interviewed to provide the necessary data. As such, single case study was not suitable for this study. This case study research developed its theoretical propositions based on scoping review of literature. The initial framework for school oral health programmes was developed based on semi-structured interviews of pupils, parents, teachers and school nurses. The last phase utilized a co-production work (The Health Foundation, 2010) with the involvement of parents, teachers and school nurses in the design of the framework school oral health programme for Qatar (Realpe & Wallace, 2010).

Theoretical Propositions

The aim of this case study was to provide a comprehensive inquiry about oral health in Qatar by exploring the perceptions of students, teachers, nurses and parents. Although theoretical propositions are not compulsory in a case-study, they were quite useful in guiding the data collection and directing the focus of the study. They also served as a foundation for the conceptual framework. Theoretical propositions were developed from the scoping review of literature in this case study. The scoping review and the theoretical propositions were presented in Chapter 3. The theoretical propositions could be summarised as follows:

1. Involvement of parents and teachers enhances the success of school-based dental caries behavioural prevention programmes (Damle et al., 2014; Petersen et al., 2016; Saied-Moallemi et al., 2009; Tai et al., 2009; Yekaninejad et al., 2012).
2. Oral health promotion programmes that actively engage pupils are more likely to be effective (Angelopoulou et al., 2014; Angelopoulou et al., 2015)
3. Periodic and regular oral health promotion programmes produce a sustained improvement in oral hygiene (Daouda et al., 2016; Gonzalez-Del-Castillo-McGrath et al., 2014)

4. The use of teaching aids enhances the success of oral health education programmes (Hebbal et al., 2011; Mohamadkhah et al., 2013; Olubunmi & Olushola, 2014)
5. Combination of multiple interventions leads to a better oral hygiene outcome (Chandrashekar et al., 2014 Tai et al., 2009).
6. Oral health behaviour is influenced by personal, environmental and behavioural factors (Theoretical Framework)

Thus, theoretical propositions were integrated into this case study approach by formulating key variables. The six aspects were used as the case study variables to explore oral health and oral health interventions that can be used to reduce dental problems. Also, the six aspects were integrated into the same study to form a theoretical basis that guides how the thesis was conducted. These propositions were similar to hypotheses in experimental studies as they tend to make an educated guess with regards to the outcome of the study (Baxter & Jack, 2008).

Conceptual Framework

The conceptual framework was developed based on the theoretical propositions of the study. The propositions provided the basis to determine how the aspects relate in terms of oral health. This helped in developing a conceptual framework to show how the propositions relate to each other. The use of a conceptual framework is recommended to guide in case study research (Baxter & Jack, 2008). The purpose of the conceptual framework is to serve as an anchor for the research by identifying the participants of the study, the constructs relating to the phenomenon of interest and the potential relationship between these constructs (Miles & Hubberman, 1994). In addition, conceptual frameworks are useful as a reference guide during the data analysis process.

The conceptual framework for this research was developed by blending the findings from the review of behavioural change theories and scoping review of international literature on school-based oral health interventions. The conceptual framework was used in the case study to explain behavioural changes on oral health. The framework linked oral health concepts with empirical evidence and theories used in systemizing oral health knowledge. The conceptual framework for this case study is presented in the Figure 16, which shows that children oral health is influenced principally by personal, environmental and behavioural factors derived from the review of behavioural change theories. In addition, drivers of change were introduced based on the review of literature. The literature showed that oral health education improves the knowledge and skills of children on oral health behaviours. However, it is unclear at this stage what the roles of these different constructs are, and how this may influence the success or otherwise behavioural prevention strategies. According to Baxter and Jack (2008), conceptual frameworks are dynamic in that they change throughout the research process as new facts are unearthed.

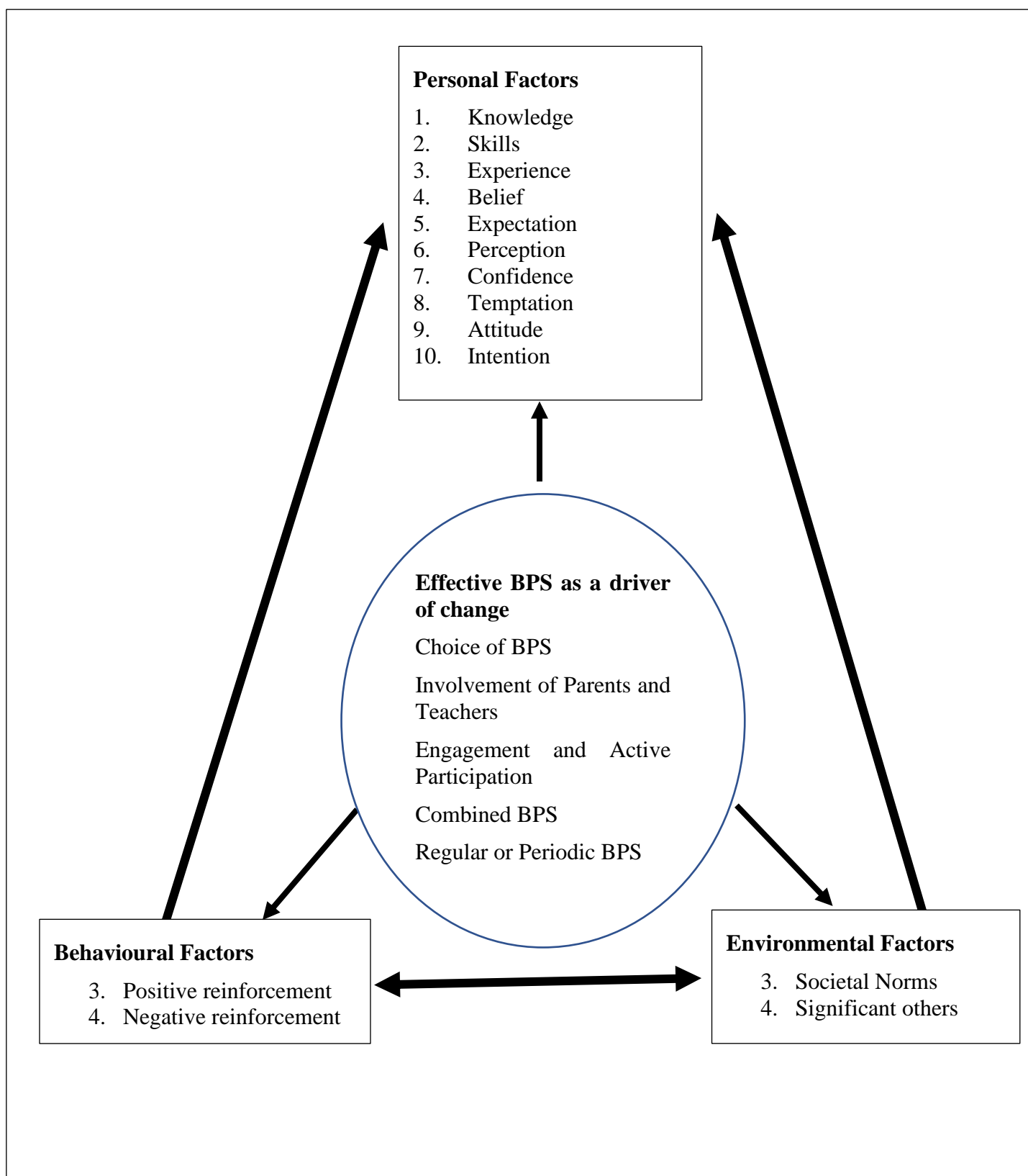


Figure 16. Conceptual Framework

Sampling and Recruitment.

Purposive sampling was used in this project to select and recruit the participants. Purposive sampling entails identifying and recruiting participants who have enough knowledge or background about the phenomenon under study (Palinkas et al., 2015). This method allows the researcher to make personal judgments and develop specific characteristics that help in selecting the best participants from the targeted population (Palinkas et al., 2015). Thus, in this project, two case study sites were selected to reflect the characteristics of the public and private primary school-based oral health strategies in Qatar, providing bounded cases (Yin, 2014). The characteristics of ten schools were achieved based on researchers' judgement. In such a case, the ministry of education selected only two schools (public & private). When the private school did not reply to their participation, the researcher contacted them by messages and email. They accepted but later hesitated to participate. This forced the researcher to select another school upon their willingness to participate. The private and public schools were used as the case study sites and were accessed through the gatekeeper of the Ministry of Education in Qatar & Bangor University, who provided ethics approval (see Appendix 2). Formal letters were sent via emails and by hand to both schools. The public school agreed immediately for the study to commence in the new academic year (2018-2019). However, there was no reply from the nominated private school despite follow-up using email, text messages, and phone calls to get a request from their side to delay for few days to be prepared, which was one of the study limitations as discussed in subsection section on study limitations. Therefore, the researcher contacted the Ministry of Education regarding a private school whose principal agreed for its school to participate after meeting her on twitter. A letter was then obtained from the Ministry of Education and forwarded to the newly selected private school. Before the onset of the study, a meeting was held with the principals and pupil co-ordinators in each school. The consent forms and PIS were sent by email to the school nurses who assisted in printing them. The school principals, the pupil coordinators and the school nurses were quite helpful in the planning and implementation of the study. The school coordinator in the public school and the school nurse in the private school assisted in informing parents and teachers about the study by calling them and distributing the information package.

The respective case study sites were:

Case 1: One public school nominated by the Ministry of Education.

Case 2: One private school in Qatar selected purposefully based on the willingness of the school to participate.

Furthermore, participants for the semi-structured interview were purposefully selected (Miles & Huberman, 1994) within each case study site, representing different potential shared experiences and different perspectives to inform the quality of data (Rubin & Rubin, 2012).

Purposive sampling was used to sample the participants in the study. The researcher freely selected the participants based on his or her judgment on which individuals have specific characteristics needed to facilitate the investigation process (Ames, Glenton, & Lewin, 2019). As a result, the participants of this present thesis were selected and recruited based on the perceptions of the investigator or researcher in which specific characteristics were developed. The researcher used a purposive sampling technique to identify and select teachers, parents, and pupils who were in a position to share their views. The technique allows for the identification and recruitment of information-rich cases or individuals who freely communicate their opinions and experiences in an expressive and reflective way (Palinkas et al., 2015). The case characteristics used to recruit and select participants of five students, both male and female, from grade 2 to 6 of primary from each public or private school with their parents based on the following criteria:

1. school (public/ private),
2. gender (male/female),
3. nationality (Qatari/ Non-Qatari),
4. Education status of parents (Educated/ illiterate),
5. Upbringing (Pupils who were born and studying in Qatar).
6. Commencement of grade 1 in Qatar
7. Grade (1-6), experience of previous school oral health programme (Yes/No).

However, the following pupils were excluded:

- 1) Pupils who just arrived in Qatar.
- 2) Pupils and parents who were not medically fit

The participants for the interviews include primary school children grades 1-6 (with the representation of male and female children) with parents engaging in the study as a dyad (n=5 children & n=5 parents), teachers (n=5) and school nurses (n=1) from each of the selected schools (Case study sites 1 and 2). Thus 15 participants were selected from each school because one of the teachers in each school was also a parent. Overall, the participants include 10 children and their parents, 2 of which were also teachers, 8 other teachers, 1 teaching assistant and 2 school nurses, rounding a total of 31 participants. It is worth mentioning here that 16 participants including students, parents, teachers and school nurses were Arabic speaking, and 15 participants also including students, parents, teachers and

school nurses were English speaking. These were recruited into the study after receiving a participant information sheet (PIS) (See appendix 3 to appendix 6) and consent forms (Appendix 7 to appendix 11) (translated version alongside English language version – see table 6 below exemplar) and returning an expression of interest forms (Appendix 12 and appendix 13).

Table 6. Translated Exemplar – Participant Information Sheet

<p>Information about the study</p> <p>You are invited to participate in this study which is conducted as part of the PHD degree of the researcher. The aim of the study is to develop prevention strategies for tooth decay among children in Qatari primary schools.</p> <p style="text-align: right;">معلومات عن البحث:</p> <p>أنت مدعوا للمشاركة في البحث الذي تقوم به صاحبة الدراسة لنيل درجة الدكتوراة، والهدف من هذا البحث هو عمل استراتيجيات وقائية تحول دون حدوث تسوس لاسنان الطلبة في المدارس الابتدائية بدولة قطر.</p>
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In addition, a sub-sample of 12 participants from the 2 case study areas, including representation from parents, teachers and school nurses were recruited for the co-production workshop (children weren't involved with the workshop). The principles that are critical to the successful implementation of co-production, including equality, diversity, accessibility, and reciprocity (Social Care Institute for Excellence, 2013) were considered in the selection of the participants for the workshop. These were recruited at the completion of the empirical work by repeating the procedures utilized earlier in the case study interview (above), with a PIS and consent form.

Data Collection

Based on data collection methods, case studies may use a wide range of approaches varying from observation to interviews and surveys with frequent use of multiple methods, also reflecting a broad set of data analysis techniques (Yin, 2014). Semi-structured interviews were used to collect data in this study. A sample of 10 primary school children with their parents as a dyad in respective Case 1 and Case 2 schools took part in the interview process. Interviews focused on exploring their

construct oral health, their knowledge and the daily social practice of using oral hygiene techniques (Appendix 14). This was supplemented by interviews with 9 teachers and 2 school nurses using a semi-structured interview guide (Appendix 15). A total of 31 participants where 16 can speak only the Arabic language, and 15 speak the English language where two of them can speak both languages. Translation to Arabic for the information package and consent form were time consuming, but not difficult. The principal investigator carried on the translation from English to Arabic and vice versa. For more accuracy however, a certified translation firm in Qatar was hired to check and approve the translation. They were appropriate, and there was no difference in meaning between the two languages.

A pilot study was conducted a month before implementing a case study to evaluate the Arabic and English study information package, the semi-structured interview guides and the tape recorder. The pilot study was conducted with parents (n=4) and children (n=3) of families from my neighbourhood, and dental professionals from my place of work. The participants were: two Arabic parent speakers, two English parent speakers, and three children, out of which only two can speak English. The pilot interviews were conducted in a quiet office. All the participants in the pilot study went through the PIS and the consent form before the interview. Gifts were presented to the participants after the interview, including toothbrush, toothpaste, and teacups. The participants were very happy to receive the gift. The pilot study revealed that interviews with children required simple words and ample time for a reply. Children were fascinated by the pictures on the participant information sheet while some parents felt that the interview should have been conducted directly without boring them with a lot of paper-works, referring to the consent form and PIS. One parent was not happy for her interview to be recorded, but later agreed after she was reassured that the information would be kept confidential and secured. Thus, the pilot study also improved the confidence and negotiation skills of the PI, which were quite useful during the main study. The pilot study revealed that the English and Arabic semi-structure guides were appropriate tools for the interview. Feedback from the participants led to minor changes, including the use of simple words for kids, especially in Arabic, provision of further explanation and clarification during the interview and the addition of few questions that came up during the interviews.

The semi-structured interviews during the main study were conducted in a quite conference room at the public school, and at the school nurse office in the private

school. Although the private school nurse office was a bit noisy due to frequent visits by the pupils, this was the only available venue in the school. The interviews were conducted using the same procedures for the pilot interviews with the minor changes described above.

The co-production phase hosted a workshop with up to 8 participants from the case study areas. The workshop discussed the framework developed from the interviews. The co-production workshop was conducted using the 'centre stage' approach (Sion Williams and John Keady, 2012). The purpose was to seek the opinions of the participants about content and context of proposed model for dental caries prevention in Qatar. The workshop was divided into three sessions. In the first session, the lead researcher reiterated the purpose of the workshop which was to develop a model for dental caries prevention strategies in Qatar. The participants were asked for their views about what would be the centre stage when developing an ideal oral health programme for Qatari school children in terms of 'what' 'who' 'when' and 'where'. In the second session, the model developed from the case study was presented to the participants and they were asked to use sticky notes to place various factors already identified on a flip chart with the most important ones at the centre. In the third session, the participants were asked to reflect on the previous two sessions in order to come up with the ideal components of oral health programmes in Qatari context. The workshop was run separately for English and Arabic speakers.

Method

The detailed method of the study has been presented in this chapter. All participants agreed to participate in the interviews by completing a consent form (Appendices 6, 8, 10, 12). They were fully informed about the study before the onset of the interview through a participant information leaflet (Appendices 5, 7, 9, 11). The school nurses assisted in selecting study participants that possess the required characteristics. The school public nurse was supported by the school coordinator and the acting principal for selecting teachers. However, participation was voluntary. Some parents refused to participate because they did not want their voices to be recorded. The children were shy initially, and some were scared of having dental examinations. However, they became comfortable and confident to participate in the study when they became aware that they would only be interviewed and not examined. The interviews were conducted in a quiet office provided by each of the schools. The confidentiality of the participants was maintained throughout the interview.

Data transcription and checking

Transcription of data before qualitative data analysis entails converting the spoken words into written format. A group or individual interviewers mainly performed it, and the responses were presented in written verbatim to find the actual meaning of the information shared (Sutton & Austin, 2015). As a consequence, raw data collected from interviews conducted of pupils, parents, teachers and nurses were transcribed. There was no professional transcriber during this transcription process because all the private school participants were English speakers. Only the public schools were Arabic speakers, and all were transcribed to Arabic, then translated from Arabic to English By PI. Also, there was no transcription software used in the process. The audio recordings were transcribed verbatim, and the lines of all the text were numbered. After transcription, the researcher read through the transcripts while listening to the audio recordings to correct spelling mistakes and related errors and anonymize the interview transcripts to protect the identity of the participants. Names, research locations and any identifying information were anonymously kept for security purposes. The researcher also inserted notations for any pauses or laughter and inserted punctuations or periods, including commas or full stops, where applicable.

Data Analysis

Qualitative data analysis is conducted by interpreting the data presented by another person in order to understand the problem from that persons' standpoint. This process of data analysis focuses on the use of voices that the researcher recorded during the interview session, which were then interpreted for easier reading and understanding, and to learn the problem being studied (Sutton & Austin, 2015). During the interview process, the researcher used audiotapes to record participants' responses. The information presented by the participants during this interview was transcribed to make it easier for interpretation.

Interview responses from pupils, teachers, school nurses and parents were analysed using thematic analysis (Braun & Clarke, 2006; Miles & Huberman, 1994). Theming process entails drawing together similar codes from the transcripts and using them to develop themes in a meaningful manner (Sutton & Austin, 2015). Similar codes were combined, and new themes were generated, which were used to answer the research questions. The themes identified from the interviews were used to describe the questions. These themes were organized in alignment with the research questions. The themes developed in the study were useful in describing the questions and the topic of

the research. As part of the case study approach, within-case and across-case analyses were performed to enhance the richness of data (Yin, 2014). Richness involved a mix of accounts from participants reflecting conflicting and commentary perspectives, involving tensions and dynamic. Richness is about ‘fine grained analysis’ (p.70) that enables questions about how and why events occur, building themes inductively (Rubin & Rubin, 2012). During data analysis, raw data obtained from interviews were transcribed into written format. The raw data were converted into written and saved as interview transcripts.

The transcripts were reviewed for any mistakes, and any filler words such as “aah” and “shh” were removed. After making the necessary corrections, the coding process began in which common phrases or patterns from the interview transcripts were determined. This was the coding process in which all similar phrases were combined and assigned codes. Manual coding was done, which entails reading thorough all the transcripts to get a sense of data and assign codes to similar patterns (Sutton & Austin, 2015). The coding was done by reading or going through the data in each transcript line-by-line to find similar phrases and assign code as much as possible. This involved identification of codes that convey unique meanings in the interview, categorising similar codes and development of descriptive themes to capture the meaning conveyed by each category of codes. Finally, interpretive analytical themes were developed from the descriptive themes. The analytical themes formed the basis of the model for the dental caries prevention strategies in Qatar. A data map on how themes were developed is presented in the following flow diagram in Figure 17.

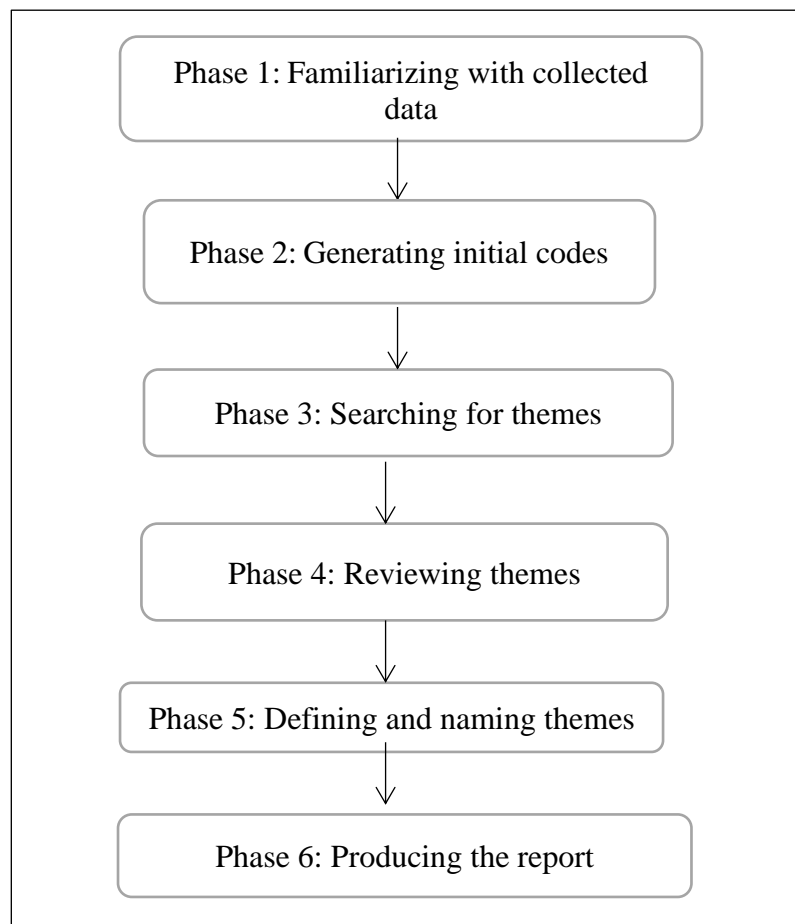


Figure 17. Data map for thematic analysis process. Source: Braun, and Clarke (2006)

Data from the workshop were analysed using thematic analysis to identify areas where substantive change could be achieved and to learn how this could be realised by individuals within both public and private primary schools. This may have identified personal, social, family-based and school mechanisms and contexts that underpin effective dental caries behavioural prevention strategies in Qatar. An overarching synthesis of the research work from the 3 phases was used to produce a conceptual model of the key features for understanding ‘how’ and ‘why’ of effective dental caries behavioural prevention strategies in Qatar among primary school children in both public and private settings.

Data analysis with the use of thematic coding approach was done by following the primary steps of data transcription and checking, rereading the texts, coding and theme development or theming as presented using a data map in the following Figure 18 (Sutton & Austin, 2015).

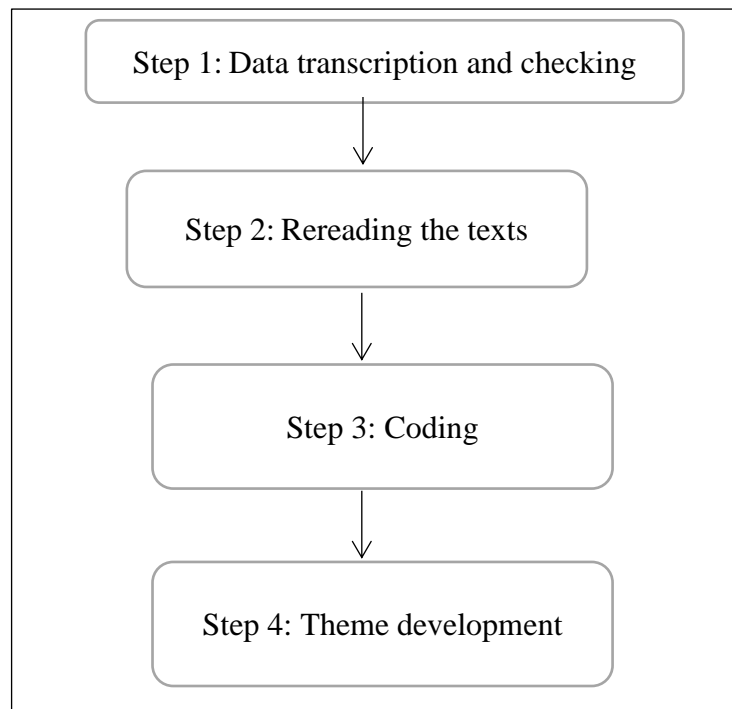


Figure 18. Thematic coding. Source: Sutton and Austin (2015)

Rereading the text

During the second step of data analysis, the researcher went through the transcripts reading between the lines to provide the actual meaning of the participants' responses. The researcher read between the lines to get familiar with the context in the transcripts and to interpret the meaning of the information from the participants. During this period, the researcher aimed to truly get a deeper understanding of what the participants were trying to say in order to provide the actual contextual meaning. Since the researcher had some expertise or knowledge in the research topic, the researcher was able to interpret the data based on the perceptions of the participants to ring about the actual meaning.

Coding process

Thematic coding was selected by the researcher in obtaining codes from the research data. Thematic coding is suitable for qualitative studies, hence making it suitable for the present study. Qualitative coding refers to the processes of reflecting, interacting, and thinking about data (Nowell et al., 2017). Therefore, qualitative coding was adopted because it would enable the primary researcher to reflect on the data findings and methods used in the studies obtained for the scoping review. Besides, following thematic coding enabled the primary investigator to interact with data from other researchers' perspective. For instance, after following the coding process, the

researcher might identify concepts and ideas suitable for their oral health study (Nowell et al., 2017). The thematic coding process that was adopted led the researcher to obtain emergent codes from the interview themes. Coding through reflection and interactions enhances the chances of obtaining an in-depth understanding of a study and obtaining data to address study objectives (Sutton & Austin, 2015). The qualitative analysis's coding process involves trimming the data and grouping information into important and manageable parts of a text (Yin, 2013). The coding process is done by simplifying the information or data and assigning codes to similar phrases or patterns to create distinct categories and concepts (Yin, 2013).

In this study, coding was done by the investigator after transcribing and checking the interview transcripts for errors. The entire data set was analyzed systematically, as mentioned by Nowell et al. (2017). According to Nowell et al. (2017), researchers need to analyze the entire data set in reviewed data systematically, and all items need to be accorded equal and full attention. Such a strategy in the present study enabled identification of exciting aspects in the research data that would form the study's themes. A consistent coding approach is essential to avoid redundant or omitted themes. Therefore, the present study adopted hierarchical coding, which gives room for combining codes to general higher-order codes. The researcher selected hierarchical coding because of its advantage, which is attaining better clarity and data interpretation. According to Nowell et al. (2017), hierarchical coding has the benefit of allowing a researcher to analyze data items and texts at different specialty levels. The distinction between low-level and high-levels can be distinguished by a researcher with the use of hierarchical coding.

Therefore, in the present study, the primary investigator used hierarchical coding to assess the data items. The researcher assessed data systematically to avoid missing out on any themes or creating redundant themes. The coding was done by identifying similarities and differences in the narratives or transcribed data presented by the participants. The coding process helped in gaining a deeper understanding of the phenomenon from the perspective of the participants (Sutton & Austin, 2015). The coding process was done manually in which the researcher used the transcribed data to make short notes. During this process, the researcher highlighted important parts of the text that adequately address the research question. Similar phrases from the texts were combined and were assigned codes. Analytic codes were utilized in the coding process to condense the information into distinct categories and concepts. After assigning codes

to similar patterns or phrases, data compilation was done in which related codes were collated to create new themes as described by Yin (2013). The researcher refined the codes by combining, eliminating, adding, and separating the codes. The use of codes supported the denotation of appropriate themes from the raw and transcribed data collected during interviews. Throughout the process of coding, the researcher paid attention to every data to identify repeated patterns or phrases not detected during the initial coding.

Ethics

Ethical approval was obtained from the Bangor University (HCMS AEC) and permission was obtained from the Ministry of Education (MOE) in Qatar to conduct the study (see Attached Appendix 2). Informed consent was obtained from the parents of the pupils. The participants were informed that they had their rights to withdraw from the study at any time they feel uncomfortable, and the data they provided would not be used in the study, rather they were destroyed. Maintaining the privacy and confidentiality of the participants was also conducted in the study. Pseudonyms were used in place of the participants' names to protect their identity. Also, the names and any other identifying information of the participants were not used while recording the data to maintain privacy.

An information sheet containing details about the study objectives, expectations of the participants, duties of the researchers and relevant contacts was sent to parents through their children. The responses were anonymized to protect the identity and confidentiality of the participants (Alcser, Antoun, Bowers, Clemens, & Lien, 2010). The data were securely stored in accordance with the University rules on the University drive. The data was stored securely on the University U-drive in a designated folder with access restricted only to authorised members of the research team. Each research participant was assigned a code, known only to the principal investigator to ensure anonymity and confidentiality. Data were stored in accordance with University regulations.

Study Limitations

The present scoping review had some limitations. One limitation was that the review was limited to only studies that have been published between 2007 and 2017. Then newly studies until 2019 were included. Therefore, other studies undertaken before 2007, like the early 2000s, were excluded despite having useful information to address the review topic and objectives. Besides, the research process's limitation to

specific years did not give room for analysing and comparing old and current evidence to obtain meaningful insight and make reasonable conclusions on oral health in Qatar. Although the scoping review focused on retrieving published articles from reputable and relevant databases, including Medline, EMBASE, Global Health, PsycINFO, Health Management Information Consortium (HMIC), and CINAHL, the possibility of publication bias was eminent. Using only the articles from the above databases limited the primary investigator to only articles that adhere to the databases' publishing guidelines. Access to insights from other researchers on the review topic whose works have not been published in the above databases was therefore not obtained.

Another limitation in the review was that the search process was limited to articles that studied oral hygiene among school children. As such, there was a possibility that non-school going children may have different results in the oral health education strategies used in the studies. Further, limiting the articles to only those published in the English language indicates selection bias. Some researchers have their works published in the non-English language but may have better insight into the review topic.

In addition, another limitation of the study was that there was no reply from the nominated private school despite follow-up using email, text messages, and phone calls to get a request from their side to be a delay for some days to be prepared. The other limitation entails implementing the oral health behavioural intervention in Qatar based on the environment surrounding the children, the weekly cultural meeting, the custom of Ramadan's religious month where sweets consumed a lot, and cultural practices that the citizens engage in hinder the success of oral health prevention interventions.

Summary

This chapter described and justified the multiple case study approach adopted for the review. The theoretical propositions were developed based on the review of behavioural change models and scoping review of international literature. Case study method with semi-structure interviews were used and in which interviews were conducted with pupils, parents, teachers and school nurses in the private and public schools using English and Arabic semi-structured interview guides. A co-production workshop was then organised to build on the results of the interviews. The results obtained from the case study interviews are presented in the next chapter.

CHAPTER FIVE

Phase 2: Case Study Findings

Introduction

This chapter presents the results of the multiple case studies conducted among pupils, parents, teachers and school nurses in a private and a public primary school in Qatar. The case studies were the second phase of the study to explore participants' views on how best to develop prevention strategies for dental caries among children in Qatari primary schools and look at the lessons learnt from the current oral health programme being implemented in primary schools. Parents and their children as well as teachers and school nurses were asked about their views on how the programme worked in their school and what impact it might have had on dental hygiene at home. The chapter discusses the characteristics of the study participants, emerging themes from the interviews and the initial framework developed for dental caries prevention strategies. Verbatim quotations from the participants were used to illustrate each theme. The main themes identified from pupils were *level of awareness and knowledge of oral health, responsibility on oral health diseases, ownership and locus of control, the effectiveness of the oral health educational programme, school-based oral health promotion, happens to others not me* and *strategies to improve oral health*. The themes identified from the responses given by parents were *parental knowledge of oral health, oral hygiene practice among parents, dental caries among pupils, oral health promotion in schools, stakeholders for school oral health promotion, Qatari context, sociodemographic difference in oral health* and *behaviour change strategies*. Themes from teachers' and school nurses' interviews were *knowledge of oral health, oral hygiene practice among teachers and school nurses, severity of dental caries among pupils, oral health promotion in school, stakeholders, Qatari context, sociodemographic difference in oral health* and *behaviour change strategies*.

Study Participants

A total of thirty-one participants were involved in the case studies. Fifteen participants were from a private school and sixteen from a public school. However, the anticipated number of participants to be interviewed was sixteen people from each school, including 5 children and 5 parents as a dyad, 5 teachers and a school nurse. Nevertheless, only fifteen participants were interviewed from private school because one of the parents was also a teacher. One teaching assistant from one of the schools participated in the study as one of the teachers. The role of the teaching assistant was primarily to support the teacher in ensuring that pupils understand the subject and ensuring that the classroom was quiet, and the environment was conducive for learning, especially in kindergarten and early primary school. Including a teaching assistant in the study allowed for more perspectives, thus enriching the data. Sixteen participants were interviewed from public school because one of the parents was also a teacher and one parent participants asked to include another daughter who was in the fifth grade. Besides, the participants in the study included ten children and their parents, two of which were also teachers; nine teachers; one teaching assistant and two school nurses. The characteristics of all the participants are presented in Table 7. The participants were assigned pseudonyms to protect their identity. The pseudonyms were used to refer to the participants throughout this chapter.

Table 7: Study Participants

S/N	Pseudonym	Gender	Nationality	Age	Description
1	Wedad	Female	Qatari	11	Grade 5 pupil
2	Wajed	Female	Qatari	43	Mother of Wedad and a housewife
3	Mariam	Female	Qatari	11	Grade 5 pupil
4	Mona	Female	Qatari	34	Mother of Mariam and a Mathematics teacher
5	Nawal	Female	Qatari	9	Grade 4 pupil
6	Noor	Female	Qatari	35	Mother of Nawal and an Administrative employee
7	Rayah	Female	Qatari	8	Grade 3 pupil
8	Rawan	Female	Qatari	11	Grade 5 pupil

S/N	Pseudonym	Gender	Nationality	Age	Description
9	Rehab	Female	Qatari	38	Mother of Rayah and a housewife
10	Sarah	Female	Non-Qatari	7	Grade 2 pupil
11	Salma	Female	Non-Qatar	37	Mother of Sarah and English teacher
12	Dorah	Female	Non-Qatari	29	School Nurse (General nurse)
13	Alia	Female	Non-Qatari	35	Science teacher for Grade 3
14	Huda	Female	Qatari	36	Teacher of Social studies & coordinator.
15	Amal	Female	Qatari	35	Mathematics teacher for Grade 6
16	Samar	Female	Non-Qatari	39	Mathematics teacher for Grade 5
17	Lili	Female	Non-Qatari	53	Assistant teacher for Grade 2
18	Lylyan	Female	Non-Qatari	30	School nurse (General nurse)
19	Rose	Female	Non-Qatari	44	Teacher of English, Science, Humanities, & Social studies for girls of key stage 2
20	Sendy	Female	Non-Qatari	54	English teacher for Grade 5 grade and has lived in Qatar for 15 years.
21	Caroline	Female	Non-Qatari	40	Teacher of all subject except Arabic & religion
22	Saad	Male	Qatari	7	Grade 2 pupil
23	Wafa	Female	Qatari	33	Mother of Saad and Civil servant
24	Abbas	Male	Qatari	9	Grade 4 pupil

S/N	Pseudonym	Gender	Nationality	Age	Description
25	Asma	Female	Qatari	34	Mother of Abbas and Civil Servant
26	Mahmoud	Male	Non-Qatari	47	Father of Ahmed in Grade 6, & English teacher for Key Stage 3 & 4
27	Ahmed	Male	Non-Qatari	12	Grade 6 pupil
28	Gala	Female	Qatari	11	Grade 5 pupil
29	Mansour	Female	Qatari	42	Father of Gala and Executive at Petroleum Company
30	Younus	Male	Non-Qatari	8	Grade 3 pupil
31	Yahya	Male	Non-Qatari	38	Father of Younus and English, Math, and Science teacher

Themes from Pupils' Interviews

Level of awareness and knowledge of oral health.

The theme of *level of awareness and knowledge of oral health* describes pupils' level of awareness about oral health behaviour. The theme was identified from the interview conducted among students from private and public schools. From the thematic analysis process, it was found that pupils were able to share their views about oral health behaviour. The majority of students (n= 8) showed that they had enough knowledge of oral health. The students were able to share their perceptions, which showed that most of them were aware of oral health hygiene. The students shared that avoiding eating sugary foods, such as chocolate, and cleaning the teeth well, helps in preventing tooth decay. The majority of students from public schools compared with private schools showed enough knowledge on oral health behaviours. For instance, Rayah from public school defined oral health and shared that oral health practice means not being sick. The participant shared that,

"It means I should not be sick."

Similarly, Nawal from the public school shared that avoiding eating chocolate is among oral health hygiene to protect the teeth while preventing dental caries. Nawal explained that

“We should not eat chocolate because it harms the teeth by causing dental caries.”

Similar responses were found from the students from public schools also supported that oral health entails cleaning the teeth to prevent decays. For instance, Mariam discussed that

“It means our teeth should be clean and does not fall if there is decay.”

Also, Gala supported the benefits of cleaning teeth as a way of maintaining oral health among pupils. Gala mentioned that

“It means that the teeth are clean. They don't have any decay.”

Also, public school pupils were aware that proper brushing of teeth and maintaining or eating healthy foods are the best oral health practices. For instance, Amjad said that

“We have a healthy day this Thursday and we will dress up as doctors, fruits, vegetables, toothbrushes, etc.”

Further, students from private schools also supported that cleaning the teeth and avoiding sweets are among oral health practices to prevent tooth decay and enhance positive facial expression, especially when interacting with others. For instance, Ahmed mentioned that,

“It means that we should brush our teeth. Also, when we eat sugary food we should brush immediately and the same when we eat fatty food.”

In this study, the pupils generally described oral health in terms of not eating chocolate, oral hygiene, clean teeth, not having toothache and not suffering from dental caries or other medical conditions. The majority of the pupils (n=8) demonstrated a wide range of oral health knowledge including oral health prevention strategies. It is, therefore, noted that most of the responses were centred on the consequences of poor oral hygiene. This then leads to the conclusion that the motivation for good oral hygiene practices among the pupils may have been driven by fear of the consequences of bad oral hygiene, desire to look good and desire for general well-being. For instance, Saad explained that

“No decay, cleaning well, not eating sweet.”

Also, Ahmed discussed that

“It does not hurt us, and it is important for beautiful face.”

Responsibility on oral health diseases.

The theme of *responsibility on oral health diseases* describes the perception of pupils to their role in protecting themselves from dental diseases they know. The theme aimed to provide a deeper understanding of whether pupils from private and public schools are aware of their responsibility in protecting themselves from diseases that may occur when they do not practice oral health. Largely, the pupils expressed their perception of dental caries as a serious health condition. They used expressions such as tooth decay, destruction and holes in the teeth to describe the role they play in the occurrence of oral health diseases, such as dental caries. For instance, Sarah from public school mentioned that dental caries are holes in their teeth. The pupil mentioned,

“Holes in teeth.”

Also, Younus from public school also explained caries as follows,

“Holes. It’s like animals that want to eat my tooth.”

Besides, students from both private and public schools discussed their responsibilities towards dental caries as one of the oral health diseases. The students shared that dental caries are among the oral health diseases, and they have the responsibility to protect their teeth by not taking too many sweets, which causes dental caries characterized by holes in teeth. For instance, Wedad explained that,

“Yes, I know it destroys teeth if we eat too much sweets.”

The students perceived that they are responsible for the occurrence of dental caries due to high preferences of sugary foods, such as eating too many sweets. The students were aware that too many sweets destroy their teeth, which may result in the development of holes.

Some students shared their perceptions that healthcare professionals, including doctors and nurses, have a role in removing dental caries and assisting people with dental decays on how to maintain healthy teeth. For instance, Amjad explained

“I hope they take me to the dentist, so he removes the caries I have because caries eat my teeth and I don’t like that. I hope we have doctors or nurses here who will help us to keep healthy and remove the caries.”

The perceptions of pupils imply that students have the responsibility to engage in dental care visits to remove caries and improve their oral health behaviours.

In addition to perceiving dental caries as a serious problem, the pupils also regarded themselves as being susceptible to dental caries. Based on the theme of responsibility for oral health diseases, the findings demonstrated that pupils from both private and public schools were aware of their responsibilities towards the development of dental caries. The pupils indicated that they play crucial roles in terms of eating behaviours, which impact the onset of oral health diseases, such as dental caries.

Ownership and locus of control.

The theme of *Ownership and Locus of Control* describes the way in which pupils take care of themselves in terms of oral hygiene to control dental diseases that can affect their quality of life. Pupils from private and public schools shared their perceptions of oral health behaviours they engage in to control dental health diseases. The pupils shared health behaviours, which include brushing their teeth as the best strategy they undertake to control oral health diseases. They mentioned that they brushed their teeth every day after meals as a way to control and manage their oral health status. Pupils from both private and public schools showed their control behaviours towards oral health through tooth brushing after meals. For instance, Rayah from public school explained,

“I brush my teeth using toothpaste at least three times a day and particularly after the meals.”

Another student from public school, Mariam, mentioned that she brushed her teeth two times a day as a way of enhancing oral health. Mariam explained,

“Two times in the morning and before bed.”

Similarly, Ahmed from private school supported the action of brushing teeth daily as oral health behaviour. Ahmed shared that he engaged in oral health practice by practicing teeth brushing once per day. Ahmed said that

“Yes, Once daily for two minutes.”

Pupils from private schools also supported tooth brushing at different times every day. The pupils shared that they practice tooth brushing, which reflects their control over oral health. For instance, Saad agreed on teeth brushing his teeth for oral health hygiene. Saad shared that,

“Yes, Once daily for two minutes.”

Also, Younus shared that he brushed his teeth two times. Similar responses were found from Gala who showed control over oral health by brushing the teeth three times daily. Gala shared that,

“Yes. Five times...Three times. When I wake up in the morning, after lunch and before bed.”

Similarly, Amjad said,

“Yes, when I wake up, before I sleep, and in the afternoon.”

Majority of the pupils reported that they brushed their teeth at least 2-3 times daily (after waking up in the morning, after meals, and just before going to bed. Some pupils however acknowledged that they didn't brush their teeth often due to a number of reasons including forgetfulness, tiredness, sleep and rushing to catch the school bus early in the morning. However, two pupils reported that they did not brush at all. For instance, Sarah shared that,

“I do not like to brush my teeth.”

Rawan shared similar responses that she does not brush her teeth. Some pupils shared that at times they brush their teeth and sometimes they also forget. For instance, Amjad said that,

“Sometimes I miss afternoon but morning and night always (Amjad - from private school pupil.”

Wedad mentioned that,

“Yes, mostly because sometimes the school bus comes early so I don't.”

Nawal explained that,

“Three times daily, but I forget sometimes.” Ahmed explained that, “Yes, sometimes when I am tired, I forget and sleep.”

Based on the responses given by the pupils, it is evident that these students are aware of oral health practices. Despite that, they forget to clean or brush their teeth sometimes; they are aware of controlling their teeth by practicing oral hygiene daily, two times, or three times daily. This demonstrates that the students take control of their teeth to prevent oral diseases, such as dental caries and tooth decay. These findings suggest that the practice of oral hygiene with regards to the frequency of brushing of

teeth among the pupils was relatively good. However, there is a need for school oral health promotion to go beyond encouraging toothbrushing to addressing other relevant issues such as techniques of toothbrushing, dental flossing, diet modification and dental visit.

Effectiveness of oral health educational programme.

The theme of the *effectiveness of the oral health educational programme* discusses the effectiveness of the programme in supporting the students to practice oral health hygiene. The theme discusses the way students reacted to the programme and its outcomes in terms of oral health behaviours. From the analysis, it was found that the oral health educational programme allowed students to learn more about dental hygiene. The students shared that during the educational session, they were able to learn from the doctors who taught them how to brush their teeth. The pupils also shared that they learned how to practice oral hygiene by watching videos and engaging in dental check-ups. Based on the theme identified from the analysis, it is evident that most of the pupils have visited dental care clinics, and they understand the risks associated with oral diseases. Majority of the pupils from public schools were aware and had attended the former facility-based school oral health programme established by the Government. The programme was set up to encourage pupils to visit a facility for oral health education and dental check, and to collect free toothbrushes. Those who were found to have oral health problems were followed up for a certain period. Most of the pupils from public schools shared the efficacy of the programme in improving their engagement in oral health behaviours. Based on the information presented by the pupils, it is evident that the educational programme played a significant role in facilitating the ability to engage in dental hygiene. Most of the pupils demonstrated that the educational programme was effective in shaping their skills on the use of toothbrushes and participation in follow-up for dental-check-ups. For instance, Wedad shared that during the educational programme, they got the opportunity to follow on how to brush their teeth as demonstrated by the doctor. The participants discussed that through doctor demonstration, watching the video and engaging in medical follow up for dental care check-ups, they gain a deeper understanding of the usefulness of brushing teeth. Wedad mentioned,

“They will ask us to be seated and then a doctor will demonstrate how to brush the teeth using a big tooth and brush. We also saw a video about the importance of brushing teeth. After that they started calling us in groups of 3 for the dental

check-up in another room. For those who required dental follow up, they informed their parents...My mom received a message later to follow up with the doctor in my case...They also distributed free tooth brushes and tooth pastes to all pupils."

Similarly, Rayah explained that during the educational programme, they get the opportunity to visit dentist room for dental check-ups. This indicates the efficacy of the programme in shaping the ability of pupils to visit dental care visits for thorough check-up for their oral health. Rayah, explained that,

"The school nurse took us to the dentist room for check-up...They gave it before the trip...Yes, when I was in grade 1...About how to wash our teeth and look after them."

Mariam supported the efficacy of the programme in improving the ability of students to check on their teeth by visiting dental clinic. Mariam said that,

"Yes, they took us to the clinic with my friends and checked our teeth and tell us if we have decay to brush every day. If we don't have decay, they reward us."

Similar responses that support the efficacy of oral health educational programme were found in the statement by Rawan who shared that the programme allowed them to visit dentist to check their teeth. Rawan mentioned that,

"They took us before to the dentist. I don't remember when. They checked our teeth."

Most of the pupils in public schools who participated in the facility-based school oral health programme reported to have changed their behaviour. However, some of them reported that the behavioural change was not sustained. For instance, Rayah shared that, *"Yes sometimes, but not now."*

Wedad discussed that,

"No not every day – sometimes I forget. Sometimes I sleep but, in the morning, I brush every day before changing for school."

Whilst majority of the pupils from public schools had participated in the facility-based oral health programme, pupils from private schools had no such experience. This is because the programme didn't cover private schools. A few pupils from the public schools however did not participate in the programme as only two grades were covered. For instance, Younus explained that,

"No. It did not happen here."

Also, Saad mentioned that,

“No, never.”

While facility-based oral health programmes provide a unique opportunity to promote good oral health practices or behaviour among all age groups, the findings from this study highlight the need for such programmes to be consistent and to have a wider coverage (targeting pupils in both private and public schools).

School-based oral health promotion.

The theme of *school-based oral health promotion* describes the activities that schools encourage to promote dental care among students. The theme explains the perceptions of pupils with regards to oral health promotion activities available in schools, and whether such actions support oral health hygiene. The theme seeks to provide a better understanding that schools are essential platforms to promote oral health behaviours among pupils and the school staff. The theme argues that schools may develop prevention programmes for oral health diseases, which also allow students to practice dental hygiene. Based on the responses given by pupils from private and public schools, it is well established that such schools have adopted oral health promotion activities to support dental care and prevent oral diseases. The activities have been implemented in private and public schools to educate pupils and teach them to engage in dental care visits and practice tooth brushing. Pupils from both public and private schools reported to have had some oral health promotion activities in their schools including oral health education, routine oral health check, supervised tooth brushing, health day celebration and GCC health week celebration. Pupils supported that their schools have promotion activities that support dental care practice. For instance, Nawal mentioned,

“They teach us about healthy food and how to brush our teeth.”

Mariam supported the oral health promotion activities in schools, which facilitated the ability of pupils to practice oral health hygiene. Mariam explained,

“Sometimes they ask us to brush our teeth...They ask us to brush our teeth regularly...They called the dentist to our school to give us lecture about oral health...They talk about everything like hair, body and teeth...They took us to a meeting about how to brush our teeth and also gave us a gift. In the school

auditorium. They said we should take care of our teeth and showed a YouTube video."

Similarly, Wedad said that they have GCC health week in the school. Besides, private school pupils shared that they have dental care clinic that check teeth and encourage pupils to clean their teeth daily. For instance, Gala shared that,

"Sometimes. They check our teeth and tell us what to do. She told us to clean our teeth 3 times daily." Ahmed mentioned that "Yes, that was in grade 4. He only told us about the teeth when they hurt." Besides, Amjad responded that, "No but when they announced about the healthy day, they said that we have to brush our teeth on that day for 5 minutes."

More specifically, some pupils reported that oral health was taught as part of the school curriculum in certain grades. It was taught as part of Science. For instance, Rayad mentioned that,

"Yes, in grade 2 or 3."

Also, Nawal explained that,

"Last year in grade 3 in Science. We learnt about healthy food and clean tooth."

Similar responses were shared by Gala who mentioned that,

"They teach us in science that cleanliness is faith."

Amjad said that,

"No. I didn't have anything in the past years until now, but they said we will have something about teeth this year."

Similarly, Mariam shared,

"Yes, they taught us in Arabic and English. It was in fourth grade and it was a story about a boy who doesn't brush his teeth.... When I was in grade 4, they taught this to us but nothing in grade 5."

From the responses obtained, there is an indication that there are a number of oral health activities being implemented in both public and private schools in Qatar. The pupils showed that their schools had implemented health promotion activities that help them to practice oral health through tooth brushing, flossing and visit dental check-ups. They shared that through such activities, they learned how to maintain oral

hygiene. Based on the responses attained, the availability of oral health promotion activities was found to shape health-related attitudes, values, beliefs and behaviours of pupils. Such activities were also found to positively impact caries level of pupils and allow them to engage in prevention practices for oral diseases. Nonetheless, these activities are fragmented and uncoordinated. This then highlights the need to design and implement a well-coordinated and comprehensive oral health programme in all primary schools in Qatar.

Happens to others not me.

The theme of *happens to others, not me*, presents the occurrences of dental problems among other students. The theme outlines the perceptions of pupils regarding the development of dental caries among fellow pupils. From the responses obtained, pupils from both private and public schools in Qatar shared that their fellow pupils have dental problems, which are characterized by bad odour from the mouth and black teeth. For instance, Rayah mentioned,

“Some of them have and other don’t.”

Mariam shared similar responses and said,

“Yes, because there is smell and something white in her teeth... Many of them. My friend lied to me saying that the dentist asked her not to brush her teeth, so I told her that she should brush but she didn’t brush still.”

Pupils also reported that they could easily notice or identify dental caries in their fellow pupils and the commonest ways they could do this were by the colour of teeth and the smell of breath. For instance, Younus mentioned that,

“Yes. Many of them. Around ten of them in my class. Yes, I ask them to stop eating sweets and start eating health.”

Gala also mentioned that,

“Yes. When they smile, their teeth are white.”

Amjad presented similar responses and explained that,

“I hope that the teacher tells us how to brush our teeth. I saw one student in year 3 who left the school now, but he had many black teeth at that time.”

The perceptions of pupils regarding the identification of fellow pupils with oral health problems indicate that they are able to detect the presence of oral diseases. This

shows that the students have knowledge and awareness of dental caries and are able to identify when their classmates are not practicing oral health hygiene. It is evident that these pupils have increased awareness of oral health practices, and they can assist their colleagues on the best oral health behaviours they can engage in to reduce dental caries and related oral health problems. The majority of pupils from both private and public schools shared the best strategies to improve oral health behaviours among their classmates, including advising their fellow pupils to brush their teeth and avoid eating sugary foods like sweets. This, therefore, indicates that schools in Qatar have played a crucial role in promoting oral health practices among their pupils, which is essential in preventing the development of the oral disease that may affect the quality of life among their students.

In summary, many of the pupils could readily recognise poor oral hygiene and dental caries in their mates and some of them went further to offer advice on good oral health practices. This suggests that some pupils can act as role models to their mates otherwise known as “oral health champions”. Their main role would be to encourage and reinforce positive oral health behavioural change among their class and school mates. As a consequence, both private and public schools have a role in supporting oral health practice among students. The school should provide support to all pupils to serve as role models to others, especially those in lower grades, and this would enhance the maintenance of oral health behaviours and prevention of dental caries.

Strategies to improve oral health.

The theme of *strategies to improve oral health* entails the approaches that pupils perceived to be effective health responses to oral health problems in schools. The theme discusses health responses for the prevention and control of oral health diseases. Based on the responses obtained from the participants, it was found that most of the pupils from private and public schools were aware of the appropriate strategies that can be implemented to improve oral health behaviours in their schools. For instance, Wedad mentioned,

“Gathering them in one hall and showing them videos about importance of brushing and how dental caries is harmful...Giving them educational leaflets about the importance of brushing teeth regularly.”

Mariam mentioned that,

“If there are pupils who don’t brush their teeth, we should teach them...To keep the mother, father and teacher informed.”

The pupils shared oral health strategies, including the implementation of educational programmes, presenting oral health videos, and eating healthy foods, which may help them reduce cases of dental caries and oral health-related infections. The pupils made several suggestions on how oral health in their respective schools could be improved. These suggestions included showing educational videos, distributing educational leaflets, facilitating health education, introducing the concept of healthy lunch box, getting teachers to remind and prompt pupils on oral health hygiene, ensuring consistent routine dental check, enforcing healthy school cafeteria, and educating parents and teachers. For instance, Younus explained that,

“Eating healthy stuff and not sweets. By brushing their teeth. By asking them to bring healthy stuff in their lunch box. Eating vegetables.

Moreover, Ahmed presented similar responses and said,

“I think we should eat healthier and avoid anything that could break our tooth. I also think that the teachers should ask us regularly if we brushed our teeth and remind us to do the same before bed every night. I think they should have an activity where a dentist checks our teeth in a separate room and tell us if anything is wrong. I think they should get a test about it asking what to do if this or that happens.”

Similarly, Amjad mentioned,

“I want cafeteria in the school that will give only healthy food to the pupils but no burgers, nuggets or fries. Only healthy food like broccoli, carrots etc. I will tell them not to eat Nutella sandwich because our teacher does not tell other children not to bring them from home.”

Suggestions made by some of the pupils depict their awareness of oral health and this further supports the fact that some of the pupils can be made “oral health champions” acting as change agents to encourage and reinforce positive oral health behavioural change. With respect to the response presented by each pupil from private or public schools, the suggestions made with regards to oral health strategies indicate improved awareness of students on the best approaches that schools should implement. The pupils showed that they could act as the change agents in schools and other settings to promote oral health practices to people. The increased levels of awareness

demonstrated by the majority of pupils regarding strategies to improve oral health in schools depict that private and public schools in Qatar have provided a good foundation for their pupils to learn the best strategies to avoid dental caries and other oral diseases. As a result, schools play a crucial role in educating and encouraging pupils on the appropriate strategies to avoid dental problems. Based on the responses given by the pupils, it can be concluded that schools contribute significantly by preparing pupils on how to maintain oral hygiene based on appropriate strategies that promote tooth brushing, flossing, frequent cleaning of teeth and healthy eating, such as avoiding sugary foods.

Themes from Parents Interviews

Parental knowledge of oral health.

The theme of *parental knowledge of oral health* describes the level of understanding that parents have towards oral health practices. The theme discusses the perceptions of parents regarding what they know about oral health. Parents of children from both public and private schools in Qatar were able to share their perceptions of oral health. Based on the responses that parents presented, it is evident that most of them understand oral health behaviour and oral health practices. For instance, Yahya explained,

“Looking after the mouth and anything related to the mouth in terms of tongue, teeth, gums, anything.”

Mahmoud mentioned that,

“It means taking care of whatever is there in the mouth in terms of teeth, gum and maybe throat.”

Also, Wafa said,

“Mouth in all if not cleaned it will come dirty, the tongue, cause smell, and an ulcer appear on the inner cheek and it's because of remaining food. All the previous have appear if mouth is not clean.”

Asma shared that, “

It means general knowledge about cleaning the teeth and general oral health.”

Similarly, Mansour mentioned that,

“It is the interface of the human. When we were young, they used to tell us always about oral hygiene and when we grew up, we realized how important this is.”

Overall, parents showed relatively high level of knowledge of oral health. Their responses centred around describing their understanding of good oral health which may be summarised in one sentence as looking after the mouth and related structures including tongue, teeth, gums and throat. For instance, Salam shared that,

“It means taking care of our teeth to avoid dental caries, washing them regularly and changing the toothpaste from time to time because I heard that it becomes ineffective if used for prolonged periods.”

Miriam also established that

“Daily cleanliness of teeth and taking care of mouth by brushing before bed and after waking up.” Nawal shared that, *“One must be very particular about their teeth so that they don’t pain and for good appearance.”*

Parents shared that oral health entails cleaning the mouth and teeth to remove any remaining food after meals and maintaining the overall hygiene of the mouth or teeth. For instance, Rehab explained that

“It means the health of teeth without any dental decay.”

Wajed shared that,

“It means the health of the whole body. It affects the people you interact with within one way.”

Based on the parents’ perceptions about oral health practices, there was significantly high level of oral health knowledge among parents which might have positively influenced the level of the knowledge of their children. This then implies that the parents have a critical role to play as role models providing cues for behavioural change in their children. Parental knowledge of oral health also implies that they can supervise their children at home as a way to improve their oral health behaviours, such as brushing, flossing, and mouth rinsing or mouth washing.

Regarding how parents obtained their knowledge of oral health, the responses obtained included: through education, from culture and home upbringing, through life experience, from reading and surfing the internet, through advertisement and mass media campaign, and a dental visit. For instance, Yahya shared that,

“I read and heard about it and from the school.”

Also, Asma mentioned that

“From my background.”

Salma said,

“From the internet and advertisements.”

Mariam mentioned that she learned from life experiences and said,

“From our life because we have to take care of our mouth and teeth.”

Nawal mentioned that

“I get some information during my dental visits about cleaning, flossing, etc.”

Rehab said that

“From my experience.”

Wajed shared that,

“We are taught this from childhood, and our faith (as Muslims) directs us about the importance of cleanliness and hygiene and hence its importance. Not following these directives will drive people away from me.”

Parents from both private and public schools also shared that they receive oral health education from schools and through the US system in which parents are required to undergo the teeth screening process. For instance, Mahmoud mentioned,

“For one, I was raised in the US. My son did mention something, but I don’t think he is aware of that. In the American system, we are supposed to check our teeth every 6 months. It is mandatory by the system, and if we don’t, there are multiple follow-ups from the school, social workers, etc. So, we create this awareness at a young age in schools.”

Similar responses were found from Mansour, who mentioned,

“From our childhood and when we grew up, we knew about it even more. Back when we were in school, they used to give us tooth brush and tooth paste and there used to be trips to the health centre as a part of school and the scouting.”

Wafa also shared,

“From live, from kids, from myself since I used to brush my teeth regularly. I buy different shapes of toothbrushes as well as buying electric and battery one not only using the manual. But still I don't know which toothpaste the best for kids is yet since there are several companies.”

The reported sources of oral health knowledge by parents highlight the importance of societal norms, culture and religion in habitual oral health behaviours.

Oral hygiene practice among parents.

The theme of *oral hygiene practice among parents* entails the ability of parents to practice oral health behaviour, such as brushing, dental flossing and mouth washing.

The theme describes the frequency of parents practicing tooth brushing. From the responses obtained, it is evident that parents of pupils from private and public schools have frequent tooth brushing behaviours. For instance, Wafa shared that,

“I usually brush twice a day, and sometimes three.”

Yahya mentioned that,

“Most importantly I brush my teeth in the morning, at night and after meals. Not only the teeth but also the gums, tongue etc.”

Salma said that,

“I brush twice daily.”

Parents shared different times they practice oral health practices, and based on their responses, it is evident that their majorities were aware or have enough knowledge about oral health and dental hygiene. Most of women reported brushing their teeth to prevent odour in the mouth and ensure fresh breath while communicating with other people, especially at work. Parents reported brushing regularly (about 2-3 times daily), particularly in the morning, after meals and at night. One of the parents reported dental flossing. A few parents however admitted that they sometimes forget to brush their teeth. For instance, Asma mentioned that,

“Brushing 2 to 3 times a day and flossing regularly.”

Mahmoud shared that,

“I do brush my teeth in the morning and I’m guilty of not brushing at night sometimes, but I think we humans think of smelling better for work than before sleep.”

Mariam mentioned that,

“I brush daily before bed and after waking up.” Mansour said that, “I wash my teeth at least 3 times a day.”

Similarly, Nawal shared that,

“I brush 3 times maximum per day especially before bed at night. Also, from time to time I use a device I bought recently for deep cleaning.”

Similar responses on brushing teeth daily were obtained from Rehab who mentioned that,

“I brush my teeth using toothpaste at least 3 times a day and particularly after the meals.”

Wajed also shared that,

“Before bed, after waking up and after meals.”

From the responses, parents were aware of oral health conditions; hence they practiced dental hygiene to avoid infections. These parents mentioned using appropriate toothbrushes and kinds of toothpaste during their daily cleaning of teeth. They also shared that they change cleaning devices (toothbrushes), which indicates their level of knowledge and interest about oral health and oral hygiene. As a consequence, parents can use their knowledge and skills in oral health to monitor the dental hygiene of their children. Also, based on oral health knowledge presented by parents, they can be role models for oral health behaviours in children. Children can copy such behaviours from their parents, which leads to reduced cases of dental caries and related oral conditions.

Dental caries among pupils.

The theme of *dental caries among pupils* describes the perceptions of parents regarding oral health conditions. The theme sought to determine whether parents were aware of dental caries, and if they can be able to detect such oral conditions in their children. With respect to the responses presented by parents, it is evident that parents had knowledge about dental caries, their development, and can detect the disorders in their children. Parents demonstrated a high level of knowledge about dental caries and their contributing factors. Parents shared that they can identify health problems in the teeth of the children and are aware of possible risk factors of such conditions. For instance, Asma shared,

“Yes, I noticed dental problems mainly with my daughter. She had prolonged milk feeding so I think this affected her teeth a bit, so they have problems. My son’s teeth are better, but he still has some dental caries although both of them brush at least twice a day under my supervision.”

Similarly, Wafa shared,

“Yes, but I am following with dentist. My son problem that he has been scared from his last visit to the dentist, his father changed the dentist and he is the one

who is following with him now since I can't withstand being in a dentist clinic. I am afraid, but his father is supportive him and motivate him."

Other parents shared the need for dental care visits as one of the best ways to manage dental conditions in their school children. Parents from private and public schools were able to give their perceptions on dental caries in the school children. For instance, Yahya mentioned,

"For my children, not really because from the oral health perspective, they are perfectly fine, but as a teacher: yes, they do have a lot of dental problem like tooth decay, and caries and by the age of 6 or 7 it is clearly visible that they have a dental problem."

Also, Salma presented similar responses and said,

"Yes, she does, and her teeth are falling off. I took her to HMC dental clinic, and they started doing some fillings and cleaning. Even those fillings are falling off. Some of the fallen teeth re-appeared but there are others that didn't, and it's been around three months now".

Many of the parents reported to have noticed dental caries in their children or in other children. They also reported taking their children to dental clinic after noticing dental caries. For instance, Mariam mentioned that,

"Yes, she had dental decay once and we removed that tooth. No problems after that time. Also, my youngest son had yellowish teeth and the dentist asked me to stop the sweets, juice and flavoured milk."

Nawal also explained,

"Yes, they have decay, but usually, I take them to the dentist immediately if they have any pain. One of my daughters had a problem with a tooth, and the dentist told me that there is nothing much he can do, and the tooth will eventually fall off and get replaced by a permanent tooth."

From the responses given by parents, it can be concluded that some school children from private and public schools in Qatar have dental caries. Parents shared that some of their children had oral caries, but they can take them for dental treatment. Parents mentioned that due to dental decay, they found the usefulness of dental visits to assist in treating and replacing those teeth affected by the disease. This, therefore, reflects that parents have enough knowledge of dental caries, and they are very

concerned about dental care visits. These findings imply a notable prevalence of dental caries in Qatar, and this poses a significant public health threat to the country, and further highlights the need for designing and implementing prevention strategies.

Also, the responses obtained about dental caries among pupils imply that parents are change agents to the health promotion of their school children. The study also revealed that parents have the primary responsibility in the oral health status of their children.

Moreover, parents showed that dental caries is a public health concern in private and public schools in Qatar. As a result, supporting children in how to maintain oral hygiene and supporting them in frequent visits to dental clinics is crucial to aid in preventing dental caries. As such, oral health promotion is necessary to assist parents in addressing dental conditions in their children.

Oral health promotion in schools.

School support for oral health. The theme of *school support for oral health* describes the roles of schools in regard to dental health practices and oral health behaviours. The theme describes the school programmes that have been implemented in schools and their efficacy in oral health promotion among children. Parents presented their perceptions on the support that schools provide with respect to oral health practices for school children. Most of the parents shared their views on appropriate school support to improve oral health behaviours among children. Some parents shared that schools have not done well in terms of providing enough support to children on oral health practices. For instance, Mariam mentioned,

“They have activities but to some extent. They had a lecture this year in this school, but I am not sure if it was for the whole school. Even in the past, when my children were in another school, they brought home approval letters for a trip to the dentist.”

Similarly, Asma shared,

“They are not focused much on healthy teeth but more on healthy food. The teacher always is always keen that the child brings only healthy food to the school and if I send something unhealthy, they confiscate during school hours and return when they are going back home. I think that is a good step because it shows that they care about our children’s health.”

From the responses, it is well indicated that parents from private and public schools have enough evidence on the role of schools in improving oral health practices. Parents shared the programmes and school initiatives that help in promoting oral health conditions of school children. Some parents acknowledged that the schools support oral health. They reported, to the best of their knowledge, the oral health related programmes or activities that had so far taken place in the schools including oral health teaching session, healthy eating, dental check, follow-up letters and dental clinic trip have been useful in promoting oral health behaviours in school children. They also reported that healthy eating received more attention than other oral health related activities. For instance, Nawal mentioned that,

“We receive letters about dental check-ups from the school. They also organized a trip to the dentist some time back. It is once per year.”

Also, Salma mentioned that,

“They sent us letters at the beginning of the academic year to register if our children had dental problems because there would be a programme for dental check-up during the year and I registered my daughter.”

Similar responses were found from Wafa who shared,

“And to be honest, there were only one lecture for two year, and it is the lonely one. My son came home and was very happy that he got toothbrush as a gift, learned how to brush his teeth. I remembered that he was happy and told me the technique he learned from the dentist at school.”

However, most parents did not feel that the school was providing adequate oral health support to the children. Some of parents denied having awareness of any oral health activities organised by schools. For instance, Yahya said that, “

“Honestly speaking, I don’t think there is much going on about the importance of healthy teeth. If we had dentists coming in, checking, observing etc. it would be very helpful.”

Also, Mahmoud mentioned that,

“We are not supporting actually...I haven’t seen any health promotional activities at all.”

Mansour also mentioned,

“As a parent, I don’t see any support or activities except few topics in their curriculum. When a child is excited about a topic, they will definitely talk about it at home. I don’t see that happening for oral health.”

Similarly, Wafa shared that,

“For this school, I can say it’s rarely happened or almost none. I never heard from my kids that they have something regarding oral health.”

Rehab explained that,

“No, I didn’t hear of anything.”

Based on the responses, it is evident that parents were aware of the roles that school play in relation to oral health promotion. Parents demonstrated the extent to which public and private schools in Qatar support oral health promotion among school children. It is evident that some schools have vested while others have not implemented the required programmes and activities to promote oral health in school children. From the responses, most of the parents who reported knowing about school oral health activities were from public schools while majority of those who denied having any knowledge of school oral health activities were from private schools. Parents presented different views on the school support for oral health, which implies that some schools need to focus more on oral health programmes and activities to improve the dental status of the children. The difference in parents’ perceptions of the support the schools offer in terms of oral health shows that more is needed from schools to improve or promote oral health behaviours in children. Their responses further confirmed the inequality in the coverage of school oral health programmes /activities in primary schools in Qatar.

Oral health in the school curriculum. The theme of oral health in the school curriculum outlines the need for incorporating oral health education as part of class lessons. The theme discusses the integration of oral health into the school curriculum, which can be taught as part of lessons. Parents were allowed to share their views regarding the integration of oral health in the school system. In relation to their responses, parents from both schools in Qatar shared the need for such incorporation to achieve better oral outcomes from their children. Relating to the responses obtained, it is well established that parents were aware that oral health had been integrated into

classroom lessons in which children were taught about the anatomy of teeth. For instance, Wafa shared,

“I think there were in the last year or the year before in the science something related to oral health for my other son, but I am not sure.”

Also, Yahya mentioned,

“We have a subject – Humanity – where we talk about the social aspects of life and very briefly touch health topics. Like I said its merely one lesson throughout the whole academic year and it’s a very vague topic but nothing in detail.”

Parents also discussed that the structure and function of teeth are being taught as part of science lessons in classrooms. For instance, Nawal mentioned that,

“I don’t know but I think I heard my daughter tell me that there is something in the science subject.”

Parents further reported that structure and function of teeth was the main topic taught as part of the curriculum in grade 3 and it was taught mainly as part of Science, and in some instances as part of Islamic Studies and Humanity. For instance, Salma mentioned that,

“I think there is something in science and Islamic studies.”

Similarly, Mahmoud explained,

“In our curriculum, I don’t see anything like that but last year we had something called “cross-curriculum” where we incorporate other lessons with ours so I do remember talking a bit about health during my classes but that was only few details because I don’t have a scientific background.”

Wajed mentioned,

“Yes, in the early stages. My daughter is in grade 3 and they have lessons about teeth and its different types in the science subject. It doesn’t cover anything about cleaning teeth and oral hygiene, so it would be better to include that in the curriculum.”

It was however noted that the content did not cover adequate information about oral hygiene and dental caries. For instance, Mansour shared that,

“Yes, they do but very briefly about teeth, cleaning, decay etc. which is usually in one or two primary grades. I don’t think so because half page of information in a 30-40 pages curriculum will not have any effect.”

Parents shared their views on oral health in the school curriculum, which showed that children are also taught on oral health as part of their lessons. Parents shared that oral health has been integrated into the curriculum, especially in grade 1 to grade 3. The parents believed that the integration of oral health into class lessons could assist children in acquiring the necessary skills for dental hygiene. They also believed that the inclusion of oral health in the curriculum enables children to understand different types of teeth and cleaning decay. Although oral health was included in the curriculum, the parents generally believed that this was insufficient, and the content was inadequate. Parents shared their views on oral health in the school curriculum, which showed that children are also taught oral health as part of their lessons. Parents shared that oral health has been integrated into the curriculum, especially in grade 1 to grade 3. The parents believed that the integration of oral health into class lessons could assist children in acquiring the necessary skills for dental hygiene. They also believed that the inclusion of oral health in the curriculum enables children to understand different types of teeth and cleaning decay.

Involvement of parents in school oral health activity. The theme of *involvement of parents in school oral health activity* describes the role of parents in shaping oral behaviour of school children. The theme describes the participation of parents in oral health activities in the school, and the impacts of their involvement in dental hygiene of children. Given the responses obtained, there is an indication that parents were interested in getting more involved in oral health activities organised by the schools. Unfortunately, they haven’t been given the opportunity. For instance, Salma supported,

“Yes, parents are involved however mostly for academic purpose but not much for the health activities.”

Also, Yahya mentioned that,

“Parents are not involved in the education – nothing to do with health. That is my personal opinion (as a parent).”

Mariam also shared that,

“As a parent, no I don’t see any involvement.”

It was however gathered that the parents were given more opportunities to be involved in academic activities rather than in general health activities where oral health falls under. It was also reported that the Parents-Teachers meeting often focused on academic activities. For instance Wafa shared that,

“They call us in all academic things only, and nothing regarding their health hygiene or oral health.”

Similarly, Nawal said,

“Not for oral health, but yes, they do for general health. My children once told me about an activity regarding healthy food in their school, but the parents were not invited Yes, there are activities like the National Day, PTA meetings, workshops for mother etc. They invite us, and I try to attend sometimes if my time allows.”

Similar responses were found from Wajed who said,

“There aren’t any real programmes as such that require our involvement No, they don’t actually. The school doesn’t have any effective programmes that address oral health issues and involves parents and children together. For example, the parent-teacher meetings are usually held for discussing the academic performance of the child, but we want similar meetings/ workshops for discussing our children’s health too.”

The responses obtained above give a good outlook in the sense that parents are not only interested in learning about oral health, but they are also interested in participating in school oral health activities.

Previous facility-based school oral health programme. Some parents in public schools reported to be aware that their children were taken to the PHCC as part of routine dental visit. They further reported that the visit involved activities such as oral health education, dental check-up and follow-up for those who had been seen previously. For instance, Salma mentioned,

“Yes, I hear about trips to the school health clinics for dental check-ups, but I don’t know anything about the letters...I don’t have much information actually because I don’t go with them, but I am assuming they educate them about oral health.”

Similarly, Rehab shared that,

“Yes, I think I heard about it a couple of years back when they took my daughters and then gave us follow up appointments at PHCC.”

Although parents were aware of their children’s routine dental visit to the PHCC, it seemed they were not involved in the process. For instance, Wajed mentioned that,

“Nothing except what I mentioned about the trip to PHCC once a year and maybe some brochures or pamphlets sent through our children. We didn’t get any chance to meet the dentists as in a workshop.”

Mariam shared that,

“I think she was in grade 4 and they took her to the PHCC. They did a dental checkup and I don’t know more than that.”

Pupils in primary schools are minors and parents are hugely responsible for their well-being. Hence, not involving the parents in the planning and implementation of the facility-based programme was a wrong decision. Moreover, some parents expressed interest in participating in health-related activities or programmes.

Impact of school oral health activities on children. A number of parents acknowledged that the school oral health-related activities that targeted pupils significantly improved the oral health hygiene of their children. Parents also reported to have noticed increased level of confidence and enthusiasm among their children regarding dental visits. For instance, Wafa supported,

“For my child, yes it did a lot that lecture he attended at school, and of course following from home side too.”

Mariam also shared that,

“In general, she is already very particular about her oral health.”

Nawal mentined that,

“Yes, because they used to be scared of visiting the dentist but now that fear was gone, and they were accepting the idea. It could be because they knew the importance of teeth.”

Rehab shared that,

“Yes, because it has check-ups and follow up which is a good thing. She just said that they did a check-up.”

However, a few parents noted that these improvements were short - lived while others did not notice any improvement at all. For instance, Wafa said that, *“There were no impacts on him from the lesson, but yes from the lecture. He was happy while explaining the toothbrushing technique. As you know that kids learn more and fast from practical things than theoretical one.”*

Also, Rehab shared that,

“Unfortunately, not. I provide them with different types of toothbrushes and pastes and ask them to brush regularly but they don’t listen. They hardly brush one or two times a day.”

Wajed explained that,

“No not much. Initially they get excited because of gifts and they are eager for the first couple of months and then start skipping although I keep advising them.”

Parents’ responses to the impact of school oral health activities in their children point to the fact that there is a gap to address with regards to sustaining learnt oral health behaviour among the pupils. Perhaps a consistent and comprehensive school oral health programme covering all grades in both private and public schools would suffice in this case.

Awareness of new school programmes. Majority of the parents were not aware of the introduction of a new school oral health programme which was being piloted at the time this interview was conducted. For instance, Wafa said,

“No, only the lonely lecture I told you about two years ago.”

Mahmoud also shared that,

“I haven’t heard about anything...I am not sure if anything is done for the primary levels.”

Mansour said that,

“I don’t see any programmes being implemented.”

The low level of awareness of the new school oral health programme among the parents stresses the need for a deliberate effort to create more awareness about existing programmes. The awareness effort can be such that the parents will be given the opportunity to actively participate in the programme implementation from the onset.

Disconnection between oral hygiene behaviour in school & at home. Overall, the opinions of the parents portrayed a sense of disconnection between school and home oral hygiene behaviours or practices of their children. While one of the parents seemed apprehensive about the disconnect and blamed it on everyone, others expressed their concern for the need for a change and suggested how this change can be achieved. Yahya shared,

“With regards to oral health there is nothing happening. Obviously, we are all at fault.”

Parents also suggested that the school need to provide essential oral health information to the pupils while the parents need to follow-up at home through reinforcement of the information and supervision to make sure the information received from school is put into practice. For instance, Asma mentioned,

“There could be follow-up between the home and school. There should be consistency in the information the child is receiving at both places. It’s not possible that the school prohibits sweets and then we allow them to eat at home. Hence the same should be followed at both places.”

Similarly, Salam said,

“If both are consistent and following the same plan, it will work. There is one good thing in all schools here that it is strictly not allowed to bring any unhealthy food to the schools. As a mother, it is difficult to control the food habits for children for a long time and hence the school may help the parents in this regard”.

Similar responses were also presented by Nawal that,

“By motivating the student and encouraging them to participate in all related activities.”

Rehab mentioned,

“If the teacher focuses on oral health and gives them advice every day the children might start implementing what she says. Sometimes children listen to the

teacher more than they listen to their parents because they are used to what their parents say every day and don't take us seriously... Insha'Allah, it will work."

Wafa said that,

"I hope if there is connection between home and school. That will be complete and successful."

Also, Mansour shared that,

"If the school is providing the child with the correct information and the child starts implementing under the supervision from schools and parents, it will create impact."

According to Mariam,

"Any cooperation between home and school will have an impact on the student. At the same time, if the student feels motivated by the activities conducted in the school like lectures, visits by dentists etc. it will help too."

Responses from the parents have raised another vital concern about the sustainability of oral hygiene among primary school pupils in Qatar. Since there are inconsistencies between oral hygiene practices of children in school and at home, it is unlikely that the oral hygiene behaviour learnt in school will be sustained after leaving primary school. Fortunately, however, many of the parents are optimistic that the situation can be salvaged, and they offered valuable suggestions on how this can be done. The suggestions include: having a more structured follow-up and monitoring of oral hygiene behaviour both in school and at home, ensuring that there is consistency of information shared among both pupils and their parents, consist information, and carrying along all relevant stakeholders right from the planning phase. For instance, Mahmoud shared,

"I think it will because sometimes we are too busy with our lives and then we get the phone call we know that we are missing something. The involvement of school with parents is very critical. I think they should do that. Like in the US, if you have not been to the dentist for more than 6 months, they could take your kids away from you because the child needs that care you are failing to provide. Here I haven't seen it but let's assume that here they should have it compulsory for the parents to submit the health and dentist report during school registration."

Wafa supported oral health education in school and home and said,

“It will work because there will be cooperation between the two sites for the sake of the child. Then we will have kids with clean teeth, not seeking dentist clinic for having teeth injected.”

Nawal supported that,

“It will be positive because there will be awareness from school and home.”

Salma also shared,

“If the parent is following what the school requested, it will work. For example, if the administration decides to check the lunchboxes of all pupils for unhealthy food, it happens sometimes that the child has chips or chocolates. This means that the parents didn’t comply with the school rules.”

The responses underpin the importance of involving parents and other relevant stakeholders right from the planning phase in order to ensure sustainability of oral hygiene behaviour among primary school pupils.

Stakeholders for school oral health promotion.

The relevant stakeholders for school oral health promotion were identified by the parents to include the school, teachers, school nurses, all other school staff, parents, the pupils themselves, social workers and nannies. They recognise that it is a collective responsibility. For instance, Mahmoud shared,

“In schools it should be the nurse and at home it is the parents, especially the moms...Everybody in the school should be involved.”

Yahya mentioned that,

“It will be the nurse, P&Ts (parents and teachers) and principals. It is a collective responsibility.”

Salma also mentioned that,

“The school nurse, social workers, P&Ts and everyone in the school.”

Parents also suggested the roles and responsibilities of the various stakeholders. The school was identified as the major role player especially in providing oral health information and engage dental health services. For instance, Asma said.

“The schools have a major role in this because we (the parents) try our best to advise them at home but it is different when they hear it from someone who has

more scientific background about these issues because they can explain better...The teacher initiates this connection (between home and school)."

Wafa shared that,

"Mostly parents, then the school should start her role in awareness."

Mariam said that,

"Teachers in the first place and also the nurses. The teachers are usually teaching the values during the year like respect, honesty, cleanliness etc. Oral health could be included under cleanliness."

In addition, parents and school nurses are expected to motivate children's oral health behaviour. Wafa shared that,

"Parents. I feel parents are first in maintaining their children behaviour by motivation. I am not depending on school because they do not do any activities at school or showing that interest in giving such activities."

Mariam also said that,

"The school nurse along with administration. They could seek external support from dentists to either visit the school or the pupils could go on a trip to the clinic for check-ups."

In addition to the stakeholders from schools, the Ministries of Education and Public Health were also identified to have a vital role to play particularly in area of oversight supervision and monitoring of Oral Health School Programme. For example, Mansour mentioned,

"Any programme requires a regulatory body that will oversee the implementation. In Qatar, I think it is the Ministry of Education and one of the PHCCs. They could implement these programmes as work plans by the schools through a given schedule for the clinics involved. There should be a check list for these programmes for the schools and clinics involved to make sure that they are implementing them. It could also receive some subsidized contribution from the Ministry of Education."

From the parents' responses, it is evident that parents appreciated the necessity of taking a multidisciplinary and multisectoral approach towards promoting school oral health. Moreover, the parents seemed to have a good understanding of why and who should be involved and also a fair understanding of what roles the various stakeholders might play.

Qatari Context

Currently, the rate of consumption of sweets and chocolates is relatively high in Qatar, particularly during the holy months of Ramadan and the Eid, and at family gatherings, or festivals or ceremonies (Perumal, 2019). Since the consumption of sweets and chocolates is now almost considered a culture in Qatar, it has become necessary to explore the perception of parents on sweet and chocolate consumption as related to their children's oral hygiene practices. Also, it has been noticed that people in Ramadan consumed a lot of Vimto either as juice or in sweet recipes. Interestingly, some parents felt that non-regular intake of sweets and chocolates by some children may be attributed to the low economic status of their parents. Wafa mentioned,

"I can allow them eating once a week only, but it will be a headache during that week. So, to avoid any screaming and crying I let them eat chocolates. The problem is that we as parents crave to eat chocolates too much, so we can't avoid them from eating too. In our community we have the weekly family gathering, parties so we can't stop them from eating neither us will stop. In Ramadan the gift distributed yearly to kids has sweets....I think the parties that we have and the occasion that sweets giving as gifts and stayed for long period of time with the children eating them at home without control or keeping good home care."

Similarly, Salma said,

"I feel that the children here are at luxury so when we take them to supermarket, they start filling the shopping trolley with all the unhealthy stuff like chocolates, sweets, chips etc. This is spoiling our children and many of us feel shy to say no to the child in front of the people in the supermarket, so we just let it be as it is. Also, once I saw a situation in front of me where a child was insisting to get some sweet and the mother didn't want to take it for him so someone else interfered and provided the child with what he asked for. I felt it strange because the mother would know better what is good and what is not for their child."

Mariam also mentioned,

"I remember once my daughter was talking to me about her friend (who is not Qatari) that she was not allowed to eat sweets except once a week and limited quantity. I don't know if this was because of their economic status or if the parents were actually strict about the sweet's intake for their children. They could be extremely rich people but have awareness, so they will still restrict the sweets"

intake for their children. Also, if there is awareness, the parents will be keen to follow up regularly with the dentist even if they have to do it at their own cost.”

Similar responses were echoed by Salam who explained that,

“Arabs in general eat too much and we don’t have any specific food habits... We could eat anything anytime.”

Also, Rehab said that,

“I would say it’s because of the type of food we eat and mainly the outside food. The home food is much clean and healthy.”

Yahya shared that,

“It is a very norm in this country to have chocolates and sweets on a very regular basis.”

Other contextual factors identified include busy lifestyles which prevent parents from personally looking after their children’s oral health. For instance Mahmoud shared,

“In Qatar, the lifestyle is different. Yes, the people are busy but sometimes they are busy with things not so important. Our kids should be a priority no matter what. Ever since we moved here, I feel that my kids have changed the way they used to live back in US. Now they are more dependable on others like maids, drivers etc. The parents (us) are usually very tired.”

Lack of adequate monitoring was also identified as an organisational factor in Qatar, which hinders oral health programmes. For instance, Mansour explained,

“Our main problem in Qatar is that we lack proper monitoring systems when it comes to health, education etc. Even if the monitoring authority is there, it doesn’t function properly due to lack of sufficient qualified personnel and resources. However, there are other companies in the private sector that are licensed to play this part. The school collects fees from the pupils so these costs could be embedded within that fees.”

On the other hand, some parents highlighted some aspects of Qatari culture which could encourage oral hygiene such as use of miswak (chewing stick) and greeting by kiss. For instance, Mahmoud said that, *“Alhamdulillah we live in a Muslim culture, so it is good.”* Also, Mansour mentioned,

“It’s customary for the people to kiss each other on the cheek and nose while greeting in the traditional way so people will be socially acceptable if they have good oral health and not welcome if they don’t. You heard from my daughter earlier that she brushes her teeth after lunch because she has many spaces between her teeth and food gets stuck in there and could cause bad breath if she doesn’t wash properly which in turn might affect her relationship with other children while playing. These issues are general to all cultures but for the Qataris, it is more because of the way we greet and interact with each other.”

Yahya explained,

“I don’t think so because we know that the Arabs and Prophet Mohammed (PBUH) used the miswak very regularly and this cleans teeth and mouth Yes, it does because more awareness means better oral health. Some of the young population even started to focus more on beauty of their smile through different techniques like the Hollywood smile, braces etc. but we see it more than before.”

Similar responses were shared by Wajed that,

“In the old days, our families used to stress on natural products like the miswak and other cleaning powders but today these have been replaced by the modern toothpaste and toothbrush.”

These findings point to the fact that for any oral health promotion programme to be effective, the oral health related cultural practices of the people must be taken into account when designing such a programme. In the Qatari context, some practices seem to discourage while some seem to encourage oral hygiene, all of which must be considered when designing and implementing any oral health promotion intervention in Qatar.

Sociodemographic difference in oral health.

Some of the parents shared their thoughts on what may be considered as gender differences in oral health. Most of them thought that girls had better oral hygiene practices, and thus better oral health than boys. For example, Mahmoud mentioned,

“I really believe that girls are more focused on their lives than boys. Of course, they have other interests but generally they are more caring about their stuff than boys.”

Mansour shared,

“I noticed that the girls have better oral health than the boys. The girls usually take care of their personal hygiene more than the boys and this applies to oral health as well. The boys are careless, so they require more discipline in this regard.”

Wafa also supported that,

“Yes, I think girls do more care than boys. I don't have girls, but I think they are do care more about their teeth.”

Mariam explained that,

“I think the girls are more caring than boys about their oral health.”

Also, Nawal mentioned that,

“I don't have boys but from what I see from my nephews I think girls are better in maintaining their oral health.”

Wajed said that,

“I feel girls are more careful about their oral health than the boys.”

A few parents however did not think that any difference exists between the oral health of females and males. For instance, Yahya said that,

“I don't think so because I have seen some girls also suffering from dental problems.”

In terms of the type of school (either public or private), parents had variable opinions about the differences in oral health of pupils in public schools and private schools. For instance, Wafa said,

“I have no idea since all my children at private schools, but from my previous experience at public school where I worked for a while, they were providing them with some activities, workshops...They have a lot of activities...They really do care...I remember there were different files.”

Mansour also shared,

“Actually, there is a difference because some government schools have programmes while others don't, and the same applies to private schools. As I

said, this depends on the monitoring and the caliber of the persons involved in each school. For example, I had one of my children in this school and another in the Finnish school, and I can comfortably say that the Finnish school was way much better than this school when it comes to effectiveness.”

Similarly, Salma explained,

“No, I didn’t feel any difference because my daughter was in a private school before I moved her to public school. I feel that the focus on health matters is more in public schools.”

Behaviour change strategies.

This section presents valuable strategies enumerated by the parents on how sustainable oral health behavioural change among the pupils might be enhanced. The parents enumerated strategies to be implemented by school, home and the dental health services.

The strategies suggested by parents to be implemented by the school include: regular oral health awareness campaign, workshops and education for pupils and parents to ensure consistency in oral health hygiene practices, prohibition of unhealthy food and introduction of school canteen, random dental inspection, supervised daily brushing at school and linking oral health activities to academic grades to motivate the pupils. Nawal explained,

“Through periodic awareness because they are children and repeating the information will help them retain it.”

Mariam said,

“Through continuous awareness. Like I said there could be week-long activities every term, random check-ups at least monthly and the student with good teeth are rewarded. For young pupils, recognition is very important to motivate them and encourage to continue.”

Mansour also mentioned,

“For the lower grades until year 3, I believe we could engage them more in different activities and programmes where they are recognized for their positive behaviour and encouraged to continue further by linking it to their academic grades – maybe for the elective subjects.”

Salma said,

“By continuing to prohibit unhealthy food inside the schools and continuing the awareness activities and reminding them continuously.”

Also, Yahya shared that,

“We need to start with having policies at the school level to maintain these changes.”

Mahmoud explained,

“My suggestion would be to stop allowing children to bring their own food and instead we should have a school canteen that provides only healthy food. We could have certain activity once a week likes a vegetable day where we pick one vegetable like cucumber and we ask children to bring that from home as their snack.”

Asma mentioned that,

“I just want to reiterate the importance of an event promoted through social media about oral health. The event may include activities, fun games etc. to help children be more familiar with dentists.”

Similarly, Mansour shared,

“Majority of the parents are now educated, and they know that they should make time to take their children to a dentist. The main motivation for the parents to do this will be if the children will ask them for it and children will do that when they receive strong messages from the schools through lectures, competitions etc. Education must be done by both but the action itself is motivated by the child. Many children don't like to visit dentists and they are scared but if the school makes the most of the 8 hours that the child spends there, it would be very helpful. Nowadays we (the parents) see our children for hardly 3 hours because they come back from the school and us from work, but they sleep very early. Usually these 3 hours are spent teaching and shouting at them to study so there is not much scope to give them this information at home.”

The parents also recommended strategies to be implemented at home including constant reminder, education, family discussion, controlling intake, toothbrushing. Mahmoud explained that, “

“Through consistency. If there is someone to remind them at home and school and there is an example to live by, it will be sustained.” Wafa also mentioned

that, *“From KG to all primary levels need motivation and reminding. Do you know what? My boy at grade 7 cause me a big problem and never listen to me regarding oral hygiene.”*

Rehab shared that,

“We should advise them that they should brush their teeth otherwise there will be decay and the teeth will fall off and then they can't eat food because they don't have teeth and they will remain hungry.”

Similarly, Yahya said,

“First and foremost, it is brushing in the morning and at night and also not consuming too much sweets. It is a very norm in this country to have chocolates and sweets on a very regular basis, so the starting point would be brushing their teeth regularly and not consuming too many sweet dishes.”

Nawal mentioned that,

“By trying to teach them more about healthy food and for those who got used to unhealthy food, we can try to control their intake.”

Salma also explained that,

“For the primary school pupils, rewards, gifts etc. as a part of the activities can motivate them. For the parents, their attendance in any activity that we organize about oral health would be enough to motivate them.”

Strategies recommended at the level of the dental health services include the regular dental check-up, follow-up at specialist clinic, monitoring, writing letters to school to remind them about oral health activities, organising programmes for the school. Wajed explained,

“Through regular check - ups. If you are saying that the prevalence of dental caries is 89% then most probably the parents are not paying attention to this problem. In this case, the school and PHCC must cooperate to have frequent check - ups maybe once every 2 - 3 months.”

Mansour also shared,

“No there should be an annual assessment against KPIs like number of children with dental decay, number of decayed teeth rectified per child, how many

maintained this change etc. Measuring these KPIs gives you an idea about how well the programme is running and areas of improvement.”

Similarly, Salma mentioned,

“Yes, I think that the school health programme should be more effective in the follow up process for those children that actually suffer from dental issues because general check-up alone is not sufficient. There should be continuous follow up because the decay could move from one tooth to another and sometimes the gums and it becomes a big problem. Hence, I think these children should be referred to the special clinics and followed more regularly until age of 10 years.”

Similar responses were shared by Mahmoud, who said,

“I would suggest if you can initiate some steps while you are in this process like writing letters to schools that would remind them about such issues. For example, the health associate in our school you met, you can talk to someone at PHCC to coordinate with them for implementing programmes for this school. By doing this, you will hit 2 birds with one stone. First you will get virtue from Allah because of the work you are doing and second you will feel good about yourself because by doing this you are not only helping yourself but also learning from different opinions and taking actions (Mahmoud - parent from private school).”

Yahya said,

“With regards to the school nurse, we have one who is supposed to deal with day to day emergencies... We don't have any workshops, lectures or seminars where children are brought from their classrooms and taught about general and oral health.”

Mansour mentioned,

“The school cannot do this alone, but they need professional help. It's not possible for one or two nurses to follow 300 - 400 pupils. No, I want the schools to partner with clinics that have scheduled programmes from the Ministry to be implemented in the schools. If we are talking about 10 hours every academic year, it is around 2 hours per month. This time is dedicated for each group or class. They can start by creating a database about the baseline information about the dental condition of each child. Nowadays the trending mistake is that

when a child's teeth falls, no one informs us that we have to put a space maintainer in that space. We realize this years later when some other dentist points this out. That is why this database should be created by a professional who could compile this information in the correct way. The Ministry should upgrade the clinics in the country to be ready for such programmes. Many countries around the world have implemented such programmes and hence it shouldn't be difficult for the Ministry to find a reference for creating a similar programme for Qatar. The clinics should be obliged to provide these services to the schools at subsidized rates."

Although these oral health strategies are classified under home, school and dental health services, it is clear that most activities require co-operation among these constituencies.

Themes from Teachers' & School Nurses' Interviews

Knowledge of oral health.

Overall, the school nurses (n=2) and the majority of the teachers (n=8) had good knowledge of oral health. They described oral health in terms of good oral hygiene, personal hygiene, consumption of healthy food, having strong teeth, the absence of toothache. They also described oral health diseases as consequences of bad oral hygiene. For instance, Dorah, a public school nurse mentioned,

"It means when we take care of our teeth and the internal health by eating healthy food. It means how to take care of teeth like how to clean, types of healthy food etc."

Samar, a public school teacher mentioned that,

"It means that a person should have strong teeth and no tooth pain. It also includes fresh breath."

Also, Alia - public school teacher shared,

"Personally, I think that oral health means healthy body because it is the entry point of the essential elements for the human body. I can breathe, eat and drink through the mouth so it is important to keep it healthy."

Huda, a public school teacher, explained that,

"When I read or hear about oral health, the only thing that comes to my mind is personal cleanliness."

Also, Caroline, a private school teacher, shared that,

“It is very important because I don’t want to have a toothache because it is very painful, and it is also important for hygiene.”

Lili, a private school teacher, explained that,

“It means a lot. If you have problems with your teeth, then you can’t eat well. Also, if my mouth is not clean, people will turn their faces away from me and that is not good.”

Similarly, Sendy, a private school teacher mentioned,

“Oral health actually means how to take care of the teeth and clean them in the proper manner. Also, to eat healthy food that enables the enamel of the tooth to stay healthy, daily flossing and to see that we have good breath because good teeth mean good breath. We must also eat fruits and vegetables that help in healthy teeth and gums. Drinking plenty of water, gargling twice a day, brushing teeth etc.”

In addition to their description of oral health, the teachers and nurses identified ways that they acquired their knowledge of oral health. These include from formal education, personal study, dentist visit, parents, personal observation, and life experiences. For instance, Dorah, a public school nurse, mentioned that,

“We took it during our studying and also through what we see in our daily life.”

Amal, a public school teacher shared that,

“This is my perception of oral health.”

Samar, a public school teacher, mentioned that,

“Through life experience. I notice that when I have healthy teeth, my body works fine but when I have toothache, my whole body suffers, and I feel terrible. That how I know that having healthy teeth is very important.”

Similar response were presented by Huda, a public school teacher, who shared that,

“Through teaching, reading and my role as a wife and mother, we have been through these problems and eventually learnt what is right and wrong.”

Also, Caroline, a private school teacher said that,

“When we were young, our mothers and also in schools they used to teach us. We also used to have visits from dentists when I was young, so it was a practice for us.”

Lylyan, a private school teacher, also mentioned that,

“By self - learning and also during the nursing education.”

Oral hygiene practice among teachers and school nurses.

Teachers and school nurses who participated in the study reported to have relatively good oral hygiene practices, particularly with regards to the frequency of brushing and in some cases, dental flossing. For instance, Dorah shared,

“I use the toothpaste and toothbrush three times a day or at least in the morning which is important to remove any leftovers in the teeth and at night because the caries usually grows at night in case, they eat sugary food. I skip after lunch sometimes but always committed to morning and night.”

Amal also explained,

“It depends on the type of food. If it is heavy food, then I wash after it because I had braces for some years and hence, I still use the cleaning kit. Else if I am eating light snacks then I don’t wash usually.”

Samar explained that,

“Primarily its morning and night, although I know we are supposed to do more than that. Now we know the right way of brushing teeth and deep brushing.”

Alia shared,

“I start by brushing, gargling and cleaning my tongue early morning. I avoid eating sweets throughout the day and brush immediately if I ate sweets. I brush in the evening before bed. I don’t like caffeinated drinks like coffee, tea etc. that cause yellowish teeth. I prefer milk and fresh juices but milk more.”

Similarly, Huda shared,

“ I like to use the toothbrushes and pastes based on useful sources of information like books and internet rather than depending on advertisements. There was a certain brand that everyone here was excited about and it created a lot of hype but when I searched about it I found that it does not contain fluoride. Personally, I enjoy brushing my teeth regularly after meals but not

immediately after the meal because I read that it is safe to brush after 30 minutes to avoid any harm to the tooth enamel. When I came to know that this specific toothpaste does not have fluoride, I stopped using it for my children and myself.”

Caroline presented similar responses and said that,

“The usual routine of brushing teeth before and after sleep. I floss during weekends sometimes. I also use mouthwash regularly. Also, I have dental visits every 6 months.”

Lili also mentioned,

“My daily routine of oral care is to brush my teeth every morning and sometimes if I eat what I don’t like in between meals I like to refresh again. By what I don’t like, I mean that some foods that are known to produce mouth odour. Also, I am used to flossing before going to bed.”

Sendy from a private school also mentioned,

“The normal is brushing teeth early in the morning and I have something that could be silly – I believe that singing a small song in my mind like happy birthday song fully means I spent enough time for brushing teeth. Also, I follow up and down movement and not sideways to make sure it reaches my gums, using proper brush to clean my tongue and also gargling with Listerine for a fresh breath. In the evening before going to bed, I brush again, drink plenty of water and even floss to make sure there is nothing stuck in my teeth. Yes, twice a day. Sometimes when I am very lazy, I might do it once. It mostly depends on what I eat.”

Also, Lylyan shared that,

“I always brush my teeth after every time I eat.”

Rose, a private school teacher, said that,

“After breakfast I wash and after lunch I gargle with mouthwash and in night I brush. In case there is something still stuck I use dental floss.”

Severity of dental caries among pupils.

Some of the teachers and school nurses expressed their concern over the high rate and severity of dental decay among pupils. For instance, Dorah mentioned,

“Yes, most of the problems are about caries, abscess etc. Many girls come to me complaining about toothache.”

Samar also shared same responses and said that,

“Yes, I notice some of them with dental problems while they talk to me and some of them are usually in late stages of dental deterioration.”

Alia mentioned that,

“Yes, I noticed when we asked them to draw their teeth during the activity we had, I saw tooth decay, broken teeth etc. Some of them had teeth in poor health.”

Lili shared similar responses and said that,

“I used to notice some issues previously but never to the extent that they are sick or complain of pain in front of me. I used to notice while talking only that some have caries or fallen teeth etc.”

Sendy said,

“Yes, loads in this school. Tooth decay and yellowish teeth.”

The teachers however responded differently when they noticed tooth decay in pupils. Some of the teachers took some action while others didn't. As among those who didn't take any action, some of them felt it was not their responsibility to be involved in issues regarding dental caries among the pupils even though they believed that teachers have a significant role to play in promoting oral health. For instance, Huda mentioned that,

“I didn't interfere so far in these matters. Because it is outside my domain.”

Also, Samar explained that,

“I didn't interfere directly, but I believe that teachers have a much bigger responsibility towards these issues.”

Teachers who took action did that by speaking to the pupils about oral hygiene, contacting their parents or referring them the school nurse. For example Alia said that,

“I brought this to their attention.”

Caroline shared that,

“I will just ask them if they brushed their teeth in the morning and if they smell bad then obviously, they didn't.”

Lylyan explained that,

“I send a letter to the parents that their children require cleaning of hair, nails, teeth etc.”

Rose from private school also shared that,

“I have kids (pupils) who come with toothache and we refer them to the nurse who calls their home and are usually taken to a dentist from home.”

Sendy said,

“We speak to them and tell them that this is what happens when you eat too many sweets and unhealthy food. The enamel is not strong to protect their teeth.”

Oral health promotion in school

Facility-based oral health programme. As earlier mentioned, the former school oral health programme included a component in which grade 1 and 4 pupils visited the PHCC for routine dental check. As expected, teachers and school nurses in public schools reported that they were familiar with the programme; whereas, teachers and school nurses in private schools reported not to have been aware of the programme since private schools were not covered by the programme. For instance, Dorah shared,

“There is a school oral health programme where all pupils in grades 1 and 4 are taken for a check up to the PHCC. There is also the GCC week for oral health, and it involves many activities like drawing, painting, assemblies, etc. about different topics related to oral health. We also have visited by dentists from Ministry of Public Health like the one we had last week, and they brought gifts for the pupils. These gifts are the right motivation for the pupils...No, we send all the pupils in both grades. In term one, we start with grade 4, and in term two with grade 1. Every year, we coordinate in advance with the PHC depending on their capacity and divide the total number of pupils on different days until all of them are seen.”

Amal mentioned that

“I know it ever since I was a student myself that we visit the school health department where they check our teeth for caries, plaque or if braces are required and educate us too.”

Similarly, Alia mentioned,

“I remember around 4 years back when I was teaching in primary school for boys, we took the pupils to a PHCC where the dentist gave a lecture to the pupils and then examined their teeth one by one and gave them gifts. It was a good activity and the pupils enjoyed it a lot.”

Huda also mentioned that,

“I remember about it when I was a child (laughs). They used to take us for the check up and give us toothbrushes.”

Suggestions for improvement of school oral health programme. The teachers of both private and public schools identified some of the recurring factors and challenges that can limit the success of school oral health programmes. These factors and challenges are consistent with those already identified by parents which include lack of follow-up at home, inadequate monitoring of oral health related activities of the pupils and lack of clarity and consistency of the programme implementation plan and process. Some of the teachers also suggested how these factors and challenges might be handled. For example, Amal mentioned,

“Anything that we want to be successful should be followed up regularly. For example, we could design a booklet for each student with attractive design and follow up their oral health through this booklet for brushing teeth, frequency of brushing etc. There should also be cooperation from the parent. If we give the booklet and there is no follow up from the parent, then we will at least know where the loose ends are. The student could then share this booklet with the nurse who can recognize the outstanding children for their good behaviour.”

Samar presented similar responses and said,

“No, it’s throughout the year but their varieties of them. If we are talking about oral health activities, then it is once a while only maybe once or twice during the whole year. If you are talking about more attention to oral health, then ideally, we require more frequent activities...Maybe every 2 weeks or monthly such that the subject stays with the pupils and they are more aware about it...Of course, through support from management and higher authorities. At some point, we were a part of “Active Qatar” programme. It was a programme where they select random schools to participate in it. I had to keep a daily count of the physical activities I ask my pupils to do. For example, if I feel that they are sleepy, I ask them to stand and jog in their places. If we have similar programmes for oral health, it would be useful.”

Similarly, Alia shared,

“I would say because of the narrow duration of the academic curriculum to allow such activities. I wish there was dedicated time for such activities included in the curriculum in advance, so the pupils could participate freely. This will also help the teachers to plan and for the parents to attend and engage...Yes, because the

teacher is already overburdened with many tasks. If the teacher has sufficient time to perform these activities along with her primary tasks, they will do it, but they are tied up with planning, teaching, evaluating and other activities relevant to the academic aspects.”

Dorah mentioned,

“Convenience wise it is better when the dentist is visiting the school rather than we are taking the children to PHCC because it is a huge task and responsibility and many parents refuse participation because of this. Some parents also insist that the child cannot go to the dentist without the parent...Through continuous awareness and follow up...I think inside and outside. For example, we can have age limits for food the way we have for movies. If a child is below certain age, they cannot buy certain unhealthy food.”

Also, Huda said that,

“If there is no support from the home, there won't be any impact by the school alone. The basic attention should be from home...We can create awareness among parents about oral health...Through workshops.”

Besides, Caroline mentioned,

“As I said, regular monitoring from teachers and parents is very important. It must be a regular follow up – maybe every quarter – instead of only one session per year. We could also use the school bulletin boards because we do that for the different activities in the school. If it is presented like a yearlong programme, it can be sustained because everyone will be reminded about it every now and then...To do away with a tooth ache (laughs). It is really difficult for us adults to deal with a toothache and it will be worse for younger children, so I think if they do away with a toothache once it will surely motivate them to avoid more in future.”

Sendy shared that,

“I think it's just a plan that we need to devise. If we are spoken to about what is important for oral health, we could then work on a plan. I can't actually tell you now about a plan because I don't know much about oral health but once we know enough, we could then sit together and discuss pros/ cons, affordability / non -

affordability, positive/negatives and how that can be evolved in our mind - set before we put it on paper.”

New oral health school programme. Concerning the newly introduced oral health program known as the Asnani programme, teachers and nurses from public schools reported to have heard about it. Teachers and nurses from private schools however, reported not to have been aware of the programme. This again hints at the need to intensify efforts toward creating more awareness about the Asnani programme. For instance, Dorah shared, *“The programme leaflet says that the dentist will visit the school and check all grades in the school that includes cleaning, checking and follow up with PHCCs if required.”* Samar said, *“I hear about it that a dental team comes to the school for checking the children’ teeth. I am not sure because I’m not involved in all activities, but this is what I heard.”*

Caroline mentioned,

“I am not aware of that. I would volunteer my children if there is something like this –laughs...Well if there is a programme then the teacher is obliged to do it especially if it involves follow up with the dentists because it will reflect how compliant they are about doing their part. It should be made clear since the beginning that this is a yearlong project, so they manage it accordingly.”

Also, Sendy explained,

“I am not sure if it is being implemented but I would actually encourage having one because it is important. It should be something more than a lesson in science, maybe a whole subject and a notebook with information about teeth and how to take care of them.”

Previous health programmes in school. Some of the respondents alluded that oral health promotion activities in schools had previously been a part of other related health programmes. Examples of such programmes are health day commemoration and healthy eating promotion. However, these programmes are no longer being implemented. Lili explained,

“Every year we have the health day. On this day, all children are asked to get healthy food and dress in their own costume. Then we all sit together in all classes and talk to the children about being healthy.”

Samar also explained,

“Yes, we were before 2 or 3 years in the school health promotion programme. I think the programme runs for 3 years only. During the programme, the activities are much more than usual, and all those activities must be health oriented. I think the goal of the programme is to ensure maximum involvement in the 3 years and then leave it for the school to carry on away from the programme and allow for other schools to participate instead.”

R3: “When these were implemented, the school was very active and there were activities, press releases, partnerships, invitations etc. but I don’t know why it stopped or what is going on now” (Huda - public school teacher).

R4: “Yes, but very few activities compared to when it was active. For example, as a parent, I received a letter for my child that they will take them to a trip to the PHCC for checking their teeth” (Huda - public school teacher).

R5: “The file was closed. When it was active, we had many things going on but there is nothing now” (Huda - public school teacher).

R6: “Nothing that I am aware of” (Lylyan - private school nurse).

Oral health in the school curriculum. The teachers and school nurses in both the private and public primary schools seemed aware of the inclusion of oral health in the curriculum of certain grades.

R1: “It is included in grade 3 science subject. Even when we had the lecture, girls were invited for hands on session about the different types of teeth and other information” (Dorah - public SN).

R2: “Yes, I taught them this year and we had participation from the MOPH through invited dentist who gave us a lecture and distributed leaflets, toothbrushes and toothpastes. She explained the anatomy, different types, functions and ways to care for them. It was one lesson but continued over different classes...It talks about the upper and lower jaws, types of teeth, functions, anatomy, ways of cleaning and caring. It was an interactive class with the pupils. The importance of Miswak and cleanliness from Islam perspective was also covered. The pupils also had a practical session where they actually brushed their

teeth with their colleagues in the school during the lesson. We also taught the pupils about the right way to brush teeth” (Alia - public school teacher).

R3: *“It is a part of the science subject where we talk about all the different body parts. After talking about each part, we explain how to take care of that part” (Caroline - private school teacher).*

R4: *“We have science as a subject where we talk about the human body including oral health. The lesson is about the anatomy of the teeth, but we do talk to them more because we have to inform our pupils about oral health. If we go into detail about different body parts like what is in the eye, in the mouth etc. that when we actually discuss it” (Sendy - private school teacher).*

School’s Support for Oral Health

The responses obtained from teachers and school nurses are consistent with those obtained from parents. This reinforces the assertion that schools had not given adequate attention to health-related programmes or activities resulting in inconsistencies and ineffectiveness. Nonetheless, respondents pointed out that there had been some recent improvement in the attention given oral health.

R1: *“I would say that the support is very little...Very little because I think that children at this age require much more attention. There should be close follow up on a weekly basis. As a mother, I find it hard dealing with my children too because by the time they come to me complaining about their teeth, it’s too late for remedies. That is why prevention through schools is better” (Samar - public school teacher).*

R2: *“Again, it depends like Ministry of Health, Qatar Diabetes Association, Qatar Cancer Society etc. The external requests that we receive are usually about national programmes that will be implemented by National authorities...When we have any occasion like the GCC oral health week, we organize activities for the pupils and for the parents like awareness lectures. Not only for oral health but for other health issues too. Not for oral health but we did for healthy nutrition. This year we could do that, but we didn’t start yet” (Dorah - public school nurse).*

R3: *“They talk about it almost once a year and usually take grade 4 children for check-ups every year...If there is a national or international day for oral health, they provide information in the assemblies and the nurse also takes some pupils for check-ups. I am not aware if there are any other activities”* (Amal - public school teacher).

R4: *“In this year specifically, I felt the school was very responsive to my request for the community involvement regarding the oral health lecture that I requested. This year we have a new curriculum but the previous one did not include any information about oral health. I taught grade 6 and the only information about teeth was the difference between permanent and milk teeth and their count. There was nothing about cleaning or brushing”* (Alia - public school teacher).

R5: *“Yes, this year we explained the upper and lower jaws, anatomy, functions and cleaning. No for grade 3 only. I hope there are more activities with wider scope”* (Alia - public school teacher).

R6: *“I wouldn’t say it is 100% because for example, the schools prohibit the chocolates, sweets, chips etc. during regular school days but during the special activities all these items are available to the children from the school itself”* (Huda - public school teacher).

R7: *“Not much support is given”* (Sandy - private school teacher).

R8: *“Once a year they we have one day where someone usually comes and talks about health. We have the nurse section and kids who have any issues including tooth pain are usually seen by the nurse and I think she is doing a good job”* (Rose - private school teacher).

Parents Involvement in School Activities

The teachers and school nurses asserted that schools had made considerable efforts to get parents involved in previous in school health activities, but they generally showed little or no interest.

“Yes, they participate but there is nothing specific about oral health. It is usually about other activities like reading day, day for elderly etc.” (Amal - public school teacher).

“Not for oral health but we did for healthy nutrition. This year we could do that, but we didn’t start yet...When we have any occasion like the GCC oral health week, we organize activities for the pupils and for the parents like awareness lectures. Not only for oral health but for other health issues too...We invite them to our activities and lectures through messages...Not necessarily. For example, when we take the pupils to the PHCC for check-up, we send messages before the approval forms are sent informing the parents about what we are planning to do and even after the form is sent, we send them follow up messages about the outcome of the check-up. Also, when their children bring unhealthy food, we send messages about the importance of healthy food. So, we use the messages for other purposes” (Dorah - public SN).

“We just inform them that there is a dental week but there is no actual involvement for the parents” (Caroline - private school teacher).

R4: *“Yes, it does but engagement usually involved the community. For example, I could receive an invitation to attend as a mother but my willingness to attend will depend on the mindset of the community around us. If I have the culture of engagement, I will definitely participate for the benefit of my child...I feel that the parents are not much interested in attending such events”* (Samar - public school teacher).

R5: *“Yes, the event I told you about last year did involve the parents too”* (Lili - private school teacher assistant).

R6: *“Yes, they do. When we have the parent - teacher meeting, we generally speak about health. Also, when we send the letter home, we ask them to send their child to school with a health snack. We don’t want sweets, chocolates, cold drinks etc. but freshly squeezed juice, vegetables, sandwich with cheese, tomato and lettuce in it and we encourage a lot of water. Parents do comply with these requests”* (Sandy - private school teacher).

R7: *“Yes, they are but not exactly about oral health. At the beginning of the year, the nurse sends letters to the parents about personal hygiene and health. We also talk about it in the morning assembly”* (Rose - private school teacher).

While some of the respondents hinted at what might have caused the low participation of parents such as lack of interest, others suggested strategies that might help get the parents to be more involved including awareness creation, mass media

campaigns, community outreach, talks and workshops for parents, survey of oral hygiene among pupils etc.

R1: “We could start initiating more activities and find the missing piece to know why the parents are not engaging to so that we can engage them more” (Samar - public school teacher).

R2: “To create awareness among the parents because dental caries usually comes from home but not the school. I know that dental caries is usually due to wrong eating habits like dairy products before sleep (without washing) and eating chocolates (without washing). The children also bring these things to school although it’s prohibited but they still do. The parents should be responsible for that but if you are telling that they prevalence is 89% I don’t think they actually care” (Amal - public school teacher).

R3: “Media and school lectures will help” (Lili - private school teacher).

R4: “Having frequent talks and advertisements on the roads, shops, billboards about healthy smile and educating parents about importance of saving teeth and eating healthy food to develop healthy teeth and gums. If its allowed to go to people’s homes to invite them to community level talks about oral health and talking to them about brushing techniques because not all them know this information about brushing, gargling etc.” (Sendy - private school teacher).

R4: “Having fun activities, education to show them how important it is. Also guiding the parents and giving them resources to go about this topic because sometimes the children are resistant, and the parents give up after one or two attempts. If they have proper guidance, they can have good results” (Rose - private school teacher).

R5: “It would be great as I said earlier, most of the pupils follow their teacher more than the parents. Also, any information the parent will give will most probably be given at school too. Parents also get to learn from the school when they come to know about these programmes. Most parents could be aware, but they are not putting much effort but when it comes from the child then it has a stronger impact on them” (Caroline - private school teacher).

R6: “Not much. Although we stress on it during our meetings with parents, but we are not sure if anything is actually implemented at home. I would suggest

conducting a survey to the parents asking them if their children brush their teeth. This could show the connection” (Sandy - private school teacher).

R7: *“Through follow up by the school and with the parents if they are in turn following up with the clinics and updating the school accordingly”* (Amal - public school teacher).

R8: *“If it doesn’t work, there could be many reasons like school, parents, culture etc. and the same applies if it works. If a mother is facing such problems with her children and then the school invites her to engage to that the problem could be solved, there will be immediate response from the mother. Hence, we should start with children who have dental problems because their parents are most likely to responds and engage in such activities than the other who don’t have this problem in the first place”* (Samar - public school teacher).

R9: *“It would always work. In this school for example, we maintain a very close relationship with the parents of the pupils”* (Caroline - private school teacher).

R10: *“It will work because like I said the parents are usually responsive and if we send a dental survey, we will receive a very fair response. Yes, I would admit that because the easiest way to get to parents is via the school because we send flyers to home to read it. That is the first way to make awareness rather than depending on outside community. If they know what we are doing at school and that their attendance is very important we do get responses... I think we could educate the children about dental health. I know in my class usually the parents ask their children what they learned today. We also send some notes with the children like a reflection sheet that shows what the child did that day. If we have tooth paste and brush and teach the child to do that, they probably will say that it was the best thing they did. The parents would then know more. In my class I can say that at least 22 out of 24 pupils will do this. We also know that parents get the message because they return a signed copy of it. We also used happy face stickers for the pupils to mark how much they liked the activity, so this also helps the parents to know that their children liked it”* (Sandy - private school teacher).

R11: *“Coordination between parents, teachers and student will make it work”* (Lylyan - private school nurse).

Stakeholders

A number of stakeholders were identified by the teachers and school nurses including parents, teachers, dental health services and social workers. They further described the stakeholders as individuals or groups that may have direct or indirect influence on the oral health outcomes of pupils.

R1: "This is a societal intervention and requires roles from home, school and society" (Dorah - public school nurse).

R2: "The whole school should be involved in the planning and not leave it to individual efforts because it will not work that way" (Samar - public school teacher).

R3: "I think all of us should be involved. The plan should include the teacher, the nurse, social worker, administration and everyone else. We could have awareness sessions and guidelines about how to protect teeth, also check their food habits" (Samar - public school teacher)

R4: "The involved ones could be parents, teachers, schools and dental associations that should care for dental health of pupils. The initiative wouldn't come from the school though because as I mentioned earlier, we only help in passing this information, but we need help from professionals like dentists for example in case of dental problems" (Caroline - private school teacher).

R5: "All of us – children, teachers and parents. If the parents have something to talk about, the first point of contact is the teachers. If the teachers cannot handle it then it moves to the administration. We do the sheet, the child takes it home, parents read it and sign it and we see it the next day" (Sandy - private school teacher).

R6: "The school nurse mainly but other sections could be involved. Each department in the school is assigned for the morning assembly per week. If it coincides that our department is assigned during the health topics, then we are engaged in these activities too" (Amal - public school teacher)

R7: "It could be decided by the Ministries of Health and Education since they are involved. They could allocate one day for an activity for this health with a clear plan for the administration, teachers, pupils and parents about their roles

in this scheduled activity. Enough time should be provided for this. The teacher, parent and the health authorities” (Alia - public school teacher).

R8: *“The school, a dentist, the school and myself as the school nurse” (Lylyan - private school nurse).*

R9: *“The school nurse is the main person and then the teachers. For example, I do it individually to my pupils. In year 4 we have a topic in science about teeth, so I go deep into it and explain more...The school administration and Primary Health Care in the country. School, parents and PHCC could send someone to give these lectures and information to the kids” (Rose - private school teacher).*

R10: *“The plan could be from the Ministry of Education or Health or school administration. The execution has to be through the teachers” (Samar - public teacher).*

R11: *“I think this decision should come from the higher authorities, so everyone will follow it. For example, the National Sports Day was initiated by the government and everyone actively participates on this day and activities all around the country” (Alia - public school teacher).*

Qatari Context

Similar to the responses obtained from parents, some of the teachers and school nurses suggested that consumption of unhealthy foods, which contribute to poor oral health, has over the years become embedded into the culture of Qataris. Others suggested that the high economic status of most Qataris has made them susceptible to consumption of junk food even among children. However, a few respondents felt that there are no cultural issues specific to Qatar that influence oral health.

R1: *“The children nowadays depend mostly on junk food and they know very well about how to order and the different restaurants. This should be stopped...It is not about the cultural traditions because the previous generations did not have oral health issues that we have now. In fact, the more we are advancing, the dental problems are becoming more prevalent” (Dorah - public school nurse).*

R2: *“From economic perspective, the standard here is high and hence I may give my children money as a sign of love and they use it to buy sweets and other*

things from supermarket. Even when we think about rewarding, it's about eating sweets and food in general. Also, the traditional foods affect the oral health" (Samar - public school teacher).

R3: *"I feel that the parents and the community in general have are very well aware about health. The Qatari individual is very keen to always appear in the best possible way, so I think they are very caring about their smile too"* (Alia - public school teacher).

R4: *"Lack of care and follow up by the parents at home"* (Huda - public school teacher).

R5: *"In Qatari context, I believe it is a rich country and they do support health matters. For example, the government celebrates the National Sports Day because they believe in its importance, so I think they will support any initiative or programme about dental health too...I don't think so. I have been here for 7 years and I believe the people here are very conscious about their health. There are also many programmes at Aspire and other clubs. Free health care is another benefit"* (Caroline - private school teacher).

R6: *"It depends on individuals mostly. For example, there are some diseases that would affect your teeth even if you eat health and clean regularly"* (Lili - private school teacher).

R7: *"Yes, the economic status helps in this positive behaviour. For example, the private clinics charge a handsome fee for the Hollywood smile and only economically advanced persons can afford it. There is also the religious aspect because the community here is religious, and they are following the Islamic principles. The use of Miswak is also popular"* (Alia - public school teacher).

R8: *"I feel that some cultures are better in sustaining their oral health than we do. Like Japan, china, India etc. These are the countries I have been to and it is evident that they are more caring about their oral health than us. Here in Qatar, our economic status is high, but we see the parents while grocery shopping tends to take too many sweets and forget the essentials for their children's lunch box"* (Huda - public school teacher).

R9: *"I don't think so because oral health is general to everyone regardless of the race, religion, gender, culture etc."* (Caroline - private school teacher).

"I think it is a general issue in different countries" (Lili - private school teacher).

R10: *"No, I think it's a worldwide issue and not specific to Qatar. People should be encouraged worldwide to attend"* (Sandy - private school teacher).

Sociodemographic Difference in Oral Health

While some respondents asserted that girls take better care of their teeth than boys do, others didn't agree with that assertion.

R1: *"I don't think there is any gender difference because the rules are same"* (Dorah -public school nurse).

R2: *"It's the same for both"* (Amal - public school teacher).

R3: *"No, it's the same to me"* (Samar - public school health).

R2: *"Definitely because girls are more concerned about their appearance and beauty. Boys don't prioritize this"* (Alia - public school teacher).

R3: *"Previously we could say that girls used to care much but now boys and girls are equally caring. They are using many modern techniques like the Hollywood smile, braces, veneers etc."* (Huda - public school teacher).

R4: *"No, I don't see that. They are children and will do what we ask them to do anyways. It will be the same for both"* (Caroline - private school teacher).

"In primary schools, children are not allowed to bring chocolates and candies to school. When they are eating, we go around and see what they are eating. If they have any chocolates or biscuits with chocolates, we will take it away" (Lili - private school teacher).

R5: *"Yes, I think girls take care more of their teeth than boys. When I talk to boys and tell them they don't have good teeth, they don't worry much about it. I also noticed they have stains on their teeth maybe because of coffee and tea consumption. Girls listen if you talk once or twice about it unlike the boys"* (Sandy - private school teacher).

R6: *"I don't think there is any difference"* (Lylyan - private school nurse).

R7: *"I think it is easier to deal with girls than boys (laughs). It takes more time for the boys to calm them down before we start teaching this to them, but the girls are much easier to deal with"* (Rose - private school teacher).

R8: *“No, I tried both and I don’t see any difference. They are at the same level as public schools”* (Samar - public school teacher).

*“I don’t know anything about the private schools because I didn’t interact with them. All of my children are in public schools. I feel that the public schools are providing better quality than private schools even for oral health. All oral health activities are provided regularly without any additional cost”*s (Alia - public school teacher).

R9: *“I feel that the government schools are stricter regarding healthy food compared to private schools. For example, in private schools they have unhealthy food during their breaks but in government schools this doesn’t happen because of the strict rules. Sometimes, they also distribute/ sell healthy snacks like fruits and vegetables”* (Huda - public school teacher).

R10: *“I don’t think so, but maybe private school has more people coming and talking about dental health. I also think there are more pupils in public schools than private schools”* (Sandy - private school teacher).

R11: *“I think the private school pupils have more knowledge about oral health”* (Lylyan - school nurse).

R12: *“I don’t know but I think the government schools have more facilities”* (Rose - private school teacher).

Behavioural Change Strategies

Behavioural change strategies recommended by teachers and school nurses include lectures, real life examples, awareness, videos, cartoons and supervised tooth brushing at school.

R1: *“The first step is motivation through videos, cartoons etc. so that as long as the child sees this material, they are aware of oral health?”* (Samar - public school teacher).

R2: *“We could do it during the pupils break in a way that we allow additional 5 minutes after the break so that the pupils can brush their teeth after food...I prefer to continue learning in the later grades what that they started in the early*

stages so that the change could be maintained for the longest possible duration” (Alia - public school teacher).

R3: *“Through continuous awareness mainly for the primary school because it is the basis for their life. At that age, the children are ready to receive the information we provide and willing to hear. Also, actions are more helpful than advices in some cases”* (Huda - public school teacher).

R4: *“The first step is through awareness at home and school. The school has rules that prohibit unhealthy food like Pepsi, chocolates, candies etc. Brushing the teeth and cleaning is also important...They bring it but there is regular checking and they confiscate them. The canteen is also instructed to sell only certain type of food that is healthy, which includes oral health, nutrition etc.”* (Dorah public school nurse).

R5: *“First and foremost is the awareness as it is very important. We have to create awareness from a young age about oral health because young children are eating more sugar foods. There is also guidance to pupils and teachers at school and reminding them about the importance of these things. By creating awareness, teaching them from home, consistency between home and school, making use of the activities like health week – all this would help the kids”* (Rose - private school teacher).

R6: *“We could start by promoting awareness among teachers to create awareness among pupils about the importance of oral health. Like for example, you are doing this research project, so you can meet with all the teachers in one place and tell us how to handle this situation because like I said earlier, I am helpless when I see pupils with dental problems because we don’t know what to do. If we, the teachers, are aware that it is our duty to guide the pupils from a health perspective, we will definitely do that”* (Samar -public school teacher).

R7: *“Through awareness mainly using pamphlets, videos, lectures, TV programmes, community visits, partnerships between ministries etc.”* (Alia - public school teacher).

R8: *“May be if they send more professionals like yourself who can come and talk to children about importance of oral health”* (Lili - private school teacher).

R9: *“There should be someone at home and school that gives continuous knowledge about the oral health, so they don’t forget. For example, back in Philippines, oral kits are provided in schools, so children can wash their mouth at any time”* (Lylyan - private school nurse).

R10: *“By having programmes and reminding them to take care of their teeth and parents’ involvement from home”* (Rose - private school teacher).

R11: *“By asking them to eat something better and by confiscating anything wrong that they might catch the child-eating”* (Sendy - private school teacher)

R12: *“Any law will face some difficulties when implemented initially, but it improves gradually until it becomes effective...I would say brochures and videos because we get from YouTube, but they are not good enough. Also, we could include oral health as a subject that is compulsory at least once for all pupils as a part of their curriculum”* (Dorah - public school nurse).

R13: *“If there was a section included in different subjects over one week, it could help. For example, today I will talk about it, maybe another teacher on the next day and so on for the whole week...Yes, maybe in the life matters lesson that we discussed earlier. For example, I can have a question about the number of teeth and a fraction of them had dental problems. The mathematical part would discuss numbers”* (Amal -public school teacher).

R14: *“For example, I can have a question about the number of teeth and a fraction of them had dental problems. The mathematical part would discuss numbers, but I could also talk to my pupils about what could be the reasons for these dental problems...If once a week, yes...Yes, but through different subjects and teachers. The main point is that it should be developed by us and not “imported” from outside because it will be difficult to fit in our teaching plan”* (Amal - public school teacher).

R15: *“We have the lessons about values that we discuss throughout the years and cleanliness is included. We could give them more information, advices and follow up regularly without fail...In the third grade maybe depending on the set criteria and standards. It could be included under the “values” that we teach to the children because it includes cleanliness too”* (Huda - public school teacher).

R16: *“The main one is the school radio because it involves all school pupils at one time. We also have the competitions because primary school pupils are usually excited about winning in such competitions, so this could motivate them...It could be throughout the year and include painting, healthy teeth, healthy food etc. We’ve had them in the past a couple of time and the girls including their parents were very excited back then”* (Samar - public school teacher).

R17: *“Why not? As a teacher I should have certain values that I inculcate in my pupils. I believe that one of these values should be health and this could include oral health. This is from then Ministry of Public Health through the Ministry of Education. These values will then grow with the pupils and help them to achieve better oral health...Our subjects are now realistic and related to daily life. For example, I can teach the pupils “Omar went to the PHCC at 6:30 pm” and then ask them why did he go to PHCC? Is it because of dental problems? And so on. It takes a couple of minutes, but the information is provided in context and the pupils receive it.”* (Samar - public school teacher).

R18: *“I would be really excited if we are provided more information about not only oral health but also about the anatomy, hygiene different types etc. so we can continue to teach children how important their teeth are. If we have more sessions, books etc. at school, this would be nice. It will be nice and important to have a school programme”* (Sindy - private school teacher).

R19: *“We have a web/ mobile application that links us with the parents of our pupils, and we have the option to send private and general messages through that. Sometimes we do send messages about these issues and sometimes in private. It is mostly used to discuss academics but sometimes we discuss about general issues on how the child should be healthy, sleeping patterns, food, hygiene etc...and also, notifications through the app”* (Yahya - parent from private school).

“The teachers and the nurses also went further to describe how the programme should be organized to ensure the change is sustained. For instance, It should be led by an official organization, so it is more credible. The school only passes information but usually if it is from a higher organization, it would have a better

status. The children could learn about different ways of cleaning because most of them know only about using toothpaste and toothbrushing ... If it is a yearlong programme, I would say 2 to 5 years. For example, if I am a student here from grade 1, I would have learned about it every year until grade 4. We should focus more on kindergartens to grade 3 and only informative sessions for later stages. If they are taught at early age it is always better” (Caroline - private school teacher).

These included being led by an official organisation such as the PHCC; involvement of the major stakeholders in its development; employment of additional staff to oversee the programme. For instance,

“If the school and PHC come up with a programme, this could be good (Rose - private school teacher).” The main point is that it should be developed by us and not “imported” from outside because it will be difficult to fit in our teaching plan” (Amal - public school teacher).”

R4: *“The school could appoint someone with a specific job title relevant to these activities which could then execute these activities along with the pupils and teachers. The teachers cannot be responsible for this alone. There will be better ideas and better implementation since it will be done by people dedicated for these activities alone without any other duties...I think that the general values are communicated to all schools, and then it keeps changing every month. For example, last month we had respect, this month's cleanliness and next month's loyalty to the country and so on” (Alia - public school teacher).*

“Here it is the role of the teachers. As a teacher, if I notice that this physical activity has benefitted me or my pupils, I will continue doing even if the programme finished. The same could apply for the oral health programme” (Samar - public school teacher)

R6: *“If the pupils have good examples like their parents and teachers who are implementing these practices, they will certainly follow their habits” (Huda - public school teacher).*

R7: *“Provided that the school does its part by continuous follow-up, I believe this could be maintained for a long time. They will learn that this is important the same way they learn math” (Sandy - private school teacher).*

R8: *“If there is no consistency, it will definitely hinder it. If it starts from KG and stops in year 2 or 3, then the new kids joining later will be missed. Hence it should be consistent in all years of school”* (Rose - private school teacher).

R7: *“Let me tell you something. These programmes should have a clear plan from the management. When we have such programmes during the academic year, and we are already under huge pressure, we will do it for one or two days just for the sake of it. For example, when we had the concept of “healthy schools” few years back, the teachers were under so much pressure with too much to deliver but the idea itself was not effective. The children would participate in the activities, but their wrong food habits still continued as it is. Hence the plan should be well written and clear for both sides. The correct plan will not overburden the teachers. If the plan is well designed, it will be easy to fit within the teacher’s academic plan and implemented it smoothly...It will be related to the subject of that teacher. For example, I would receive something about matters we come across in daily life, but math-related. As for the life values, it is usually decided weekly by the school and applicable to all subjects”* (Amal - public school teacher)

R9: *“If there is a programme that could be implemented in all schools at the same time that would be great. For oral health programmes, the effect is noticed more at homes than in schools. This sense of benefit that I am gaining will ensure continuity. On the other hand, if the programme was just implemented with verbal instructions without further insight, most probably, it wouldn’t work because the teachers will say that they are already overburdened with other duties”* (Samar - public school teacher).

R10: *“I prefer to continue learning in the later grades what that they started in the early stages so that the change could be maintained for the longest possible duration”* (Alia -public school teacher).

R11: *“Well if there is a programme then the teacher is obliged to do it especially if it involves follow up with the dentists because it will reflect how compliant they are about doing their part. It should be made clear since the beginning that this is a yearlong project, so they manage it accordingly”* (Caroline - private school teacher).

R12: *“Provided that the school does its part by continuous follow up, I believe this could be maintained for a long time. They will learn that this is important the same way they learn math...Involvement of administration, home and teacher by educating, checking their foods and snacks, and maybe giving prizes to those who always bring healthy food, dentist visits etc.”* (Rose - private school teacher).

R13: *“Anything that we want to be successful should be followed up regularly. For example, we could design a booklet for each student with an attractive design and follow up their oral health through this booklet for brushing teeth, frequency of brushing, etc. There should also be cooperation from the parent. If we give the booklet and there is no follow up from the parent, then we will at least know where the loose ends are. The student could then share this booklet with the nurse who can recognize the outstanding children for their good behaviour...Usually it is decided by the schools and Ministry. These are usually pre-embedded in the school books and we are only required to discuss it”* (Amal - public school teacher).

R14: *“It would be great if there is a dental programme for free (laughs). The country is rich, and I am sure if it is anything important, they would support without any hesitation. Community might not know how important oral health is and that could explain why such a programme is not yet available. I would love it if my pupils can benefit from the implementation of this programme”* (Caroline - private school teacher).

Summary

Oral health care was identified as being crucial for school children. Promoting oral health education in schools provides the basis for children to practice oral health behaviours, such as frequent brushing of teeth, dental flossing, mouth washing, rinsing and the use of appropriate toothpaste. It is well established from the data that oral health behaviours in children help in preventing or reducing cases of oral diseases such as dental caries, gingivitis, periodontitis and other related disorders. The participants presented adequate information about oral health practices among children. From the information collected, it is evident that promoting oral health education in schools and supporting such practices at home enhances the ability of students to improve their oral

health status. As such, schools and homes have a crucial role in shaping oral health behaviours of school children. Parents and teachers have the responsibility to supervise and educate school children on the best oral health behaviours. They also have a role to play in guiding children on the best food they should eat to avoid oral health diseases. For instance, parents and teachers should teach children the association between sugary diets or foods and the development of dental caries. This way, they assist school children in improving the level of knowledge, attitudes and behaviours towards food choices, which is necessary in reducing cases of oral disorders. Besides, the implementation of oral health programmes in Qatar schools should be aimed at improving dental care practices among school children. Teachers play a crucial role in ensuring that their pupils comply with the necessary oral health behaviours, including how to brush their teeth and maintain oral hygiene. The programmes can be extended to homes as a way to support oral health and oral hygiene, especially in children from rural and low-income areas.

This chapter has presented the results of the case studies. The respondents gave an insight into the previous and current programmes and also identified issues with the programmes. Most importantly, they highlighted ideas that, if implemented within the school, the home and the health services, they might enhance dental caries prevention in Qatar. Oral health care is crucial for school children. Promoting oral health education in schools provides the basis for children to practice oral health behaviours, such as frequent brushing of teeth, dental flossing, mouth washing, rinsing and the use of appropriate toothpaste. It is well established from the findings that such oral health behaviours in children help in preventing or reducing cases of oral diseases, such as dental caries, gingivitis, periodontitis and other related disorders. The participants presented adequate information about oral health practices among children.

From the information collected, it is evident that promoting oral health education in schools and supporting such practices at home enhances the ability of students to improve their oral health status. As such, schools and homes have a crucial role in shaping oral health behaviours of school children. Parents and teachers have the responsibility to supervise and educate school children on the best oral health behaviours. Parents and teachers also have a role to play in guiding children on the best food they should eat to avoid oral health diseases. For instance, parents and teachers should teach children the association between sugary diets or foods and the development of dental caries. This way, they assist school children in improving the

level of knowledge, attitudes and behaviours towards food choices, which is necessary in reducing cases of oral disorders. Besides, the implementation of oral health policies in Qatar was found to improve dental care practices among school children. The policies ensure that teachers help their children to comply with the necessary policies that guide them on how to brush their teeth and maintain oral hygiene. The policies can be extended to homes as a way to support oral health and oral hygiene, especially in children from rural and low-income areas.

CHAPTER SIX

Co-Production Workshop: Approach And Findings

Introduction

This chapter presents the results of the co-production workshop, which was aimed at obtaining further inputs from the school oral health stakeholders in regard to the oral health prevention framework developed for dental caries prevention. The co-production workshop was the final phase of the study where the participants of each school worked together to explore, from their points of view, the factors that were important in the primary school and home environment, and how they can be linked to the existing oral hygiene programme being implemented in primary schools within Qatar. Promoting oral health education in schools and at home allows students to engage in oral health practices that prevent them from the risk of dental caries and other oral health diseases. As a result, schools and homes have a responsibility towards shaping oral health behaviours of school children. Parents and teachers work together to supervise and educate school children on the appropriate oral health behaviours. The aim of the oral health programme was to give school children a chance to shape what a good programme should focus on, and what would be involved in the future, and thus identifying how best to develop dental caries behavioural prevention strategies for children in Qatari primary schools by examining the evidence. A brief overview of the methods used for the workshop and the patterns that emerged from the data are presented in this chapter. Verbatim quotations from the participations and the visual technique of using centre stage diagrams drawn by the participants are also included in this chapter as recommended by Williams and Keady (2012).

Methods

The centre stage approach by Williams and Keady 2012 was adopted to explore the participants' views about what would be the content of the new oral health programme, who will be involved, where the challenges and barriers would be, when the programme should take place and the motivation for change in their setting. The centre stage approach (Williams and Keady 2012) was developed based on the Constructivist grounded theory (Charmaz, 2000). Unlike in the original Grounded Theory which is mainly rooted in data-driven theory generation based on researcher's interpretation of the data (Glaser & Strauss, 1967), constructive grounded theory seeks

collaboration between the researcher and the study participants to co-create a theory (Charmaz, 2000). The centre stage approach allowed the study participants to co-create a theory by using diagrams to express the relative importance they attach to different aspects of a phenomenon, with the most important being at the centre of the diagram.

Workshop participants.

Although the original plan was to recruit 12 participants for the workshop, two prospective participants (one from each school) withdrew before the onset of the workshop. Another participant from the private school withdrew at the beginning of the workshop due to illness and another participant withdrew from the public school due to family circumstances. Therefore, only Eight participants attended the workshop, four from each school. They were recruited from the participants of the case study interviews. The participants of the workshop have prolonged experiences in education. The characteristics of the workshop participants and the assigned pseudonyms are presented in Table 8.

Table 8. Workshop Participants

S/N	Pseudonym	Gender	Nationality	Age	Description
1	Mona	Female	Qatari	34	Mother of Maria and a Mathematics teacher
2	Nawal	Female	Qatari	9	Grade 4 pupil
3	Noora	Female	Qatari	35	Mother of Nawal and an Administrative employee
4	Huda	Female	Qatari	36	Teacher of Social studies & coordinator.
5	Samar	Female	Non-Qatari	39	Mathematics teacher for Grade 5
6	Sendy	Female	Non-Qatari	54	English teacher for Grade 5 grade and has lived in Qatar for 15 years.
7	Caroline	Female	Non-Qatari	40	Teacher of all subject except Arabic & religion

S/N	Pseudonym	Gender	Nationality	Age	Description
8	Yahya	Male	Non-Qatari	38	Father of Younus and English, Math, and Science teacher

The pre-plenary processes.

Each of the participants was given a note-book, a pen and colouring marker pens for the workshop. The principal investigator went through the workshop information sheet (appendix 6) and the workshop consent form (appendix 11) again with the participants. The participants were then introduced to the workshop. In general, the participants were very enthusiastic and interacted very well during the workshop. During the workshop, the participants expressed their ideas, suggestions, feelings, experience and their hopes with regards to an oral health programme that can prevent dental caries and allow the coming generation to live with healthy teeth.

The workshop processes.

The purpose of the workshop was to explore the participants' thoughts on the way to develop a programme that tackles Dental Caries and building on the findings from the interviews. The session was organized in two parts. In the first part, the participants were asked what they thought is 'centre-stage' in an ideal Oral Health programme using diagrams and placing what, who, when and where in the flowcharts with the important factors in the middle, less important to the margins and looking at inter-relationships. They then built on their work at the model derived from the findings of the interviews and tried to see if that helps in developing their initial ideas further. The workshop in the public school was conducted in Arabic while the workshop in the private school was conducted in English.

Positioning analysis.

The centre stage diagram in this study primarily explored the following questions, which were developed based on the findings in the case study interviews:

- What would be the content of the Programme, and what would be included?
- Who will be involved in the programme?
- Where are the Challenges and Barriers to the programme?
- When should different parts of the programme take place?

- In your setting, what would be the primary motivation for change?

The centre stage diagram summarizing the positioning analysis is presented in the following Figure 19.

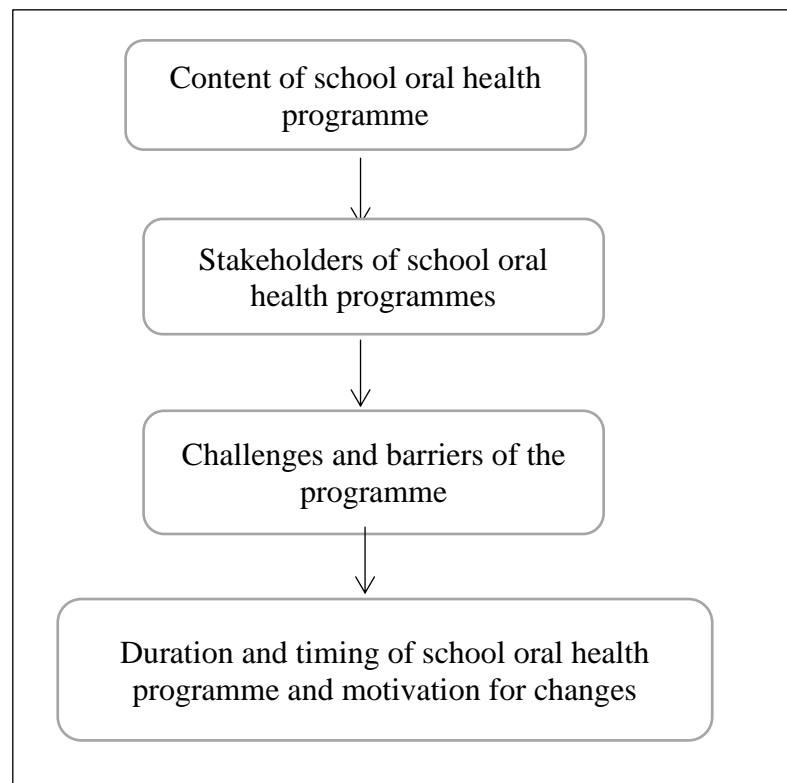


Figure 19. The centre stage diagram

The participants had a discussion on each of these questions and then drew a diagram to represent their positioning. The workshop discussion was analysed based on priority themes from the questions that consisted of content of school oral health programme, stakeholders of school oral health programmes, challenges and barriers of the programme, duration and timing of school oral health programme and motivation for changes.

Findings

This findings subsection presents the themes and categories that emerged based on the data obtained from the interviewed participants. The chapter entails the themes that the researcher obtained from the interviews on pupils, nurses, parents, and teachers. The themes that emerged from the interview sessions are as follows:

1. Content of the school oral health programme.
2. Stakeholders of school oral health programmes.
3. Anticipated challenges, and barriers of the programme

4. Duration, and timing of school oral health programme
5. Motivation for change

Content of the school oral health programme.

The content of the school oral health programme was viewed by all participant categories as being essential to enhance dental health. All participants suggested that both preventive and curative interventions would make school oral health interventions more effective. One participant highlighted the importance of monitoring and all of them indicated their awareness of oral health programmes including their effectiveness to the oral health of school-going children. The participants supported the need to integrate oral health programmes into school curriculums as reflected in the following statements:

“I think we need awareness and care because they are different. Awareness is like advising people about health, but care involves providing treatment if there are any issues. This is with regards to the content of the programme ”(Samar) and “Education comes first, implementation comes second, and monitoring of the whole process is also important” (Yahya).

All participants concurred that oral health awareness needs to be prioritised in schools. The concept of oral health awareness was used by all participants to refer to the health education and awareness that is proposed through oral health education programmes. Therefore, the participants proposed the introduction of workshops to aid in the development and implementation of oral health programmes. Enhanced oral health awareness was supported by the participants as noted in the following participant’s statement:

“I think before the workshops we need to make students aware that we are going to have workshops and whatever we are developing are programmes for you (the children) because it is important. So, we need to develop awareness before the workshops. We are stressing more on the awareness that should be made before these activities because the children should know the importance of healthy teeth” (Sandy).

Another participant also explained that

“...because if we let them know about the importance of what we are doing, the other person will be motivated and enthusiastic. This applies to students, parents, and teachers” (Sama).

Prioritization of oral health awareness was further affirmed through the posing of a question on the same by one participant and provision of an affirmative response from the others. The questions posited as seen below:

So, if we want to identify our priority when it comes to a programme to improve oral habits for school children, what would it be? Do we agree on awareness?"
(Samar)

Hence, the participants supported the need for schools to prioritize oral health programmes as a strategy for improving the oral health behaviours of children. They supported that incorporating the programmes in classwork and introducing workshops for students play a crucial role in increasing their awareness levels on oral health habits. The participants also suggested how oral health awareness could be carried out, including early morning catch-up, weekly assembly, special workshops, incorporation into lessons, direct instruction, distribution of oral health aids to the pupils. Community outreach was also proposed as a means of reaching a larger number of parents.

"We have the weekly assemblies where the children usually present plays about lessons they learnt, and we are thinking to incorporate oral hygiene into the lessons and hence these assemblies." (Sendy)

Caroline also explained that,

"Another thing is the early morning catch-ups before the lessons. We could use one of those sessions to create awareness and discuss about oral hygiene."

Besides another participant also mentioned that,

"We could also do it similar to the "life values" lessons that we have by including one or two references in our daily lessons to the students regarding oral health. If it is official through the academic coordinator, they will review our daily lesson plan to ensure that it includes messages regarding oral health" (Samar).

Similarly, one participant shared that,

"Yes, maybe like a workshop or morning lectures to the teachers to increase their awareness as well" (Huda).

Another participant also explained that,

“It could also be done through direct instructions mainly for the older students who show up in the morning with bad breath. The teacher could ask them to go and brush it immediately, and if this happens once or twice, then it is a form of awareness for the children” Sendy.

Caroline shared that,

“As we have the hand wash after each meal, we could introduce the same for brushing teeth or gargling.”

One other participant also concurred with the other participants by mentioning that,

“Even in malls, they could have a small information desk for this programme in the same way it’s done for other programmes like diabetes, cancer etc. It will help creating awareness for everyone – not only the families but also the laborers and all sections of the community. It could also be extended to prisons, hospitals, and other public places. If it’s only going to be in schools, I am not sure if you will involve all stakeholders because parents can get this information outside, and this will have a positive impact on their attitude towards the same programme in the school.” (Samar)

Stakeholders of school oral health projects.

Both the public and private school participants identified the school, the family and the dental services as the major stakeholders who should be involved in school oral health programmes and their roles. Such propositions are reflected in the following statements:

“Let me tell you about myself. Until today, it is my wife or myself who are brushing our children’s teeth every morning and evening because if I just tell them to do it on their own, they would do it for few seconds and that’s it while it should actually last for at least a couple of minutes. So, what I personally believe is that if you are planning to tackle the problem from its roots then you need to involve parents, teachers, and everybody and anybody involved in this process” (Yahya).

Other participants also concurred with Yahya’s proposition as depicted in the statements they gave below:

“As for the participants, it says about parents and students, but when it comes to awareness, all members of the family could be involved. Awareness could be created among parents, and since the programme is for students, awareness should involve the school members like teachers, nurses etc...Also, it is difficult for us as teachers to search for the right information about this topic but when we have someone professional provide this information to us regularly, we could then help in delivering these messages to the students in the right way” (Samar).

“This comes as a routine since childhood, and the only way is to enforce it and through being a good role model at home. To me, if I did not sing the happy birthday song twice in my head, then I am not done brushing yet. This is a must for morning and evening” (Sandy).

The participants also re-echoed the findings of the case study interviews that the school is the main driver for change. This is because they explained that pupils spend most of their wakeful hours in school and take the information provided in school more seriously. These findings concur with the statements from the participants below:

“I feel that the bigger role will be for the schools. The school is the main driver for change as it will drive change through the students...it is mainly the schools because the children listen to the advice, they receive at the school more seriously” (Noora).

Another participant said,

“Students spend most of the time at school so if it implemented, then it will be embedded in them. It will be an ongoing process involving home, school, and you (the health services). If you have dental services in the schools instead of a nurse, the children will be encouraged to see them every time they experience any dental issues” (Caroline).

One other participant made the following statement;

“The stakeholders will be of course the teachers and depending on the frequency we could ask the parents to attend as well – just like we do for the assemblies.”
(Sandy)

Samar also shared that, *“It is more convenient for the schools and teachers to conduct their workshops at the school because it is difficult to move to another location with all the faculty and administration.”*

Samar explained,

“I believe it won’t be difficult to deal with the students because they are with us in the school, and we can easily communicate our messages to them by making the issue about their own oral health. Students usually listen to the teachers more than their parents.”

Anticipated challenges and barriers of school oral health programme.

The participants in both private and public schools identified several challenges and barriers that may affect the school oral health programme. The public-school teachers agreed that the biggest challenge would be the reluctance of teachers to accept additional workload. They however suggested that the workload could be reduced to accommodate oral health programme. For instance, a participant explained,

“So, I think it is not difficulty for the students, but the problem is about getting teachers involved. For this to happen, teachers should see strong reasons that drive them to participate in the awareness process. The teachers are already overburdened and hence require some real motivation to take up this additional task...the problem I see lies with the teachers – how do we get involved? ...What do you think? I need all of you to convince me as a teacher to get involved (laughs)” (Samar).

The aspect of challenges is also explained by another participant’s statement who shared that,

“It is doable if some other burdens are eased off the teachers. If the load of lessons is reduced to give way for such a programme, it would definitely motivate the teachers” (Huda).

Low level of participation of the pupils and parents was also recognised as an additional challenge of school oral health programme. The participants especially identified lack of follow-up at home as a great challenge as seen in the following participant’s statement,

“I think that one of the challenges could be non-response from the potential participants, including us (the teachers) and the other reason could be non-response from the students because of their fear from dental problems in general.” (Samar)

“The biggest challenge comes from home because if they leave their home in the morning without brushing their teeth, then that is a challenge. When they come to school, there is another challenge where the teacher is supposed to follow up

with them if they brushed. So, the challenge could be at school, but it starts at home “ (Sendy).

Yahya also mentioned that,

“Also important is the monitoring mainly for those children who are looked after by nannies and maids. I always work with some sort of a reward-based attitude because sometimes people ask what do I get if I do this.”

Other challenges identified by the participants include not having a chance to brush the teeth after eating outside and personal laziness. The challenges are as posited in the following statements,

“I think there are challenges even outside the home and school. For example, when we eat outside, we don’t get the chance to brush or gargle after the food. This is a challenge too” (Sendy)

“The way I look at it as laziness to do the right thing. Not looking or dressing properly or brushing is basically laziness and that is the biggest challenge” (Yahya).

Duration and timing of new school oral health programme.

Most participants preferred continuous or regular programmes throughout the year. Suggestions included daily, weekly, quarterly, biannual and annual programmes.

For instance, one participant shared Sendy that,

“The development of awareness should be an ongoing thing throughout the year” (Sendy).

Similarly, another participant explained that,

“I feel that dental problems are like an epidemic and majority of the children are suffering from it. That is why I think that one workshop will not bring enough change and we need to have something more” (Yahya).

Caroline also mentioned that,

“It could be a weekly thing in the classroom or from assembly to assembly or quarterly during each academic year. Every 2 months there could be a workshop for the teachers or parents.

Solo from private school stated,

“It should be a part of their daily routine like brushing and gargling after each meal. Since the children spend most of the time at school, it has to be implemented in the school routine. The dental week could be done once per year including

workshops and lectures, but the monitoring process should be ongoing on a daily basis”

Mona from public school said that,

“Yes, it could be at least twice a year and involves activities for maybe a week.”

A similar response was echoed by Huda that,

“I think implementation wise the schools are very active in implementing and supporting but the problem is that there is no follow up post implementation like assessment, reminders etc.”

Also, Mona echoed that,

“But it would be better if these activities last longer than one day and on a continuous basis.”

Motivation for change.

The participants highlighted motivations for change including incentives, medical benefits derived from the programme, awareness and monitoring. For instance, one participant shared the following position,

“Coming to the programme, I think there has to be an incentive mainly if the child wasn’t taught to do this early in their childhood and asked at older ages. As adults and children, we always need incentives. What do you think?” (Yahya)

Another participant concurred through the following statement,

“I think you are right because the habit stays on throughout the life. It should be like “one-two-three” where you wake up, take a shower, brush your teeth etc. The other incentive is like giving them fancy toothbrushes and toothpastes that get their attention” (Sandy).

Samar also echoed that,

“As a mother, I will be accepting this programme because it would mean more benefits for my children and less dental visits, so this is motivating enough for a parent...It could be the current state of dental health in schools”

Also, mentioned in support of Yahya is the following statement by another participant:

“I think it is monitoring at home because from my personal experience with my son, children need continuous monitoring at home” (Caroline).

Motivation for change can be achieved by designing oral health programmes that inspire school children to take part in oral hygiene. Through such programmes,

school children get the chance to practice oral hygiene that reduces the risk of dental caries and related diseases.

Design of New School Oral Health Behavioural Prevention programme

Both groups had discussions before designing their programme in the form of a diagram. The discussions and the diagrams from the private school and the public-school workshop participants are presented below. The designing of the school oral health programme is based on the information collected from co-production workshop and centre staging, or positioning analysis. This subsection thus, presents co-production discussion of participants from public school and co-production discussion of the private school participants.

Co-production discussion of the participants from the public school.

The participants at the public school had discussion on what they were going to design. They preferred to make a chart, like a network diagram, then to follow the centre-stage model to design the final diagram (see Figure 20). The participants perceived that follow-up at school and dental visits are useful to provide the necessary support and content on oral health for school children. For instance, Samar said,

“So now we have 3 sections – content, participants, and challenges. We identified that priority is awareness so what do we discuss next – content or participation? I think that for such programmes, there should be support from the Ministry of Health as well. It shouldn’t be like the initial check-up that we do for creating the student’s health record where we wait for hours to see the dentist and it ends with a disappointing check-up without any result. It is just for the sake of completing the file. But such programme, if implemented, should have an extension through the ministry such that it starts in the schools, but the follow up is done all the way to the clinic and beyond. So, does the Ministry has the ability to provide such support to each school? It seems that the awareness and content are actually inter-related. The content has a direct effect of the awareness. What did we discuss about the content? Technical support (Medical teams and follow up)”

Noora shared that,

“Also workshops for the students, parents and the programme managers.”

Similarly, Samar explained that,

“Yes, we are doing that now. The student is transferred by the school nurse to continue follow up with a paediatric dentist at the PHCC (principal investigator).

Huda shared,

“I once received a call from the PHCC for my child to follow up at the clinic. I am very caring when it comes to my children’s dental health and follow them closely. When I visited the clinic, they informed that his teeth were fine, but he just needs to follow up more regularly”

The challenges of oral health programmes were also mentioned as seen in the statement posited by one participant:

“Let’s look at the challenges. What do you think about that? I think that one of the challenges could be non - response from the potential participants, including us (the teachers) and the other reason could be non-response from the students because of their fear from dental problems in general...Yes, I think if we depend on the parents in a big way, there are chances of failure due to variation in the level of participation from one family to another” (Samar).

Mona said that,

“Because they are totally dependent on the school for such things.”

The public-school group had discussion used before writing and drawing using the flow chart. For instance Huda asked,

“If we include these items in the programme, will it be applied through the ministry activities?”

Noora replied to Huda by mentioning that,

“Yes, I think it will be within the life values.”

Huda also replied that,

“Everyone should be committed and do their best.”

Mona also said. *“It should be something officially included through the ministry.”*

Similarly, Huda replied,

“Because every year we meet with the school principal and the academic counsellor to decide the activities, events etc. for the whole year. Based on the

requests we receive from the different sections, we finalize the programme for the whole year.”

Samar also shared that,

“The chart we are making is like a tree where the most important item is at the top and other components like content, participants, challenges etc. are under it. The top priority is awareness.”

Also, Samar replied that,

“It could be both – the content of the lessons and the implementation plan.

Huda further mentioned that,

“Usually the content is after the awareness.”

Noora said in reply to Huda,

“But we should have content in order to spread awareness. What do you think?”

Similarly, Samar replied through the following statement,

“I think the awareness is important because if I draft strong content, but my awareness is poor the result will not be satisfactory but if I have strong awareness, I will still manage to convey the message even if the content is not that strong. In the chart, we are showing the importance of the things from priority basis but not from the implementation basis... No awareness is more important. Let me give you an example like marketing. If I have a product that I made in the best way but then I did not market it well, it will be of no use but if I market the product well, it will work even if the product has some minor flaws. In the same way, if I have a content that is very strong, but I am not able to deliver it to the community, there is no benefit at all. So, if the parent or teacher or the student are convinced through proper awareness about the importance of this programme, they will implement it with self-motivation. Do you all agree, or you have other opinions?”

Huda replied that,

“I agree with you.”

Noora also replied that,

“I thought about it from the implementation perspective.”

Samar further responded,

“Yes of course when it’s time to implement we have to start by drafting the scientific content of the programme and the implementation plan as well but as I said here, we are only talking about the importance of each item from planning perspective.”

Then the group designed a network diagram as presented in figure 20. The group chose Samar to talk and he made the following statement:

“Our programme focuses on awareness followed by content (in terms of the programmes and lectures that will be delivered) and then participants (parents, students and programme managers) and finally the dental service providers. The answer to “where” is at the school and “when” is throughout the academic year. As for the challenges, we included fear by the students, non-response from the parents and non-cooperation from the programme team (teachers and dental services).”

The principal investigator said:

“Very well – so all of you agree on this programme?”

Samar and Huda said

“Yes”.

The other participants shook their heads in the affirmative. The participants compared the tree diagram with the model developed from the interview and designed their final diagram (see figure 20).

Samar explained,

“Yes, I think they are inter-related. In the interviews, they have referred to the same issues that we just discussed about the drivers for change. I think the only item not covered in the interviews is the challenges that the proposed programme could face. If we look at each of these circles, we have the title and then the details. For example, we have the services which means the school. Within the schools, we have the teachers and students who will be involved in the workshops. Another example is the family where we have the awareness of the family members. Another example is the dental services where we need their technical support and supplying (simplified) information that we can deliver to the students

because we (teachers) are not well versed with these health topics and need this type of support.”

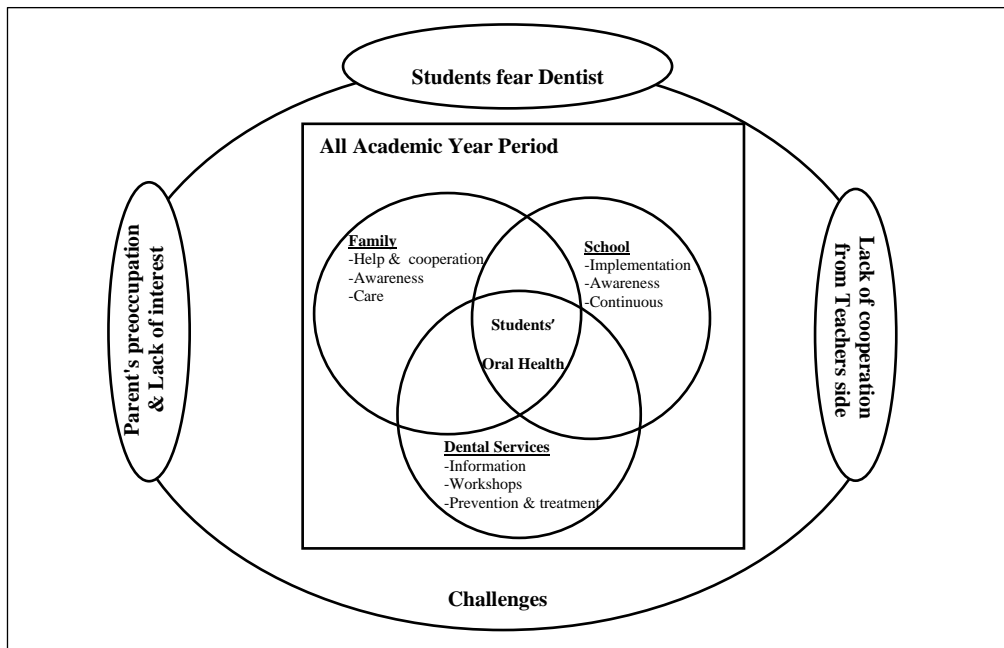


Figure 20. Public School Framework.

Co-production discussion of the private school participants.

The participants at the private school had enough of previous discussions and preferred to work on the chart flow immediately (See Figure 21). They supported that follow up from home to school assists school children to understand the need for oral health hygiene, and the importance of seeking dental services. The participants supported the concept that dental services and schoolwork collaboratively in providing check-ups, monitoring and advertising the need for oral health hygiene.

For instance, Solo (explaining the final draft of the chart in Figure 21) shared,

“It all starts from home and then the school and Ministry of Health. The school will follow what is initiated from home to help the child be aware of the importance of oral health. The idea of oral health will be embedded more in the children if they have more access to dental services like check-ups, monitoring and advertisements about importance of oral health.”

The principal investigator asked: How will the dental services and schools interact?

Yahya replied,

“There will be workshops organized by representatives of the Ministry of Public Health that will be delivered in schools. The responsibility of the school will be

daily monitoring of the oral habits for the children, discussing it during events and assemblies and having 3-4 workshops in collaboration with Ministry of Public Health.”

Sendy said that,

“It shouldn’t be limited to workshops, but the dental services could actually do check-ups at the school...Yes, in my earlier school that was owned by a company, they used to provide the dental accessories as gifts to all the students.” Also Caroline replied that, “And supply accessories too.”

The private school participants compared their chart and the case-study interviewed outcomes diagram. Yahya explained,

“Our chart already addresses home, school and dental services but we haven’t talked about the negative forces that you mentioned in your chart... It is actually religious, and it works far better than the toothbrush. It eliminates bad breath and also prevents mucus formation due to coughs.”

Also, Sendy said,

“I was going to talk about the culture earlier in the workshop but felt that it could be rude to bring it up. I did notice in the culture here they use (miswak)... I did not know it had all these benefits. In our childhood, we saw our grandparents use powdered charcoal instead of toothbrush.”

Yahya further said,

“I would slightly disagree because I don’t think the culture and society promote bad oral health because the older people and many young ones too enjoy good oral health. It is just the lazy nature and consumption of harmful food that destroy the teeth. For example, we never see cans of coke around older people when we visit them.”

Solo also shared,

“I would say the cultural issues are involved because eating excess sweets is very prevalent in the society and it is a problem. So, it’s not laziness but it’s just they don’t know about the importance of oral health because even if I am lazy, I would still do it if it’s important.”

Sendy replied,

“There are negative factors like laziness, “don’t care” attitude, bad time management, no routines etc. It is time management because it’s like a medication that you have to take daily at a certain time and if you miss, it upsets the routine.”

Participants together the case-study interviewed out-comes diagram and theirs to final one that if implement will control the behaviour of children. For instance, Sendy said,

“Yes, we could because the main headings are more or less the same, but you could enter the details we discussed as sub-headings in your chart. I don’t think schools are expecting permanent clinics but once or twice a year will be sufficient. Back in my country, they have huge trucks with dental professionals who do roadside awareness and check-ups on the move. The idea was very welcomed in our country. I am not sure how it would work here.”

Caroline replied, *“They do it in the Malls here but not for dental health.”*

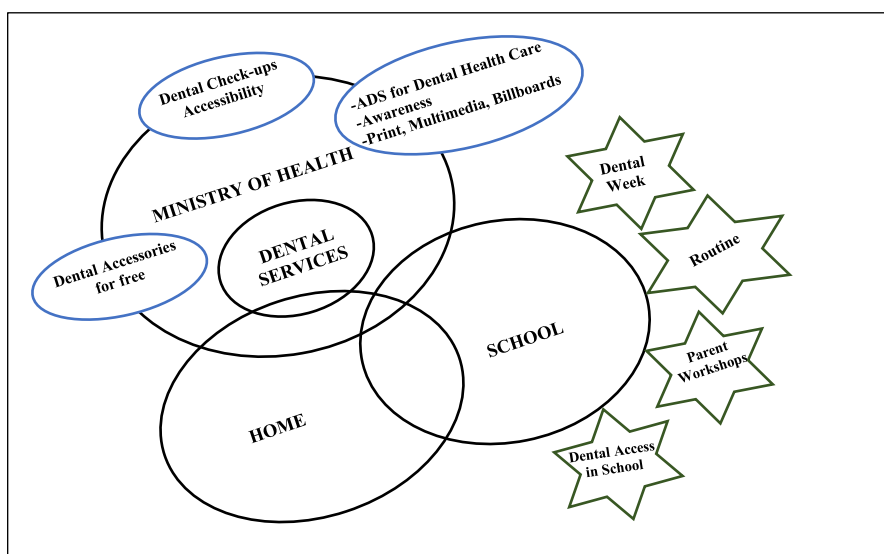


Figure 21. Private school framework

Synthesis

The co-production workshops in the private and the public schools revealed the preferences of the participants with regards to the behavioural intervention of school oral health in Qatar. The synthesis section content of the school oral health programme, roles of stakeholders in school oral health programme, challenges and barriers of the programme, duration and timing of school oral health programme, and motivation for

changes. Participants shared their views, suggestions, and the best framework to build a strategy for a comprehensive collaborative oral health programme.

Content of school oral health programme.

The participants recognised a need for a school oral health programme with both preventive and treatment components. The discussion focused on the importance of oral health awareness - educating the parent, the teachers and the children about oral health and oral health programmes. Increased awareness of parents will lead to more dental care of the children at home. Thus, it was recommended that oral health workshops should be organized for parents and teachers. The teachers preferred workshops on oral health awareness and education at their school for convenience. The participants suggested that oral health awareness could be carried out through early morning catch-up, weekly assembly, special workshops, incorporation into lessons, direct instructions and distribution of oral health aids to the pupils.

Roles of stakeholders in school oral health programme.

The school, home and the dental services were recognised as the major players in school oral health. Most participants considered the school as the most important source of oral health information to the child. The school parents are expected to reinforce and follow-up what children have learnt at school. The dental service is expected to take a lead in developing the programmes and impacting knowledge to both teachers and parents. The participants emphasized the need to involve all stakeholders in the development and execution of oral health projects.

Challenges and barriers of the programme.

A number of challenges were identified by the participants. These include increasing workload for teachers which may discourage them from participating in school oral health programmes. Non-engagement by parents was also identified as another challenge which may hinder follow-up at home. Fear of the dentists by the pupils was also recognised as a factor which may prevent engagement by the pupils.

Duration and timing of school oral health programme.

There was a consensus among the participants that the school oral health programme should comprise of regular interventions, some of which may be daily, weekly, monthly, quarterly, biannually or annually. For example, routine daily brushing after school lunch, and annual dental week were suggested.

Motivation for changes.

It was identified that knowledge of the benefits of the programme is enough to encourage participation of parents. Thus, parents need to be educated about the benefits of oral health programme and oral hygiene. The participants believed that incentives are important to encourage children to accept the service because of the low oral health awareness in the community.

Summary

This chapter has presented the results of the co-production workshop that was aimed at obtaining further inputs of the school oral health stakeholders in the framework for school oral health programme in Qatar. Using the centre stage approach, the participants expressed their expectations about the proposed school oral health programme in Qatar. The participants identified oral health awareness as the priority intervention in school oral health programme in Qatar.

CHAPTER SEVEN

Synthesis and Modelling

Introduction

This chapter presents the overall synthesis and modeling of the framework for dental caries prevention in Qatari primary schools. The primary investigator developed the oral health prevention framework from the results and the phases by focusing on the scoping review, the case study interviews, and the co-production workshop. The chapter will summarize the key findings of each study before creating a synthesis that develops a framework for dental caries in Qatar.

Summary of Findings

Scoping review.

The scoping review of literature on school based behavioural prevention strategies identified three recurring themes:

- i. Types of behavioural prevention strategy
- ii. Effectiveness of behavioural prevention strategy
- iii. Determinants of behavioural prevention strategy effectiveness.

The literature reported the following types of behavioral prevention strategies employed in previous school oral health programs around the world: traditional oral health education (Chachra et al., 2011; Daouda et al., 2016), oral health education with digital media (Hebbal et al., 2011; Mohamadkhah et al., 2013; Shenoy & Sequeira, 2010), motivational interview (Gonzalez-Del-Castillo-McGrath et al., 2014; Mohammadi et al., 2015), experiential learning (Angelopoulou et al., 2014; Angelopoulou et al., 2015), oral health puzzles (Saied-Moallemi et al., 2009), supervised tooth brushing (Macnab et al., 2008; Tarvonen et al., 2017) and supply of oral health aids (Naidu & Nandlal, 2017).

Besides, the studies discussed the effectiveness of school oral health programmes. The outcomes assessed in the studies were oral health knowledge, oral health attitude, oral health behaviour, tooth-brushing, dental flossing, reduction in sugary snacks intake and dental visit, oral hygiene (reduction in dental plaque), DMFT, and DMFS. Thirteen (13) studies have assessed oral health knowledge, and all have reported improvement in oral health knowledge following oral health promotion, irrespective of the type of behavioural prevention strategy. Nine (9) studies have

assessed oral health attitude, out of which seven (7) have reported significant improvement following school oral health programmes. Eighteen (18) studies have assessed oral health behaviour, out of which sixteen (16) have reported improvement in oral health behaviour, especially tooth brushing. Seventeen (17) out of eighteen (18) school oral health programmes have documented a reduction in dental plaques following oral health programmes. Only thirteen (13) out of twenty (20) school oral health programmes reported improved dental caries incidence.

Finally, the review identified the factors that enhance the effectiveness of school oral health programmes, which includes the involvement of parents and teachers (Damle et al., 2014; Petersen et al., 2016; Saied-Moallemi et al., 2009; Tai et al., 2009; Yekaninejad et al., 2012), active engagement of pupils (Angelopoulou et al., 2014; Angelopoulou et al., 2015); periodicity and regularity of oral health programmes (Daouda et al., 2016; Gonzalez-Del-Castillo-McGrath et al., 2014); use of teaching aids (Hebbal et al., 2011; Mohamadkhah et al., 2013; Olubunmi and Olushola, 2014) and combination of multiple interventions (Chandrashekar et al., 2014; Tai et al., 2009).

Case study interviews.

The case study interviews explored school, dental services, and home circumstances that influence Qatar's childhood oral health. The participants identified personal, organizational, and cultural factors that affect school oral health programmes and children's oral health in Qatar. Personal factors identified include forgetfulness, fear of the dentist, parent's busy lifestyle, etc. Cultural factors are mainly dietary, as consumption of confectionaries is part and parcel of Qatari society. The organizational factors refer mainly to the lack of coordination and monitoring of oral health programmes and inequity between oral health programs in public and private schools. The case study interviews revealed the fragmented state of school-based oral health programmes in Qatar. Although many oral health promotion activities were implemented by teachers in Qatari private and public schools, they were mostly uncoordinated. The participants also recommended several strategies for improving childhood oral health in Qatar.

Co-production workshop.

The co-production workshop explored participant's views and obtained further inputs from school oral health stakeholders in the framework as being developed for

dental caries prevention. The co-production process workshop explored, from participants' points of view, the factors that were important in the primary school and home environment, and how it can be linked to the existing oral hygiene programme being implemented in primary schools within Qatar.

Using the centre stage diagram approach, the participants identified what and who should be involved in the school oral health programme, when this programme should take place and where the challenges and barriers are for school oral health programme. There was a consensus among the participants that the programme should involve oral health awareness and education that could be implemented in morning assemblies and specially organised workshops. They also advocated for dental check-up. The stakeholders identified by the workshop include the school, the teachers, the pupils and the parents. The Ministry of Health was also identified as a lead stakeholder.

The projected barriers identified included reluctance of teachers to participate due to increased workload, lack of follow-up at home by the parents due to their busy lifestyles and fear of the dentist by the pupils. They advocated that the programme should be mainly school based as children spend most of their time at school.

Modelling

The main findings from the studies that centred on Phase 1 (scoping review), Phase 2 (case study interviews) and Phase 3 (co-production workshop) were synthesised (Table 9) in order to model the overall factors that seemed to operate in influencing the dental health programme. The themes identified from the scoping reviews, case study interviews (with parents, teachers, pupils and school nurses) and co-production workshops were synthesised to describe the problem in question.

Based on thematic analysis, which was used to explore the participants' responses and determine recurring themes from the data as discussed by Nowell et al. (2017), three main constituencies were identified that focused on school, family and dental services. These were interrelated with themes in shaping the development and impact of the dental caries prevention programme.

The synthesis of findings generated a 'Prevention Model in Qatar' (See Figure 22) to provide an explanatory framework that delineates the key influences identified from the study. The issues surfaced in the study regarding dental caries were centred on developing and embedding a dental health that involved the three constituents of family, schools and dental health services. The synthesis of findings supported the implementation of oral health education programmes in schools to assist children to

actively participate in oral health practices. The findings supported the role of parents, teachers and school nurses in supervising and motivating school children to improve their oral health behaviours by reducing or even preventing dental caries.

As part of the synthesis, four interrelated contingencies were also identified – *habit, diligence, awareness and presence*, and therefore placed at the intersection of the circles. The model also highlights the presence of negative centrifugal forces that operate as contexts, leading to what was termed as ‘fractured oral health’ impacting on the contingencies and the three constituencies. Opportunities exist for programmes that are able to draw together the three constituencies that enable ‘bridging’ the fractured forces centred on cultural, societal and also organisational.

Table 9. Themes from all Studies

Scoping Review	Case Study Interview	Co-production Workshop
Type of behavioural prevention strategies Traditional oral health education Oral Health education with digital media Motivational interview Experiential learning Oral health puzzles Supervised tooth brushing Supply of oral health aids	Existing school oral health activities Facility-based programme Health education Healthy eating Health week Curriculum	Content of School based Oral Health i. Oral health awareness ii. Oral health education iii. Parents Workshop iv. Free dental accessories v. School based dental care vi. Dental week
Effectiveness of BPS Oral health knowledge Oral health attitude Oral health behaviour (tooth-brushing, dental flossing, confectionaries consumption and dental visit) Oral hygiene (Dental plaque) Dental caries (DMFS, DMFT)	Current Oral Health Profiles Good oral health knowledge Good oral health attitude/perception Good tooth-brushing habits Poor dental flossing Suboptimal dental visit	Stakeholders i. School ii. Dental Services: including Ministry of Health iii. Home

<p>Determinants of Effectiveness</p> <p>Involvement of parents and teachers</p> <p>Active engagement of pupils</p> <p>Periodicity and regularity of oral health programmes</p> <p>Use of teaching aids</p> <p>Combined interventions</p>	<p>Barriers</p> <p>Personal: forgetfulness, laziness</p> <p>Environmental: lack of follow-up at home, lack of programme monitoring, cultural acceptance of confectionaries, fragmentation</p> <p>Motivators</p> <p>Behavioural: Incentives</p> <p>Environmental: Greetings by kissing, chewing stick (Miswaak) use in Islam</p> <p>Suggested Change Drivers</p> <p>School Oral Health Policy</p> <p>Regular programmes at school</p> <p>Active participation of teachers, parents and pupils</p> <p>School-based dental services</p> <p>Follow-up at home</p> <p>Monitoring of oral health programme</p>	<p>Barriers to Change</p> <ol style="list-style-type: none"> Fear of dentist Lack of interest by parents Lack of Teacher cooperation due to excessive workload <p>Suggested Change Drivers</p> <ol style="list-style-type: none"> Follow-up at home Incentives to pupils Awareness Knowledge
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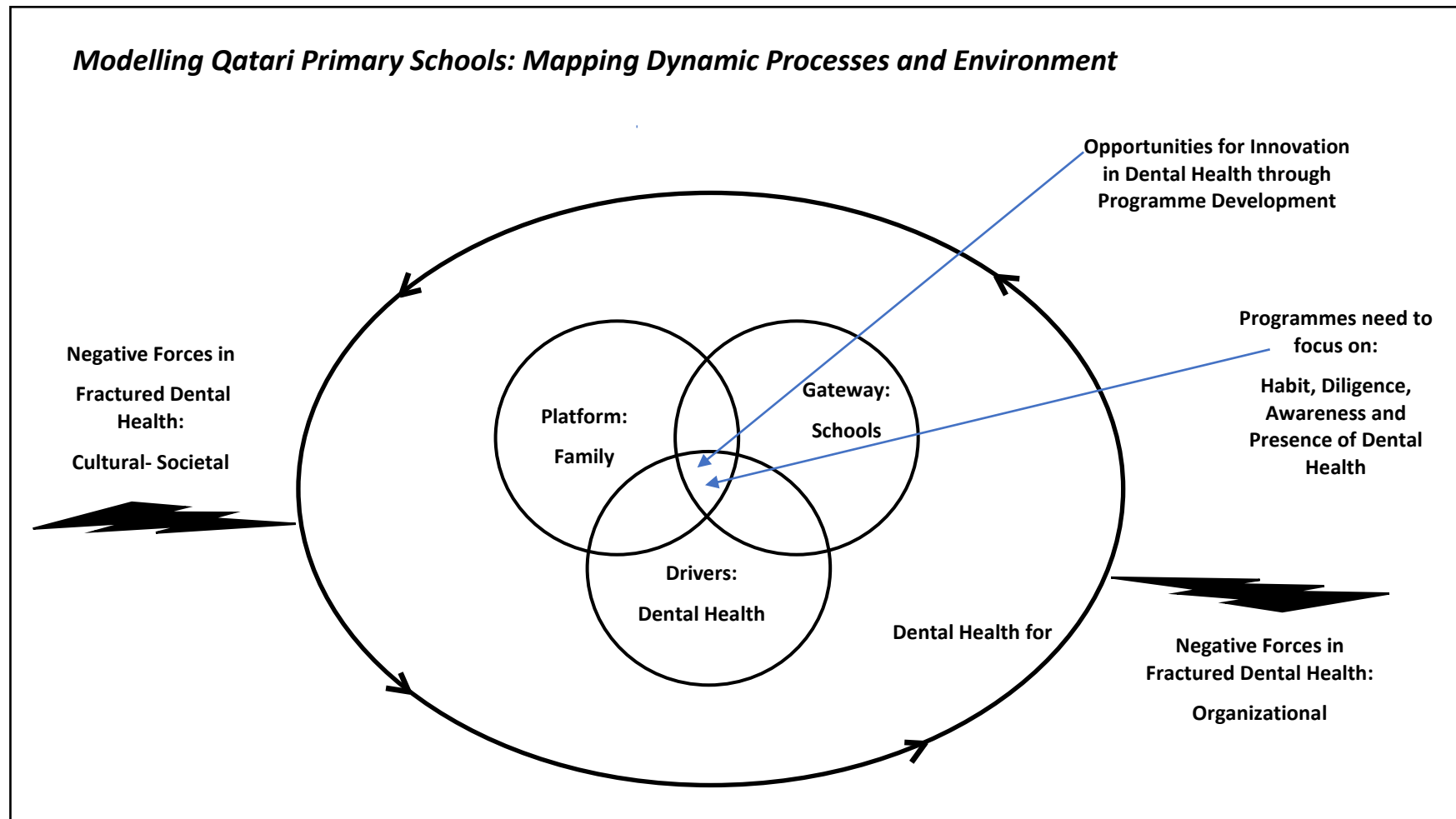


Figure 22. Dental Caries Prevention Model in Qatar

Figure 22 showed that dental services, schools and family were the cornerstone for oral health behaviours and the dental caries prevention programme. Also, the model highlights that the intersection between the constituencies of dental services, schools and family provide opportunities for dental health innovation. Through these three aspects, children are educated on the appropriate oral health behaviours and strategies to improve their dental care. School children are taught on the appropriate oral health behaviours, including toothbrushing daily, dental flossing and visiting dental clinic for check-ups.

In the next subsection of the thesis, the synthesis of findings attained in the three phases is discussed. The subsection discusses the family, school, dental health care, habit, diligence and awareness.

Family.

The participants identified the family as an important context with regards to dental caries in Qatar. The family is the platform where most daily oral hygiene related activities, such as tooth-brushing and dental flossing, are carried out. The participants agreed that oral health is primarily the responsibility of the parents at home. For instance, Rose mentioned, *“By creating awareness, teaching them from home, consistency between home and school, making use of the activities like health week – all this would help the kids.”* Also, Lylyan explained,

There should be someone at home and school that gives continuous knowledge about the oral health, so they don't forget. For example, back in Philippines, oral kits are provided in schools, so children can wash their mouth at any time.

The role of the parents in promoting oral health cannot be overemphasised. The roles of the parents at home include oral health education, healthy eating, being a role model for oral hygiene, supportive supervision of follow-up oral hygiene activities and seeking dental services promptly. These roles must be performed with diligence to inculcate the oral hygiene practice in children. Thus, home is the platform where pupils put into practice all oral hygiene obtained from the school.

School.

The school serves as an organised gateway setting to oral health services where pupils spend most of their wakeful hours. This is evident from the findings of the scoping review, which showed that the school presents an organised setting where an

oral health programme can be easily implemented (Albino & Tiwari, 2016). The scoping review also showed that teachers and school nurses were identified as major actors in the school setting. The teachers often enjoy a high level of respect and obedience from the pupils, and the use of school teachers lowers the cost of implementation (Naidu & Nandlal, 2017). Studies have shown that oral health education delivered by teachers is comparable to oral health delivered by dental professionals (Naidu & Nandlal, 2017). However, the involvement of teachers in school oral health activities in Qatar is quite limited. Thus, teachers are currently an untapped resource in School Oral Health in Qatar.

It is more feasible to reach a large population of children at a relatively lower cost through school based oral health programme (Angelopoulou et al., 2015). Children usually form their habits at an early age (Naidu and Nandlal, 2017). School based programmes reduce inequities with regards to oral health because they are readily accessible to all children irrespective of socioeconomic factors (Daouda et al., 2016)

Dental health services

The findings also provided the understanding of dental health practice context in Qatar. The dental health service is expected to lead the development of oral health programmes and co-ordinate the activities of teachers and parents. The school nurse plays a critical role in providing first aid dental services and linking the pupils to specialised dental health services in primary health centres. The primary health centres are the major provider of school oral health services in Qatar. The participants showed enthusiasm to engage with dental health services. The Ministry of Public Health also has a key role to play especially in setting agenda for school oral health and monitoring its implementation.

Habit

Habit refers to regular oral health promotion activity. The family and schools need to engage in the habit of promoting and enacting dental health. Dental Health Services need to provide structures and processes to enable habit to develop. The participants suggested a number of ways by which this could be achieved. The findings showed that introducing oral health awareness campaigns, workshops and education for pupils, as well as ensuring consistency in oral health hygiene practices through the

participation of parents, prohibition of unhealthy foods and introduction of school canteens may assist in improving oral health habits of school children

Diligence

Family and Schools need to engage in due diligence when promoting and enacting Dental Health. Services need to provide structures and processes to enable Diligence to develop. Teacher and parents admitted they were interested in promoting oral health but required guidance of the professionals from the dental services. They suggested workshops for parents and teachers. This is evident from the case study interviews with parents who supported the introduction of workshops as a way to learn the best practices to teach school children on oral health. For instance, Yahya explained, *“If we can have some sort of workshops where practitioners like dentists come to the school and talk personally to the pupils and parents. It is a long and time-consuming process, but it is an epidemic in Qatar where children usually not take care of their oral health and it is very severe.”*

Awareness

Awareness was a major issue that emerged from the discussions. The participants of the co-production workshop regarded awareness as the centre stage of school oral health programme. Family and schools need to engage in providing knowledge about good Dental Health. Services need to provide structures and processes to enable awareness to develop good habit. This is evident from case study interviews where participants supported the need for continuous awareness. For instance, Nawal shared, *“Through periodic awareness because they are children and repeating the information will help them retain it.”* Also, Mariam shared, *“We can invite the parents and pupils to a workshop or have activities for the pupils within the school about the importance of oral health.”*

Presence

Presence needs family and schools to engage in ensuring continuous visibility of Dental Health Services. Services need to provide structures and processes to enable diligence to develop presence.

Summary

This chapter has discussed the development of the model for childhood oral health in Qatar based on the findings of the study. The chapter also provided seethes and

modelling with a focus on the summary of the findings attained in the project. Moreover, the chapter discussed the summary of findings from scoping review, case study interviews and co-production workshop. Finally, the chapter discussed modelling with a focus on the main findings using a summary table. The table provided a summary of the themes obtained from all the studies or through the scoping review approach.

CHAPTER EIGHT

Discussion and Recommendations

Introduction

This chapter presents the discussion of the findings from the case study interviews and co-production workshop, drawing on evidence from the scoping review and synthesis of findings to address the objectives of the study outlined below:

- i. Understand how oral health behavioural prevention strategies operate in the contexts of public and private primary schools in Qatar
- ii. Explore why oral health knowledge and behaviour of primary school pupils in Qatar remains intransigent despite oral health programmes in schools
- iii. Explore the contexts and mechanisms that underpin the motivation of primary school pupils and their parents in Qatar to improve their oral health behaviour
- iv. Understand how changes in oral health behaviour may be sustained among primary school children in Qatar

The first objective was addressed by discussing the fragmented state of previous school based oral health programmes in Qatar. The discussion of the second objective focused on the negative forces in the fractured oral health programmes identified by the participants. The third objective discussed the contextual factors at home, school and oral health services that motivate positive oral health behaviour in Qatar. The strategies, recommended for improvement of oral health services by pupils, parents, teachers and school nurses, were discussed under the fourth objective. The fifth and last objective presented the overall framework for dental caries behavioural prevention developed from all phases of this study. Finally, conclusions and recommendations for policy, practice and future research were presented in this chapter.

Synthesis of Case Study Interview Findings

From the interviews of children, parents, teachers and school nurses, a number of major themes regarding oral health of primary school pupils in Qatar are presented below.

Knowledge and perception of oral health.

The findings suggest an appreciable knowledge of oral health among the participants, including the children. Generally, the participants were aware of dental

caries and its association with poor oral hygiene and unhealthy dietary habits. The findings support the existing literature, which indicated that dental caries develop because of plaques that result from poor dietary behaviour such as increased intake of sugary foods, and poor dental hygiene like infrequent brushing of teeth using fluoridated toothpaste (Evans et al., 2013; Mobley et al., 2009; Struzycka, 2014).

Similarly, the findings on poor oral hygiene and use of sugary diets are in alignment with the existing body of knowledge that dental caries occurs due to poor dietary habits, which increased the growth of plaque bacteria, such as *Streptococcus sobrinus* and *Streptococcus mutans*. These bacteria cause metabolization of the fermentable carbohydrates in the mouth that leads to the production of acids, which diffuse into the enamel and demineralize the dental tissues, hence facilitating the development of dental caries (Evans et al., 2013; Mobley et al., 2009; Struzycka, 2014). Moreover, the findings are in line with the information in the literature that dental caries is associated with dietary habits in which school children engage in unhealthy eating habit, such as snacking between meals, frequent use of carbonated drinks, intake of confectionery and frequent intake or consumption of fast food stalls (Punitha, Amudhan, Sivaprakasam, & Rathana Prabhu, 2015). The description of dental caries as “an animal that wants to eat my teeth” clearly portrays the high level of the perceived threat of dental caries among the school pupils. In the same vein, the participants were aware that healthy dietary habits and good oral hygiene is the cornerstone of good oral health. The findings on the perceived threat of dental caries to school children are in alignment with the existing body of international literature that oral diseases, including dental caries, pose a significant threat to the affected population or parents, and to the healthcare system (Hall-Scullin et al., 2017; Kassebaum et al., 2017; Listl et al., 2015; Peres et al., 2019; Righolt et al., 2018). The existing literature indicated that in Gulf countries like Qatar, UAE and Saudi Arabia, oral health conditions, which include central caries and periodontitis pose threats to children in terms of healthcare cost that affect the socioeconomic status in the country (Abu-Gharbieh et al., 2019; Alhabdan et al., 2018; Al-Thani et al., 2018).

Besides, the findings on the healthy dietary habits and good oral hygiene aligned with the information in the literature that facility-based oral health programmes on healthy dietary behaviours provide children with a unique opportunity to maintain good oral hygiene that helps in reducing cases of oral disorders (Padmini, Selvi Ranganath, & Netravati, 2019). The findings support the statement in the literature by Chachra et

al. (2011) that implementing oral health education on prevention of sugary diets and maintaining dental cleanliness are the basic foundations for a better good oral health. The knowledge of oral health among the participants could be summed up in the voice of one of the parents as “*Looking after the mouth and anything related to the mouth*” The participants, therefore, showed that they have a high level of perceived benefits of oral hygiene and a healthy diet. The increased perceived benefits demonstrated by the participants in terms of oral hygiene and healthy eating behaviours add value to the Health Belief Model, which showed that in schools, the majority of students acquire the necessary knowledge on proper brushing of their teeth and flossing, which help in preventing decayed missing and filled teeth index among students (Rahmati-Najarkolaei et al., 2016; Solhi et al., 2010). The literature showed that students with enough knowledge of oral health have high levels of perceived benefits, and they practice good oral hygiene to reduce oral disorders in schools (Phanthavong et al., 2019). Besides, the findings on a high level of perceived benefits demonstrated by the participants with respect to oral hygiene add value to the transtheoretical model, which showed that educational intervention programmes in schools are designed in a way to promote tooth cleaning practices and engagement of interdental cleaning behaviour among students (Hashemian et al., 2012). The model shows that improved interdental cleaning behaviour among students depict increased self-efficacy and perceived benefits of an intervention program to improve oral hygiene (Hashemian et al., 2012). It seems that the major issue with childhood oral health in Qatar is neither inadequate oral health knowledge nor perception. School-based interventions, therefore, need to go beyond the transfer of oral health knowledge to children. There is a need to inculcate innovative health promotion strategies to motivate behavioural change. This is supported in the extant literature, which showed that the adoption of oral health behavioural prevention approaches are needed to allow school children to practice oral hygiene as a way to avoid dental caries while promoting their overall health (Kumar & Preetha, 2012; Prasai Dixit et al., 2013). The literature also demonstrated that the school must have an organized and a well-coordinated programme that supports the implementation of oral health strategies to improve the ability of students to engage in oral hygiene, and reduce the development of oral disease among children (Cooper et al., 2013). Further, the findings on the efficacy of school oral health programmes in improving students’ knowledge about dental care support the existing body of literature that oral health behavioural interventions, including

lectures and education, improve oral health knowledge, which positively impacts their engagement in good oral hygiene (Angelopoulou et al., 2015; Cooper et al., 2013; Damle et al., 2014; Mohamadkhah et al., 2013; Shenoy and Sequeira, 2010). Transfer of oral health knowledge to children in schools is in line with the recommendations made by Anopa et al. (2015) where educational strategies or school-based prevention programmes on oral health should be extended to children, including those from low-income areas, to assist in preventing oral diseases. As a consequence, improving oral health behaviour and dental practices, such as brushing teeth with appropriate toothpaste, flossing and mouth washing is necessary to reduce oral health disorders.

Oral Health related practices.

The participants generally reported regular tooth brushing, which was usually associated with certain daily activities such as after meals, before going to bed and after waking from sleep. Such association was likely to encourage frequent tooth brushing since these are regular daily activities. The participants shared that they engaged in oral health practices such as brushing their teeth twice daily or three times a day. The frequency of tooth brushing, as mentioned by the participants, illustrates their level of understanding of dental health and dental hygiene. The findings thus aligned the existing literature that supported tooth brushing daily to reduce oral disorders. The researchers supported that the frequency of tooth brushing, such as twice daily with the use of appropriate toothpaste and toothbrushes, is the appropriate oral health practice to reduce dental caries. The researchers also supported that children who are aware of frequent tooth brushing, changing their toothbrushes and practicing mouth rinsing are less likely to be affected by oral disorders (Shenoy & Sequeira, 2010).

Similarly, Mohamadkhan, Shokravi, Karimy, and Faghihzadeh (2014) confirmed that children who engaged in educational intervention on oral health hygiene are more likely to have enough knowledge of the oral health behaviours to practice, such as brushing their teeth after meals, tooth flossing, mouth washing and regular visit to the dentist, which are necessary for preventing the development of dental caries. However, dental flossing was hardly mentioned among the interview participants. Similarly, a dental visit did not appear to be a routine practice among the participants despite acknowledging its importance. There was a general impression that dental visits were only meant for children who had developed dental caries and that the Government should be responsible for organising and enforcing routine dental visits. A child even

reported that he was asked to wait until he gets to grade 4, during the facility-based programme, until he sees the dentist despite having a tooth problem. Acknowledging the importance of dental visits by children supported the information presented in the literature that visiting a dental care clinic for dental check-ups is one of the essential oral health practices of oral health behaviours among children. The practice allows children to engage in thorough dental check-ups (Chandrashekar et al., 2014; Tai et al., 2009). Further, existing studies support the effectiveness of dental care visits as one of the oral behavioural practices that determines the oral behaviour of children (Collins, Villa-Torres, Sams, Zeldin, & Divaris, 2016; Zeeberg, Puello, Batista, & de Sousa, 2018). However, the findings that children should only engage in dental care visits while in grade 4 contradict the information presented in other studies, which supported early dental visit care. The studies supported that early preventive oral health care visits reduce the disparities of oral health care (Bhaskar, McGraw, & Divaris, 2014; Casamassimo et al., 2014; Rowan-Legg, 2013). Such visits are health facilitators that improve oral health behaviour and improve frequent check-ups among children (Bhaskar et al., 2014).

The participants admitted that the biggest threat to oral health in Qatari children is the widespread consumption of sugary snacks and confectionaries. Although there were several ongoing activities in the school to encourage a healthy diet among children, these were not usually replicated at home. The findings aligned the information in the literature that intake of sugary diets, such as snacks and candies, is the leading risk factor for dental caries among children (Garkoti et al., 2015). Intake of sugary diets without brushing teeth is found to enhance the growth of dental plaque bacteria in the tissues, leading to demineralization in tissues and thus causing the onset of dental caries and related oral health diseases (Evans et al., 2013; Struzycka, 2014). Moreover, Kaewkamnerdpong and Krisdapong (2018) discussed that some school environments provide a variety of food choices for children, which facilitates student engagement on sweet consumption and in turn leads to increased dental caries. Other researchers established that the rate of sweet consumption and use of chocolates is very high in Qatar, especially during the month of Ramadan, Eid and weekend gatherings. Such consumptions are found to affect the oral health hygiene of children and lead to the development of dental problems (Al-Thani et al., 2018; Bener et al., 2013). Several factors were established in the study as the primary barriers and facilitators of oral health behaviour.

Barriers and facilitators of oral health-related practices identified by the participants include personal, environmental and behavioural factors. The personal factors that were identified by the participants as barriers include forgetfulness, inadequate time to brush before leaving for school and fatigue before going to bed. The findings on personal factors as the primary barriers to oral health practices add value to the principle of perceived barriers in the Health Belief Model, which showed that barriers to tooth brushing and dental flossing prevent children from accessing the necessary dental care service. Thus, overcoming such barriers through encouragement from parents, schools and doctors, as well as supporting children through education on flossing operations enhance oral health behaviour (Jeihooni et al., 2017; Rahmati-Najarkolaei et al., 2016). That is in addition to environmental barriers, including inadequate supervision by the parents due to busy schedules, lack of follow-up at home, lack of adequate monitoring of oral health programmes and cultural promotion of sugary snacks such as chocolates. The findings on environmental factors are in alignment with the literature presented by other scholars, which demonstrated that lack of enough supervision from parents on tooth brushing with appropriate toothpaste such as fluoride toothpaste, abandonment and deprived education on oral hygiene prevent the participation or involvement in oral health practices (Lourenço, de Lima Saintrain, & Vieira, 2013; Pareek, Nagaraj, Yousuf, Ganta, Atri, & Singh, 2015). On the other hand, behavioural factors, including negative and positive reinforcement, were reported to have been used in promoting oral health-related practices. The participants discussed that unhealthy food items were often confiscated in the school, which serves as a positive reinforcement. Removing unhealthy foods, which include sugary and fatty foods, supports the existing literature that banning diet-related factors, such as foods with excessive sugar at home and school, helps prevent dental caries and other oral diseases (Mobley et al., 2009).

The distribution of toothbrushes during facility visits was also recognised as a positive reinforcement. The distribution of toothbrushes, as mentioned by the participants, supported the existing literature, which demonstrated that the distribution of toothbrushes is one of the dental care interventions to reduce the incidences and prevalence of dental caries (Naidu & Nandlal, 2017; Tarvonen et al., 2017). Researchers have also found in their previous studies that the distribution of toothbrushes and fluoride toothpaste by the dental care facilities for home use have

significant impacts in reducing dental caries (Macpherson et al., 2013; Naidu & Nandlal, 2017). The researcher discussed that distributing free toothbrushes and toothpaste to people, including school children, have positive reinforcement towards good oral health behaviours (Naidu & Nandlal, 2017).

The fragmented state of school oral health programme in Qatar.

The case study interviews revealed that primary schools in Qatar did not have an integrated functional school oral health programme. Rather, multiple fragmented oral health interventions that were only targeted at school children in public but not private schools. The private schools had their own school oral health programmes that varied from one school to another, and were not present in all private schools, in contrast with the public schools. These oral health programmes include a lecture on teeth in 'Science', the provision of first aid dental services by the school nurses as well as the promotion of healthy eating and oral health promotion during national and international health week/day. The fragmented oral health programme in Qatar is not in alignment with the report presented by the Ministry of Public Health (2014), which states that oral health in Qatar is well-structured and enhances the access to the necessary quality oral health care services.

The Ministry of Public Health (2014) presented the National Oral Road Map in Qatar, which is fragmented into four pillars and three enablers. The fragmented oral health programmes consist of population-level prevention, targeted prevention activities and sustainable dental employees and quality standards. It is well established that these pillars play a crucial role in providing long-term benefits of oral health promotion, high level of oral health education and significant improvement in oral health and oral hygiene (Ministry of Public Health, 2014). Similarly, the findings are in line with the recommendations made in the literature that the school-based oral health programme should be a well-defined programme with enough information on professional tooth cleaning procedures, and should have detail instructions on proper dental hygiene practices, advice on the best diets or foods to eat and the use of fluoride toothpaste (Jepsen et al., 2017).

In addition, the study showed that a trip is organised to Primary Health Care Corporation (PHCC) dental clinic for public school pupils in Grades 1 and 4 for oral health education and dental check-up. Firstly, the structure and functions of the teeth are taught as part of the Science curriculum for the first time in Grade 3 in each of the

schools. The oral hygiene discussion in the class ranges from a brief discussion on tooth-brushing to a comprehensive oral health education by an invited dental professional. However, this is left to the discretion of the Science teacher. Thus, the curriculum does not include enough details about oral hygiene practices or oral health. Although teachers in this study demonstrated a high level of knowledge on how oral health promotion could be integrated into subjects such as Mathematics, Life Matters and Religious Studies, oral health is only partially addressed in the Science curriculum. The findings support the oral health programme that has been developed, which is Asnani School Oral Health Programme, a newly school oral health programme that was developed from a previous one in Qatar, and provides oral health education to school children (Alsharq newspaper, 2018; Najat Alyafei, 2018). The oral health programme developed in the school has been found to be effective in providing oral health education, and in raising awareness of school children (Alsharq newspaper, 2018). The programme also allows children to engage in comprehensive screening for oral health status, and school children are taught on toothbrushing technique as well as the cause of applying fissure sealant and topical fluoride to prevent dental caries (Alsharq newspaper, 2018; Najat Alyafei, 2018).

Besides, the findings align with the extant literature that a comprehensive oral health education programme integrated into classroom lectures, in which videos and pictures are used to aid teachers, are more effective in increasing oral health behaviour and dental hygiene among school children. The programme is interactive and allows children to practice oral health in the classroom, which improves their ability to maintain oral hygiene in school and at home (Chachra et al., 2011; Daouda et al., 2016; De Farias et al., 2009; Gupta, 2008).

Moreover, oral health promotion activities in public schools include oral health education, dental checks and supervised tooth brushing. These are implemented as part of the commemoration of Health Week/Day designated by Qatari Government, GCC and World Health Organisation. The public schools usually commemorate days set aside by GCC, while private schools observe international celebrations. Since most of these special health days focus on general health, oral health activities are often left out in some years. In addition, these programmes have little or no local input. There is no sense of ownership of the programme in the school or in the community. The parents stated they are not involved in the school oral health programmes.

The Ama-Ata Conference on Primary Health Care emphasised the crucial role of community ownership and participation in successful health programmes (World Health Organisation, 1978). Also, Khoshnevisan, Pakkhesal, Jadidfard, and Godarzi Nejad (2017) explained that schools serve as the essential platforms for oral health promotion. Schools set up oral health education programmes to teach children on the best oral health behaviour they can practice reducing dental diseases. School programmes on oral health are used to educate children on tooth brushing behaviours, use of fluoride toothpaste, the best nutritious foods to take and the usefulness of tooth examination and screening procedure (Khoshnevisan et al., 2017). Similarly, existing literature showed that schools provide a favourable environment to promote oral health behaviours among children. They develop a strong network alongside the local community with the aim to target children at home for oral health practices (Alrmaly & Assery, 2018). Such a school-home-community connection is an essential aspect of oral health promotion, because children receive enough education on oral health and practices, they should carry out at home to maintain oral health and oral hygiene (Alrmaly & Assery, 2018).

Furthermore, the school nurse provides first aid dental services to pupils in both private and public school, such as analgesia for toothache. The school nurse also refers pupils to Primary Health Care Corporation (PHCC) dental clinic and sends a letter to the parents of the affected child. Thus, the school nurse plays a key role in the secondary prevention of oral health diseases. The participants acknowledged the key role of the school nurse. The pupils recommended that the school nurse should be involved more in the primary prevention of dental caries and other oral health disorders. The role that the school nurse plays in promoting oral health among school children aligns with the existing body of knowledge, which demonstrated that nurses in schools have a primary role in providing detailed instructions to pupils on daily flossing and tooth brushing (Lai et al., 2016). The instructions are useful to widen knowledge, attitudes and oral health practice among pupils, which enable them to practice tooth brushing, dental flossing, dental visit and proper mouth washing (Lai et al., 2016). Further, the existing literature showed that school nurses provide enough supervision to children on how to practice brushing and flossing on a daily basis as a way to improve their oral habits and dental conditions (Buerlein, 2010; Hoekstra, Young, Eley, Hawking, & McNulty, 2016). These nurses supervise school children and encourage healthy eating behaviours among them, which include eating healthy foods, maintaining good dental hygiene,

engaging in dental visits for routine check-ups, and ensuring that they receive appropriate fluoride exposure (Buerlein, 2010). The nurses also assist school children to limit the amount of intake of sugary diets in school and at home. This is aimed to reduce cases of dental caries and exposure to risk factors of oral disorders (Buerlein, 2010).

According to Hoekstra et al. (2016), school nurses advise students and support health promotion at school, which is necessary for ensuring that all students receive the necessary knowledge on health hygiene and health promotion. The authors established that school nurses advise students on tooth decay, hygiene, healthy eating and oral health practices, which are the key priorities in reducing oral health diseases among students and other school staff. However, it was noted in the present study that the school nurse could be overburdened since she also attends to other general health needs of the pupils. It is important to note that only one nurse is employed by the Primary Health Care Corporation (PHCC) at each public school and covers 400-800 pupils per school. In addition, and she is expected to cover other schools in case of shortages.

On the other hand, the school nurse is employed by the private school from a private company. Although the private school is required to employ 2-3 school nurses to cover 800 pupils, that is not usually the case. It was also noted that since she is not a specialist dental nurse, input from dental professionals would be needed from time to time. The findings on the workload that school nurses may experience align with the extant literature that the role of such nurses is diverse; hence they are overburdened with the amount of work they do to meet the needs in the school, especially when dealing with young children (Hoekstra et al., 2016). The literature demonstrated that working beyond their scope, such as delivering health education sessions through classroom talks to the children and responding to student referrals on oral health behaviours, is in fact overburdening the school nurses; hence may cause stressful experience among the professionals (Hoekstra et al., 2016).

Moreover, a trip was organised to a PHCC dental clinic in the previous school oral health programme to promote early detection and prompt treatment of oral health disorders, including dental caries for public school pupils in Grades 1 and 4. The pupils were taken by the school nurse to the dental clinic in batches until they were all seen over the session. The pupils were educated on oral hygiene with videos followed by a demonstration of tooth-brushing by a dentist. Gifts, such as toothbrushes and toothpaste, were distributed to the pupils. A dental check-up was conducted, and pupils

with dental caries were followed up by referrals. Thus, this national oral health programme served as a gateway to oral health services to pupils with dental health issues in public primary schools.

However, access to the programme was limited in multiple ways. Firstly, the private school pupils were not involved, and only pupils in Grade 1 and 4 were included in the public school. Physical accessibility may also be limited because the programme was facility-based. According to literature, issues with availability, accessibility, acceptability, affordability and accommodation may impair access to health services (McLaughlin & Wyszewianski, 2002).

Health services' fragmentation leads to inefficiency, ineffectiveness and inequality (Stange, 2009). These landmarks of fragmented health services were obviously demonstrated in the existing school oral health programme in Qatar. Firstly, the school oral health interventions were ineffective as the prevalence of dental caries was still high despite the programme. Secondly, inequalities were demonstrated between pupils in private and public schools and among pupils in public school with regards to access to different interventions. And thirdly, the programme was inefficient as it may be possible to use the same human and material resources to achieve more positive oral health outcomes if properly integrated into a functional school oral health programme. However, a new school oral health programme was piloted in February 2018 to address the negative consequences of a fragmented school oral health programme. The new programme took-off fully in November 2018.

Negative forces in fractured oral health programme.

The study identified negative socio-cultural and organisational forces which tend to fracture the dental health services provided for the primary school pupils. According to the participants, the consumption of chocolates, sweets and other confectionaries is culturally celebrated in Qatar. Confectionaries are used to entertain visitors and in family weekend gatherings. An unhealthy diet has been identified as an important aetiological factor of childhood caries (Albino & Tiwari, 2016; Gao, Lo, McGrath, & Ho, 2013). The participants were concerned that although confectionaries were not allowed in public schools, the children had unfettered access to them at home. Such findings supported the existing body of literature that accessibility to sugary foods or diets among pre-school children increased their susceptibility to dental caries (Skafida & Chambers, 2018). The literature indicated that easier access to such diets increases the frequent consumption of sugar-rich foods among school children, which

facilitate the development of dental decays, particularly in children who do not practice frequent tooth brushing and other oral hygiene practices (Skafida & Chambers, 2018). Similarly, the study by Peres et al. (2016) supported access to sugary-rich diets at home and the impacts they have on dental decay among children. The study indicated that young children are more susceptible to sugary-related feeding habits, which affect their dental tissues and facilitate the onset of dental caries. The authors illustrated that children aged between 6 and 12 years are high consumers of sugary-rich foods; therefore, have higher levels of dental caries compared with other children (Peres et al., 2016). The accessibility of sugary-related feeding practices is more common at home than in schools. Asawa et al., (2018) explained that children easily access sugary-rich diets, such as pastries, cakes, sweets or chocolates at home, which increases their susceptibility to dental problems.

Home access to such sugary sweetened products significantly affects children's behavioural habits and is a clear indication of behavioural risks for oral diseases. The authors explained that frequent consumption of sugary sweetened products increases the development of decayed missing and filled teeth, gingivitis and dental caries among school children (Asawa et al., 2018). Besides, it is well established in a longitudinal prospective study by Skafida and Chambers (2018) that school children are more likely to eat sweets or chocolates more frequently at home than in school, which facilitates the chances of developing dental decay. The study revealed that the children are less likely to brush their teeth between snacking and the consumption of sugary sweetened products; hence can develop tooth decay at their early stages of life.

The consumption of sugary and sweetened products is common in both urban and rural areas. The descriptive cross-sectional study by Mafuvadze, Mahachi, and Mafuvadze (2013) supported the evidence that access to sugary-rich foods at home is high among pre-school children from both urban and rural areas. The authors explained that the prevalence of dental caries among pre-school children in urban and rural areas is high, with 59.5% and 40.8% of children having dental caries, respectively (Mafuvadze et al., 2013). Therefore, it may be difficult to reduce dental caries among primary school pupils in Qatar without synergy between the school and home. Thus, the oral health programme needs to go beyond the school to promote healthy eating at home.

The need for an oral health programme to be utilized at home supports the information in the study by Mafuvadze et al. (2013), which indicated the need for relay

prevention oral health strategies and treatment services in urban and rural homes to prevent the development of oral diseases. The study recommends integrating oral health education into the curricula of elementary schools, which can be extended to homes to improve knowledge on children's dental health issues (Mafuvadze et al., 2013). Further, the findings on the need for an oral health programme to be implemented beyond the school environment are in alignment with the literature that incorporation of periodic dental caries programme into school curricula and at home are essential in improving oral hygiene behaviour among children (Cooper et al., 2013). Incorporation of the programmes allows for regular access to the necessary education on oral health and dental health behaviours, thus enhancing the children's behavioural habits to practice good dental hygiene after consuming sugary-rich products (Daouda et al., 2016; Jain et al., 2016).

Another socio-cultural challenge identified by the participants was the occupational demands on parents, which often prevented them from having enough time to supervise their children's oral health. In Qatar, men and women are often gainfully employed in jobs with long working hours. As such, fathers and mothers often have insufficient time to educate their children on oral health or supervise their oral hygiene. In addition, there is no culture of regular dental visits among the participants. Many parents would not take their children to a dental visit unless there is pain (Tai et al., 2009). For example, a pupil in the public school reported that he had dental caries but was promised by his father that he would see a dentist in Grade 4. The findings on insufficient supervisions from parents support the existing body of evidence in the literature that lack of involvement, or poor participation of parents on dental caries behavioural education for children affects the success of oral hygiene among children (Damle et al., 2014; Petersen et al., 2016; Saied-Moallemi et al., 2009; Yekaninejad et al., 2012). Moreover, Damle et al., (2014) discussed that parents have a crucial role in supervising tooth brushing and other oral health behaviours of their children at home. However, these parents may have tight schedules and insufficient time to monitor or supervise their children. This leads to a negative reinforcement of children towards oral health promotion strategies at home (Damle et al., 2014).

In the study by Yekaninejad et al. (2012), it was found that students whose parents and teachers were involved in oral health practices showed significant improvement in tooth brushing and dental flossing. The study indicated that students with teacher and parental involvement were able to engage in tooth brushing two times

daily, and practice dental flossing once per day, compared with those who did not have parental and teacher involvement. From such findings, it can be concluded that the lack of parental involvement in oral health supervision can be a significant barrier towards oral health promotion. This is because the children cannot find the necessary education on tooth brushing, dental flossing, mouth washing or mouth rinsing, which are the essential practices to reduce oral diseases.

This study also identified organisational forces that hinder the success of a school oral health programme in Qatar. Although school oral health is mentioned as part of the National Health Strategy (Ministry of Public Health, 2015), sufficient details on its implementation are not included. There is no comprehensive school oral health policy in Qatar, and school oral health is implemented randomly without specific objectives and guidelines. Findings on lack of comprehensive implementation of school oral health policy as presented by the participants expound the information reported by the Ministry of Public Health (2014) that despite the design of the oral health policy with the integration of National Oral Health Design Project 1.9, National Oral Health Strategy and National Oral Health Road Map, the implementation of the policy in the governmental schools, especially primary schools, have not been updated since its enactment in 1982. As a consequence, the oral health behaviours such as oral hygiene screening, dentist appointments, dental visits and application of fluoride toothpaste among students, are limited. This is because of the lack of comprehensive oral health policies that support children's involvement in oral health practices. Thus, there is a need for formulation and dissemination of an oral health policy in Qatar.

The participants also noted that the implementation of oral health programmes was not monitored. However, cultural factors also motivate positive oral health behaviour in Qatar. Kissing is a cultural way of greeting and motivates individuals to maintain oral hygiene to avoid mouth odour. In addition, Islam, which is the State religion in Qatar, promotes oral hygiene. The findings on the kissing as a motivation strategy to maintain oral hygiene in Qatar expound the cultural context in the literature in which kissing is one of the popular ways of greetings (Amal Al-Shammari, 2017). The findings add value to Qatar's existing cultural beliefs that greetings through kissing is a kind of respect, and those practicing such behaviours ensure that they practice oral hygiene to avoid odour in their mouths (Amal Al-Shammari, 2017).

Context of oral health in Qatar.

The participants identified home, school, and the dental health services as the main constituencies of oral health in Qatar.

Opportunities for innovation.

The participants generated a lot of innovative ideas that could be applied to build an integrated school oral health programme that would span across the dental health service, school and home contexts.

School oral health policy. The participants suggested several initiatives to be included in school oral health. A comprehensive school oral health policy is required to guide these initiatives. The importance of policy and guidelines for school oral health has been discussed in the literature (Kwan, Petersen, Pine, & Borutta, 2005). Policy areas could include healthy eating, oral health education, oral health service, healthy school environment, restriction on smoking, alcohol, sugar, and physical exercise (Kwan et al., 2005). Most importantly, it is crucial to consider the content, the context, the actors and the process of the School Oral Health, which have been set out in the study (Walt & Gilson, 1994). The participants supported that the implementation of school oral health policies is among the essential aspects of promoting oral health in schools. The findings thus aligned with the existing body of knowledge that implementation of National Health Policy and oral health policies in schools is crucial, because it provides a conducive environment to impart education on oral health behaviours to the school children (Gambhir et al., 2013).

The extant literature showed that since schools remain essential settings globally that provide efficient and effective ways to reach out to many students, implementing oral health policy is crucial because many children would get access to the necessary oral health education (Gambhir et al., 2013). The literature by Eley et al. (2019) indicated that oral hygiene education is mainly presented at school. Also the development and incorporation of oral health standards into the curriculum play a crucial role in increasing dental hygiene among students and teachers. The authors discussed that oral health curriculum is essential to students who have low knowledge and skills on appropriate brushing behaviours, suffer dental decay and who are not aware of the foods and drinks with sugar that can cause dental caries (Eley et al., 2019).

As such, oral health guidelines need to be integrated into the curriculum to improve awareness and knowledge of such students.

Besides, Kiyoshi-Teo and Blegen (2015) discussed that implementing and adhering to institutional guidelines or policies on oral health practice is crucial for the maintenance of oral hygiene. The guidelines ensure proper implementation of evidence-based practices that support oral hygiene compliance and prevent infections and oral health problems. Thus, the implementation of oral health initiatives in schools assists in promoting student compliance with oral hygiene. The schoolteachers play a significant role in supporting the use of national oral health policies to promote oral hygiene among students (Chandrashekar et al., 2012). The policies prompt the utilization of dental services to promote oral health and oral hygiene throughout the school environment (Chandrashekar et al., 2012). Additionally, the school health guidelines and policies that support the initiatives of oral health and oral hygiene offer enough opportunities to address the issues associated with oral health disorders among school children (Skafida & Chambers, 2018).

Involvement of parents in school oral health programme.

The participants canvassed for the involvement of parents in-school oral health programmes as a way of motivating and sustaining oral health practices among pupils. The involvement of parents has been reported to enhance the success of school oral health education (Damle et al., 2014; Petersen et al., 2016; Saied-Moallemi et al., 2009; Tai et al., 2009; Yekaninejad et al., 2012). Oral hygiene leaflet was suggested as a strategy for involving parents. In a previous study in Iran, pupils whose parents received an oral health education leaflet and a brushing diary to supervise their child's tooth-brushing had a more acceptable oral hygiene (reduced plaque) compared to school children who only solved puzzles at school under the supervision of health counsellors (Saied-Moallemi et al., 2009). It was also suggested that parents should discuss oral health with their children during mealtimes. Annual workshops could also be organised for parents at school alongside their kids. Letters and/or SMS could be sent to parents to update them about their wards' oral health. Training parents on oral health behaviours and dental hygiene at school is essential to widen their knowledge, which could then be applied when supervising the oral behaviours of their children. The parents are trained on the protocols of tooth brushing, mouth cleaning, mouth washing and tooth cleaning

(Morgan, 2015; Yekaninejad et al., 2012). The involvement of parents in such training allows them to learn appropriate oral health behaviours that should encourage their children to follow as they focus on reducing or preventing the development of diseases such as tooth decay, dental caries and dental missing, filled teeth decay (Damle et al., 2014).

Further, the existing body of evidence supports the role of parents in their children's oral health behaviours. It is well established that parents are the main caregivers of children. As a result, these parents have essential roles, especially during their children's early years, even during their pre-school, where they act as supervisors of children's dental hygiene (Bozorgmehr et al., 2013). Existing research showed that maternal education on oral health and oral hygiene, current attitudes, behaviour and knowledge of dental care provide deeper insights into the role of parents in promoting their children's health behaviours (Wigen & Wang, 2012). Professionals assist in improving parental oral health behavioural skills, which they can use when helping their children on dental hygiene. Dental care practitioners exert themselves to educate parents on the appropriate oral health behaviours that they should focus on while supervising their children, and in turn would reduce the risk of dental caries and related problems among their children (Bozorgmehr, Hajizamani, & Malek Mohammadi, 2013). Parents and teachers can work in collaboration to improve the oral health behaviours of school children. The findings of this present study supported the involvement of parents and teachers in promoting oral health behaviours among school children. Teachers were found to have a significant contribution in preparing school children for good oral health behaviours, including frequent brushing of teeth and the use of appropriate fluoride toothpaste.

Active participation of teachers in school oral health programme. Active participation of teachers was also suggested as a means of sustaining oral health behaviour among children. This is in line with the WHO recommendations about school health programmes and reported to have been effective in the literature (Tai et al., 2009). In Iran, students whose teachers and parents were given health education booklets had a more significant improvement in oral health behaviour (brushing and flossing), as compared to students who had oral health education without the involvement of teachers and parents (Yekaninejad et al., 2012).

Another study in Denmark reported that a comprehensive school oral health promotion programme comprising of oral health education, teacher-supervised tooth brushing and supply of oral hygiene aids (toothbrush and toothpaste) resulted in a greater reduction in dental caries among participating pupils as compared to no intervention (Petersen et al., 2016). Thus, the involvement of teachers may also enhance the success of school oral health promotion. It may be easier to integrate oral health promotion into the usual school programme when it is delivered by teachers. However, efforts should be made not to overburden teachers. Teachers can be involved by delivering oral health education and motivating them through regular annual training workshops by dental professionals (Tai et al., 2009). The findings are also in line with the information presented by Chandrashekar et al. (2014). Teachers play a crucial role in the provision of oral health education and supply of oral hygiene tools, such as toothbrushes and toothpastes to children. Through such activities, teachers support their students to improve their plaque index, which reduces the development of delayed missing, filled teeth decay.

Regulation of children diet. Currently, children in public primary schools are prohibited from bringing unhealthy food to school. Unhealthy meals are often confiscated and returned to the parents. It was suggested that the private school could establish a school canteen where only healthy food will be provided for the pupils. This will ensure that children only eat healthy food in school. However, this may not be effective to stop unhealthy eating at home. The study showed that regulating the diet in terms of reducing the number of sugary-rich products is essential as it reduces oral disorders among children. The findings are in alignment with the existing body of evidence, which illustrated that reducing the amount of sugar in the diets of children helps in preventing dental diseases. Reducing the amount of sugar or intake of sugary products helps prevent and control dental diseases among children (Watt et al., 2019). Besides, regulating the diets of children by minimizing the adverts that target children's preferences in the market is useful in promoting oral health status in children.

The literature by Peres et al. (2019) showed that regulating the marketing and adverts of children's preferences in terms of food and consumption patterns helps in preventing and managing their oral diseases. Such a strategy helps in managing children's behaviours, especially when choosing food preferences. Similarly, the literature showed that date regulation by increasing levies on sugar-rich products and

restricting the marketing of such products that target children, helps prevent them from using sugary-sweetened products that harm their dental tissues (Hall-Scullin et al., 2017). Further, the findings on the regulation of children's diets, in terms of sugary products, add value to the existing body of literature that manufactures have a crucial role in improving oral health by reducing the sugar in some products, and increase the tax on sugar as a way to reduce the availability and accessibility of the products in the market (Jepsen et al., 2017).

Manufacturers by reducing sugar content in their products that target children and minimizing public campaigns on such products can help reduce cases of dental caries (Jepsen et al., 2017). Tonetti et al. (2017) discussed that if a child is found to have dental diseases, he or she is advised on specific foods to consume to prevent the disease's progression. Such advice plays a crucial role in making sure the children are restricted from consuming the sugary products that increase the risks of oral diseases. Similarly, regulating the diet of children is done through education in which children are taught about the impacts of sugary products on dental tissues. Chachra et al. (2011) explained that lectures that focus on oral health education are crucial in improving children's knowledge about sugary-products and dental caries. Through such a lecture, children get enough knowledge about the relationship between sugary products and dental caries, which may enable them to minimize the consumption of such products (Chachra et al., 2011).

Monitoring. The participants recommended a proper monitoring plan to ensure the school oral programme is achieving its target. This indicates that school oral health needs to be planned properly with specific objectives and a monitoring plan. The administrative assistants can have a round on classes and complete a checklist for each class about their level of engagement with the school oral health programme. Monitoring initiative, as found in the study, support the literature that follow-up and monitoring of children during their oral health practice is crucial in preventing the development of oral diseases. In the literature, it is evident that monitoring by parents and teachers during oral health behaviours, especially on the frequency of tooth brushing, significantly reduces the levels of dental caries in children (Hamlet Gasoyan et al., 2019; Saied-Moallemi et al., 2009). According to Saied-Moallemi et al. (2009), monitoring of children can be done by supervising them while brushing their teeth. Parents and health counsellors use oral health leaflets and diaries of children to monitor

their brushing behaviours. Parents monitor tooth brushing behaviours of the children after every meal and ensure that they are using appropriate toothbrushes and cleaning procedures as required.

Similarly, Jepsen et al. (2017) explained that a motivational programme is useful in monitoring oral hygiene practices in children regularly. The programme assists parents in monitoring their children, particularly in terms of free sugars intake, and adopting the best strategies to motivate them to avoid sugary products. Such a monitoring process allows for effective reduction of consumption of poor diets that increase the susceptibility or risks of children's dental diseases (Jepsen et al., 2017). The literature also showed that monitoring children through supervised tooth brushing and dental flossing can result in long-term effects of enacted oral health status. Through such supervision, children improve their attitudes and knowledge towards oral hygiene behaviours, which helps them prevent their vulnerability to dental plaques (Lai et al., 2016). The findings on monitoring are also in alignment with the results of the study by Petersen et al. (2016), which demonstrated that monitoring tooth brushing by teachers during oral health education allows children to comply with the rules of oral health behaviours, which supports in reducing the incidences of plaques and dental caries. As such, involving teachers in monitoring oral health behaviours may help improve dental hygiene and reduce oral disease among children.

Inclusion of Oral Health in the Curriculum. The study findings showed that including oral health in the school curriculum is essential to reducing children's dental diseases. The study revealed that such inclusion ensures that school children get enough information that increases their knowledge, attitudes and behaviours towards oral hygiene. The findings are in line with the information in the literature that integration of oral health education into a normal school timetable allows regular access to oral health education and enhances the success of oral health programmes (Jain et al., 2016). There are also extensive examples in the literature on how oral health can be inculcated into several subjects, including Sciences, Sociology, Mathematics and Languages (Kwan et al., 2005). Also, the findings on integrating oral health into school curricula are in alignment with the information in the existing literature that disclosed that inclusion of oral health as part of the curriculum in schools facilitates the practice of oral health (Nakre & Harikiran, 2013; Randy, 2019).

Randy (2019) discussed that an oral health programme could be taught in schools as part of personal, Social, Health and Economic (PHCE) lessons. The authors explained that since some children and parents still lack the knowledge of good oral health and the importance of dental hygiene, the inclusion of dental health in classroom lessons thus contributes significantly in improving awareness, attitudes and behaviours among school children, and in turn they can extend the oral hygiene to their homes. Similarly, the findings on the inclusion of oral health in the curriculum are in line with the information presented by Nakre and Harikiran (2013) that integration of an oral health programme as part of an educational context in schools improve children knowledge, which in turn can result in the adoption of good oral behaviours that lead to better oral hygiene and oral health among children. The authors discussed that incorporating oral health activities such as emergency, preventive or restorative dental care into classwork, is crucial for improving students' ability to engage in good oral hygiene (Nakre & Harikiran, 2013).

De Farias et al. (2009) explained that introducing oral health as part of classroom lessons significantly improves oral health knowledge among students, and this can lead to reduced levels of plaques while improving oral health knowledge. Besides, including oral health as part of educational programmes in schools have significant impacts on the status of dental caries, plaques and gingivitis health among school-age children (Bhardwaj et al., 2013; Hein, Schönwetter, & Iacopino, 2011). The inclusion provides short and long-term benefits to children, schools, parents and health professionals as it increases their level of awareness on how to improve dental hygiene and gingival health (Bhardwaj et al., 2013).

Regular oral health programme. The study findings showed that regular oral health programme is one of the initiatives to be implemented to improve dental health and oral hygiene among school-age children. The study showed that regular oral health behaviours include frequent tooth brushing, frequent changing of toothbrushes, routine dental check-up and appropriate dental flossing. Evidence from the literature suggests that periodic or regular school oral health programmes are often successful (Daouda et al., 2016). Even when a one-off oral health education programme is effective, its impact is not sustained without regular reinforcement. A dental caries prevention programme among a cohort of elementary school children in Senegal, which involved a periodic oral health education from first to sixth grade, improved oral hygiene behaviour

(Daouda et al., 2016). Also, the literature suggests that a periodic oral health programme is more effective in promoting oral health practices, knowledge and maintenance of oral hygiene in school children. Such a programme provides positive reinforcement to the oral health behaviours of school children (Shenoy & Sequeira, 2010).

The findings are also in line with the presentation in the literature that implementation of periodic motivational interviewing oral health programmes are more effective for students in improving their oral health behaviours, which in turn reduces the development of plaques and dental caries (Gonzalez-Del-Castillo-McGrath et al., 2014). Researchers also supported that regular or periodic education and communication (IEC) based on learning procedures with a focus on dental care, tooth brushing methods and use of fluoride toothpaste, is a more effective way to reduce the development and progression of oral health diseases like gingivitis and tooth extraction or descaling of teeth (Daouda et al., 2016). Besides, regular school oral education is crucial to support frequent oral cleaning among children. The literature indicated that regular education on oral health, oral hygiene, brushing of teeth at least twice daily, visiting dental care services and cleaning teeth with the use of fluoride paste is necessary to improve the ability of school children to engage in frequent oral hygiene (Chandrashekar et al., 2014; Tai et al., 2009). The literature also showed that regular assessment of oral health is essential in protecting, promoting and improving dental status in children. Regular oral health practices helped in early diagnosis of oral diseases and initiation of appropriate management practices to prevent the disease from progressing or affecting other dental tissues (Arora, Khattri, Ismail, Nagraj, & Eachempati, 2019; Halawany et al., 2018; Janssens et al., 2018). Mohamadkhah et al. (2014) proved the effectiveness of regular oral health programme in improving dental health behaviours in school children. Based on the results attained, the study revealed that regular implementation of an oral health programme in the classroom led to an improvement in tooth brushing in which students were able to brush their teeth twice a day. The study also showed an increase in tooth flossing, mouthwash and improved frequent visits to dental care clinics. From the results attained with respect to regular oral health programmes, school children should be taught on the benefits of frequent tooth brushing, flossing, and frequent or regular visits to the dentist as a way to improve and promote their oral hygiene.

The Fragmented State of School Oral Health Programme in Qatar

The first objective of the study was to understand how oral health behavioural strategy operates in the contexts of Qatari public and private schools.

The case study interviews revealed that Qatari primary schools did not have a functional integrated school oral health programme. Rather, multiple fragmented oral health interventions were targeted at school children in public and private schools. These include a lecture on teeth in Science, first aid dental services by the school nurses, promotion of healthy eating and oral health promotion during national and international health week/day. In addition, a trip is organised to PHCC dental clinic for public school pupils in Grades 1 and 4 for oral health education and dental check-up.

Firstly, structure and functions of the teeth is taught as part of Science curriculum for the first time in Grade 3 in each of the schools. The oral hygiene discussion in the class ranges from a brief discussion on tooth-brushing to a comprehensive oral health education by an invited dental professional. However, this is left to the discretion of the Science teacher. Thus, the curriculum does not include enough details about oral hygiene practices or oral health. Although teachers in this study demonstrated a high level of knowledge on how oral health promotion could be integrated into subjects such as Mathematics, Life Matters and Religious Studies, oral health is only partially addressed in Science curriculum.

Moreover, oral health promotion activities in private and public schools include oral health education, dental checks and supervised tooth brushing which are implemented as part of commemoration of Health Week/Day designated by Qatari Government, GCC and World Health Organisation. The public schools usually commemorate days set aside by GCC while private schools observe international celebrations. Since most of these special health days focus on general health, oral health activities are often left out in some years. In addition, these programmes have little or no local input. There is no sense of ownership of the programme in the school or in the community. In fact, the parents stated that they are not involved in the school oral health programmes. The Ama-Ata Conference on Primary Health Care emphasised the crucial role of community ownership and participation in successful health programmes (World Health Organisation, 1978).

Furthermore, the school nurse provides first aid dental services to pupils in each private or public school, such as analgesia for tooth-ache. In addition, the school nurse refers pupils to PHCC dental clinic and sends a letter to the parents of the affected child.

Thus, the school nurse plays a key role in secondary prevention of oral health diseases. The participants acknowledged the key role of the school nurse. The pupils recommended that the school nurse should be involved more in primary prevention of dental caries and other oral health disorders. However, it was noted that the school nurse could be overburdened since she also attends to other general health needs of the pupils. It is important to note that the school nurse is employed by the PHCC, and one at each public school to cover 500-700 pupils per school, and she may be required to cover other school in case of shortage. On the other hand, the school nurse is employed by the private school from a private company. Although the private school is required to employ 2-3 school nurses to cover 800 pupils, that is not usually the case. It was also noted that since she is not a specialist dental nurse, inputs from dental professionals would be needed from time to time.

Moreover, a trip is organised to a PHCC dental clinic to promote early detection and prompt treatment of oral health disorders including dental caries for public school pupils in Grades 1 and 4. The pupils are taken by the school nurse to the dental clinic in batches until they are all seen over the session. The pupils are educated on oral hygiene with videos followed by demonstration of tooth-brushing by a dentist. Gifts, such as toothbrush and toothpaste, are distributed to the pupils. A dental check-up is conducted and pupils with dental caries are followed up by referring for a dental appointment. Thus, this national oral health programme served as a gateway to oral health services to pupils with dental health issues in public primary schools. However, access to the programme was limited in multiple ways. Firstly, the private school pupils were not involved and only pupils in Grade 1 and 4 were included in the public school. Physical accessibility may also be limited because the programme was facility based. According to literature, issues with availability, accessibility, acceptability, affordability and accommodation may impair access to health services (McLaughlin & Wyszewianski, 2002).

Fragmentation of health services leads to inefficiency, ineffectiveness and inequality among others (Stange, 2009). These landmarks of fragmented health services were obviously demonstrated in the existing school oral health programme in Qatar. Firstly, the school oral health interventions were ineffective as the prevalence of dental caries was still high despite the programmes. Inequalities were also demonstrated between pupils in private and public schools and among pupils in public school with regards to access to different interventions. The programme was inefficient as it may

be possible to use the same human and material resources to achieve more positive oral health outcomes, if properly integrated into a functional school oral health programme. However, a new school oral health programme was piloted in February 2018 with the aim of addressing the negative consequences of fragmented school oral health programme. The new programme was scheduled to take-off fully in November 2018.

Negative Forces in Fractured Oral Health Programme

The second objective of this study was to explore why previous oral health strategies did not improve oral health of primary school pupils in Qatar. The study identified negative socio-cultural and organisational forces which tend to fracture the dental health services provided for the primary school pupils.

According to the participants, consumption of chocolates, sweets and other confectionaries is culturally celebrated in Qatar. Confectionaries are used to entertain visitors and in family gatherings. Unhealthy diet has been identified as an important aetiological factor of childhood caries (Albino & Tiwari, 2016; Gao et al., 2013;). The reports of the interviews are valid because most children in Qatar are reported to have dental caries, which are mostly caused by sugary diets that contain sweets and sugary foods (Gargoti et al., 2015). Qatar family traditions value sweets as an item used for welcoming visitors into their homes and may be considered an insult to the visitor in case it is excluded from meals during a visit. Moreover, Bernamer and Grosset (2009) and Musaiger and Al-Hazzaa (2012) noted that children in Qatar are very much influenced by western diets that contain cholesterol, fat, sugar and salt which is associated with lifestyle diseases like dental caries, diabetes, high blood pressure, and obesity. Naidu and Nandlal (2017) also posited that when children consume sweets and sugary foods several times a day, they are at risk of developing tooth decay. Kaewkamnerdpong and Krisdapong (2018) also associated the prevalence of children with dental caries to the food being provided in their schools; a high sugar diet leads to the high prevalence of dental caries, whereas a balanced diet will have few cases of children reporting to have caries.

The participants were concerned that although confectionaries were not allowed in public schools, the children had unfettered access to them at home. Without a synergy between the school and the home, it may be difficult to reduce dental caries among primary school pupils in Qatar. Thus, the oral health programme needs to go beyond the school to promote healthy eating at home. The replies by the interviewees on the extension of Qatar's oral health behavioral intervention was supported by the research

study by Bhardwaj et al. (2013), Ghambir et al. (2013), Damle et al. (2014), and Gasoyan et al. (2019). The authors noted that when parents are included, the chances of success of an oral health education programme are high. Therefore Damle et al. (2014) ensured that their strategy was implemented at home by sensitizing parents on oral hygiene practices like proper tooth brushing techniques. Petersen et al. (2015) also provided findings that concur with the results in the study done by Damle et al. (2014). According to Petersen et al. (2015), oral hygiene practices are supposed to be part of the routine and behaviors of children regardless of whether they are at home or school. The authors proposed the use of posters illustrating oral hygiene practices to educate parents on how they can improve the oral health of their children when they are at home. Bhardwaj et al. (2013) was also of the opinion that the extension of the verbal health intervention beyond the school boundaries was essential to the programme and the children involved. The oral health improvement strategy that Bhardwaj et al. (2013) was assessing failed to fully lead to the elimination of dental caries among children because the intervention was not effectively implemented in the home setting. The intervention being investigated by Ghambir et al. (2013) was successful because the oral health intervention was implemented at school and home in equal measure; teachers and parents both motivated the children to engage in oral hygiene practices. Gasoyan et al. (2019) noted that in rural Armenia, the oral health education programme was successful because of the contribution of both parents and teachers despite their low income.

Another socio-cultural challenge identified by the participants was the occupational demands on the parents which often prevent them from having enough time to supervise oral health of their children. In Qatar, men and women are often gainfully employed in jobs with long working hours. As such, fathers and mothers often have insufficient time to educate their children on oral health or supervise their oral hygiene. In addition, there is no culture of regular dental visits among the participants. Many parents would not take their children for a dental visit unless there is pain (Tai et al., 2009). For example, a pupil in the public school reported that he had dental caries but was promised by his father that he would see a dentist in Grade 4.

This study also identified organisational forces which hinder the success of school oral health programme in Qatar. Although school oral health is mentioned as part of the National Health Strategy (Ministry of Public Health, 2014), sufficient details

on its implementation is not included. There is no comprehensive school oral health policy in Qatar and school oral health is implemented randomly without specific objectives and guidelines. Thus, there is a need for a formulation and dissemination of oral health policy in Qatar. The participants also noted that the implementation of oral health programmes was not monitored.

Various researchers support the finding that oral health programmes in Qatar are implemented with no adherence to any policies. The suggestion on the inclusion of oral health policies in the implementation of oral health interventions is essential to the success of oral health programmes, as mentioned by Macpherson et al. (2010), and Takeuchi et al. (2016). In Scotland, ChildSmile is implemented according to the oral health policies outlined by the Scottish government. ChildSmile is implemented following the Scottish Executive 2005 policy document (Macpherson et al., 2010). The Childsmile practice element followed the Caries Risk Assessment (CRA) protocol that aided in identifying infants who were at higher risk of getting dental caries. The policy which ChildSmile was based on ensured that the oral health of the children in Scotland was improving. Macpherson et al. (2010) policy required that all children up to the age of six were provided with toothbrushes and fluoridated toothpaste six times. Takeuchi et al. (2016) also mentioned that the MaliMali programme was effective because it was implemented through policies provided in the Kingdom of Tonga on oral health through the South Pacific Medical Team (SPMT), Japan International Cooperation Agency (JICA), Ministry of health and ministry of education. The children who participated in the study had their oral hygiene improved with significant results being noted regarding DMFT scores; the children who attended had their mean DMFT scores being lower. Organizational agreements between SPMT and JICA provided policies that the MaliMali oral health education programme enabled the intervention to be implemented in the whole country (Takeuchi et al., 2016).

However, cultural factors also motivate positive oral health behaviour in Qatar. Kissing, being a cultural way of greeting motivates individuals to maintain oral hygiene to avoid mouth odour. In addition, Islam which is the State religion in Qatar, promotes oral hygiene.

Context of Oral Health in Qatar

The third objective of this study is to examine motivational factors, contexts and mechanisms underpinning the positive motivation of primary school pupils and their parents in Qatar to improve their oral health behaviour, by focusing on the environment of primary schools, the family home and the interplay between the school and home environments.

Home.

The participants identified the home context as an important oral health motivation in Qatar. Home is the context where most daily oral hygiene related activities, such as tooth-brushing and dental flossing, are carried out. The participants agreed that oral health is primarily the responsibility of the parents at home. The role of the parents in promoting oral health cannot be overemphasised. The roles of the parents at home include oral health education, healthy eating, being a role model for oral hygiene, supportive supervision of follow-up oral hygiene activities and seeking dental services promptly. These roles must be performed with diligence to inculcate the oral hygiene practice in children. Thus, home is the platform where pupils put into practice all oral hygiene obtained from the school.

School.

Children spend most of their wakeful part of the day in school. The school also presents an organised setting where oral health programme can be easily implemented (Albino & Tiwari, 2016). The teachers and the school nurses were identified as major actors in the school setting. The teachers often enjoy a high level of respect and obedience from the pupils and the use of school teachers lowers the cost of implementation (Naidu & Nandlal, 2017). Studies have shown that oral health education delivered by teachers is comparable to oral health by dental professionals (Naidu & Nandlal, 2017). However, the involvement of teachers in school oral health activities in Qatar is quite limited. Thus, the teachers are currently untapped resources in School Oral Health in Qatar.

It is more feasible to reach a large population of children at a relatively lower cost through school based oral health programme (Angelopoulou et al., 2015). Children in primary schools are at early age when habits are formed (Naidu & Nandlal, 2017). School based programme reduced inequities with regards to oral health because it is readily accessible to all children irrespective of socioeconomic factors (Daouda et al., 2016)

Dental health services.

The findings also provided the understanding of dental health practice context in Qatar. The school nurse plays a critical role in providing first aid dental services and linking the pupils to specialised dental health services in the primary health centre. The primary health centres are the major provider of school oral health services in Qatar. The participants showed enthusiasm to engage dental health services. The Ministry of Public Health also has a key role to play especially in setting agenda for school oral health and monitoring its implementation.

Opportunities for Innovation

The fourth objective was to understand how oral health behavioural change may be sustained among primary school children in Qatar. The participants generated a lot of innovative ideas which could be applied to build an integrated school oral health programme that would span across the dental health service, school and home contexts.

School oral health policy.

The participants suggested several initiatives to be included in school oral health. A comprehensive school oral health policy is required to guide these initiatives. The importance of policy and guidelines for school oral health has been discussed in the literature (Kwan et al., 2005). Policy areas could include healthy eating, oral health education, oral health service, healthy school environment, restriction on smoking, alcohol, sugar, and physical exercise (Kwan et al., 2005). Most importantly, it is important to consider the content, the context, the actors and the process of the School Oral Health which have been set out in the study (Walt & Gilson, 1994). Incorporating oral health interventions into school policies leads to improvements in the verbal behaviours of all children. In the Kingdom of Tonga, children in almost all nursery schools are required to participate in the MaliMali Programme. Takeuchi et al. (2016) mentioned that the number of reported caries in nursery school children has reduced, meaning that the overall oral health of children has improved. Similarly, the ChildSmile programme is a necessity for all children in Scotland, according to Macpherson et al. (2010). The strategies of improving oral health outlined in ChildSmile have been incorporated as part of the curriculum in Scotland schools to ensure that the advantages of implementing Oral Health prevention programmes are sustained (Scottish Dental, 2019). According to Chachra et al. (2011), sugar consumption in schools should be restricted to only three times per day. Implementation of the restriction needs to involve

the parents of the children participating in the study to ensure that the oral health improvements attained at school are not lost due to poor oral health habits at home. Hence, the parents of children play a vital role in the implementation of oral health behavioral prevention interventions (Yekaninejad et al., 2012; Damle et al., 2014; Petersen et al., 2016).

Kaewkamnerdpong and Krisdapong (2018) mentioned that successful oral health prevention programmes in schools depended on the existing oral health policies in the school setting. In schools where sugary foodstuffs were sold while the programme was running noted, no changes in the number of children reported with caries. In a school where the selling of sweets was restricted, the intervention led to significant improvements in the number of reported caries (Kaewkamnerdpong & Krisdapong, 2018).

In the oral health behavioral intervention for children in Qatar schools, school oral health policies need to be improved. The school leadership may provide diets that are low on sugar hence improve the chances of success of the intervention.

Involvement of parents and teachers.

Involvement of parents has been reported to enhance the success of school oral health education (Damle et al., 2014; Petersen et al., 2016; Saied-Moallemi et al., 2009; Tai et al., 2009; Yekaninejad et al., 2012). In a community trial in Iran, school children whose parents received oral health education leaflet and brushing diaries for supervising the child's tooth-brushing had a more acceptable oral hygiene (reduced plaque) as compared to school children who only solved puzzles at school under the supervision of health counsellors (Saied-Moallemi et al., 2009). In another study in India, students who had oral health education and tooth brushing under the supervision of parents, had a better oral hygiene (reduced plaque) as compared to pupils who had oral health education alone without the involvement of parents (Damle et al., 2014).

The cluster-randomized research in Iran done by Yekaninejad et al. (2012) provided results that indicated that parental and teacher involvement in oral health education programmes led to oral health behaviour improvements. The improvements noted include; better tooth brushing techniques, and an increase in frequencies and increased proper flossing practices unlike when parents are not involved. Cooper et al. (2013) was also of the opinion that teachers need to be included in oral health education strategies. In their systematic review, the authors noted that parents and teachers are

valuable to primary school-based behavioural interventions because they contribute to the effectiveness of the implemented strategies (Cooper et al., 2013). Daouda et al. (2016) suggested the inclusion of mothers and teachers in future studies on dental prevention programmes. The reason behind the suggestion by Daouda et al. (2016) was because the researcher-led the intervention that they implemented with no involvement of parents, hence failed to indicate improvements in terms of reducing the number of decayed, missing, or filled teeth among the children who participated in the study.

Moreover, the involvement of parents is essential in improving the follow-up processes of oral health interventions. In the study done by Petersen et al. (2015), the behaviors of children were sustained well during and after the intervention; therefore, the improvements in the oral health of children is maintained. The findings by De Farias et al. (2009) augur with those of Petersen et al. (2015) who noted that the parent-teacher collaboration during the implementation of their intervention led to its success in addition to improving and maintaining adopted oral behaviors years after the programme has ended. The involvement of both parents and teachers is supported by Jain et al. (2015), who mentions that the duo determines the effectiveness of oral hygiene behavioural interventions. In the oral health programme in Qatar, parents and teachers need to be included to ensure that the intervention is useful both at school and at home.

Involvement of parents in school oral health programme.

The participants canvassed for involvement of parents in school oral health programme as a way of motivating and sustaining oral health practices among pupils. Involvement of parents has been reported to enhance success of school oral health education (Damle et al., 2014; Petersen et al., 2016; Saied-Moallemi et al., 2009; Tai et al., 2009; Yekaninejad et al., 2012). Oral hygiene leaflet was suggested as a strategy for involving parents. In a previous study in Iran, pupils whose parents received an oral health education leaflet and a brushing diary for supervising the child's tooth-brushing had a more acceptable oral hygiene (reduced plaque) compared to school children who only solved puzzles at school under the supervision of health counsellors (Saied-Moallemi et al., 2009). It was also suggested that parents should discuss oral health with their children during mealtimes.

Annual workshops could also be organised for parents at school alongside with their kids. Letters and/or SMS could be sent to parents to update them about oral health

of their wards. According to Damle et al. (2014), when parents are involved in oral health strategies implemented in schools, they promote the oral health of children by acting as role models and by supervising oral hygiene practices in their children. Petersen *et al.* (2015) also included that parents in their intervention contributed to the success of their behavioural strategy. Parents contribute to the effectiveness of oral hygiene interventions through monitoring and supporting their children to ensure that they adhere to oral hygiene practices at home as defined in the oral health behavioural intervention being implemented. Cooper et al. (2013) also posited that parents influence the rate of success of oral health behavioural interventions. Parents need to get adequate training on oral health prior to the implementation of oral health education programmes. The reason for the focus on their training is due to the need to have knowledge on oral health for them to aid in assisting their children to adopt proper behavioural transition like acquiring knowledge, oral hygiene skills development, and behavioural adoptions (Cooper et al., 2013).

Bhardwaj et al. (2013), just like Petersen et al. (2015), noted the value of involving parents in the implementation of oral health behavioural interventions after they assessed their results. In the research done by Bhardwaj et al. (2013), the author noted that their oral health improvement strategy was only effective in the school setting and failed in the home setting. The reason for the failure of the intervention to reflect similar improvements in comparison to the school environment was because children did not adhere to oral health guidelines at home in the same manner as they did at school (Bhardwaj et al., 2013). Ghambir et al. (2013) in their school-based oral motivation strategy, the programme was successful because the involved children were constantly motivated to adhere to oral hygiene practices in school and at home. In a school-based dental programme in rural Armenia, parents were included in the study by educating them on oral hygiene practices and tasking them with the responsibility of ensuring that their children brushed their teeth twice a day (Gasoyan et al., 2019). The programme implemented in rural Armenia was successful because the oral hygiene of children improved and also dental disease prevalence among children in the setting were reduced due to the contribution of the parents of the participants (Gasoyan et al., 2019).

Similarly, Tarvonen et al. (2016) in their longitudinal study that sought to compare two prevention interventions for dental caries in Pyongyang, Korea included parents in the implementation process. The education of parents according to Tarvonen et al. (2016) led to the success of the interventions being studied; therefore, it is viable

to include parents in oral health education interventions because they play a key role in improving the dental health of children. Halawany et al. (2018) included parents in the oral health education intervention through providing them with a booklet on oral health practices, with minimal responsibility placed on them. Despite their findings indicating that OHEs aided in the reduction of dental caries among the female primary school children in Riyadh, the researchers needed to ensure that more dental diseases were reduced with the implementation of the intervention. The authors therefore suggested that to improve the outcomes of oral health education programmes, parents need to be involved (Halawany et al., 2018).

Therefore, the oral health programme to be implemented in Qatar need to train parents on how to ensure the intervention's strategies are adhered to at home just as they are followed at school. Parents are also required to adhere to any regulations on diet by restricting excessive consumption of sugary food to only three times per day. The parents may also be tasked with ensuring that children brush their teeth twice per day using fluoridated toothpaste. Moreover, parents may be guided on oral health practices that they may adopt during the programme hence act as role models to their children, and consequently motivate the participants to adopt positive behavioural changes in their oral hygiene.

Active participation of teachers in school oral health programme.

Active participation of teachers was also suggested as a means sustaining oral health behaviour among children. This is in line with WHO recommendation about school health programme and reported to have been effective in the literature (Tai et al., 2009). In Iran, students whose teachers and parents were given health education booklet had a more significant improvement in oral health behaviour (brushing and flossing) compared to students who had oral health education without the involvement of teachers and parents (Yekaninejad et al., 2012). Another study in Denmark reported that a comprehensive school oral health promotion programme comprising of oral health education, teacher-supervised tooth brushing and supply of oral hygiene aids (toothbrush and toothpaste) resulted in greater reduction in dental caries among participating pupils compared to no intervention (Petersen et al., 2016). Thus, involvement of teachers may also enhance the success of school oral health promotion. It may be easier to integrate oral health promotion into the usual school programme when it is delivered by teachers. However, efforts should be made not to overburden teachers. Teachers can be involved by making them to deliver oral health education and

motivating them through regular annual training workshop by dental professionals (Tai et al., 2009).

Petersen et al. (2015) investigated the efficiency of an oral health prevention strategy implemented in schools in Thailand. The researchers in the schools where the participants were obtained were trained on oral hygiene behaviors that children can adopt in their day to day activities at the school to improve their oral health. Training content and procedures equipped employees with the confidence to provide oral health education (OHE) to pupils in the period of the intervention and the period after the end of the programme. Teachers are preferred in OHE programmes because they understand the abilities of their students hence would find a way for each of them to see the content as being exciting and therefore adopt it as part of their daily routine. The participants in the study effectively adopted the use of fluoridated toothpaste hence suggesting including teachers in oral health behavioural prevention programmes in schools is beneficial in the achievement of the programme's aims (Petersen et al., 2015). In Denmark, Petersen et al. (2016) included teacher-supervised tooth brushing as part of their intervention in addition to OHE and the supply of oral hygiene aids. The involvement of teachers in the oral health promotion programme in the study by Petersen et al. (2016) enhanced the success rate of the intervention. Also, it enabled the intervention to be smoothly and effectively incorporated into the school curriculum.

Naidu and Nandlal (2017) concurred with Petersen et al. (2016) on the inclusion of teachers in oral health behavioural prevention interventions. The research done by Naidu and Nandlal (2017) included teachers because they were the ones whom the researchers noted to spend more time with the children. Their teaching methods were considered useful in imparting oral hygiene practices in children regularly. In the research that Haleem et al. (2012), the participants were divided into groups, with three of them being educator-led. The teachers were involved in the educator-led groups, which, in comparison to the control group after the intervention, were noted to have their oral health behaviour, knowledge, and hygiene status effectively improved. The control group used self-learning, which in comparison to the teacher-led and peer-led group, had lower improvements. Teacher-led group strategies improved the oral health of the children in comparison to the group led by dentists (Haleem et al., 2012). Therefore, oral health behavioural interventions need to use teacher-led strategies to guide peer-led interventions among participants hence improve the overall oral health of the participants. In the research study by Jain et al. (2016), teachers were trained on

oral health knowledge and practices, which they used to enhance the success rate of the adopted intervention.

Moreover, the teachers' support and commitment were used by the authors to determine the success rate of the intervention. Teachers in the research by Jain et al. (2016) provided many contributions that aided in the achievement of improvements in the quality of oral health of children and consequently improved their quality of life. Bhardwaj et al. (2013) also reported that teachers play a vital role in the implementation of oral health programmes. Teachers, according to Bhardwaj et al. (2013), helped improve the success of the intervention because they provided an efficient environment that motivated children to adopt oral hygiene practices in their lives.

The oral health behavioural intervention also needs to incorporate teachers into the intervention with their roles clearly stated out. In the programme, teachers will be tasked with supporting the children in adopting and improving their oral hygiene practices. Also training teachers aids in the implementation of the intervention, especially among children whose parents have low income helps in reducing to pay dental clinic high expense by their parents.

Regulation of children diet.

Currently, children in public primary schools in Qatar are prohibited from bringing unhealthy food to school. Unhealthy dishes are often confiscated and returned to the parents. It was suggested that the private school could establish a school canteen where only healthy food will be provided for the pupils. Children's diets may be regulated through the reduction of sugar consumption through being aided by different stakeholders (Watt et al., 2019). The reason for the focus of children on regulating the diet of children is because there is a positive association between environments where oral health programmes are implemented and the number of reported cases of dental diseases (Kaewkamnerdpong & Krisdapong, 2018). Restriction of promotion sales for high-sugar products and placement of limitations on the sale of free sugars in schools comprise the midstream strategies, which Watt et al. (2019) mention that may be used to regulate the diet of children. Dental problems start when one is young hence regulating the diets of children while their still young efficiently improve their oral health (Hall-Scullin et al., 2017). Kaewkamnerdpong and Krisdapong (2018), from their survey performed in Thailand, noted that in a school that sold a lot of sugary foods,

children reported more dental diseases like dental caries while those that sold meals with low amounts of sweets reported low cases of oral illnesses.

Therefore, regulating the diets of children in a targeted population with a high prevalence of dental diseases ensured that children only eat healthy food while they are at school. However, the proposed suggestions may not effectively stop unhealthy eating at home, thus providing a new challenge to parents. To regulate sugar consumption at home, parents need to carefully read the label of each product that they purchase meant for their children, and wisely choose those products that have less sugar content. Alternatively, the parents may choose products that provide natural sugar like fruits, unlike canned drinks that have refined sugars that have proven to be the leading cause of dental caries among children. Hall-Scullin et al. (2017) mentioned that the manufacturers of children-attractive foods and snacks might be prompted to reduce the sugar in their products and improve labelling of products in adherence to upstream policies; hence they avoid the high levies placed on sugary products. Peres et al. (2019) support the findings by Watt et al. (2019) and Hall-Scullin et al. (2017) on the use of adverts to control children diets; he mentioned that food preferences, and consumption patterns are influenced by what they see on adverts be it online, physical or in TV adverts. Watt et al. (2019) posited that when manufacturers adhere to upstream and midstream policies on reducing sugars, they are adhering to World Health Organization policies that provide that regulation of diet through reductions in sugar in products at the manufacturing stage leads to improvements in the oral health of children. Dental disease prevention is the best way of keeping oral health at bay in children, hence controlling the social and commercial factors that lead to poor oral health provide a basis for an effective oral health education programme (Peres et al., 2019). Cooper et al. (2013) systematically reviewed articles promoting tooth brushing twice a day and reductions in the consumption of snacks and found that the two strategies improved the knowledge of children on dental health habits and plaque removal. Naidu and Nandlal (2017) mentioned that their oral health education intervention made the children have a better knowledge of the effect of sugar consumption on their teeth. Also, their research aided in regulating the use of sugary foods among children because most of the participating children started adhering to the no more than three times per day sugar consumption rule (Cooper et al., 2013; Naidu & Nandlal, 2017).

The oral health behavioral intervention for Qatar schools needs to include strategies for regulating the diets of children. This is done through cooperating with the implementers of the oral health programme, school management, teachers, and parents. Regulation of diets may also include the input of nutritionists in Qatar who help in providing guidelines on suggestions of proper diets to follow during the period when the intervention was being implemented and possibly even after the programme ends. As part of the regulation of diets, the Qatar government may enforce policies that prompt manufacturers of sugary products to reduce the amount of sugar in their products.

Also, children-targeted adverts on sugary foods may be restricted to avoid creating a mentality where children only prefer foodstuffs and snacks that have much sugar content. Moreover, as part of the oral health intervention in Qatar, parents may be trained on how to regulate the diets of their children at home in support of the programme being implemented at school.

Monitoring.

Proper monitoring plan was recommended by the participants to ensure the school oral programme is achieving its target. A monitoring plan for an oral health programme is essential to all the involved stakeholders. The gains include: project success rate increases, the progress of intervention is noted, areas for improvements on the strategies being used are identified, and necessary change of roles of the involved stakeholders are done (Ghambir et al., 2013; Gasoyan et al., 2019). Research studies have proven that monitoring of oral health behaviors in participants is essential in improving the chances of the effectiveness of school-based oral health behavioral interventions (Daouda et al., 2016; De Farias et al., 2009; Ghambir et al., 2013; Gasoyan et al., 2019; Macnab et al., 2008; Macpherson et al., 2013;). According to the research done by Macnab et al. (2008), when a child during behavioral intervention programmes realizes that they are being watched, they tend to engage in the recommended level of oral health behaviors, which consequently increases the chances of success of the oral health education programmes. Macpherson et al. (2013) noted that monitoring of the ChildSmile programme is done regularly to ensure that it is achieving its aims and to identify the way of improving the current implementation strategies to suit the needs of the participating children. The nursery school children are also monitored in the ChildSmile programme to ascertain whether their oral hygiene

practices concur with laid out national standards developed for the programme (Macpherson et al., 2010).

Monitoring of children during the implementation of oral health education programmes is essential in the identification of challenges in the understanding of oral hygiene practices which the children may have; hence contribute to making the end-result of the intervention to be more successful (Gasoyan et al., 2019; Macpherson et al., 2013). Gasoyan et al. (2019) noted that when children become aware that they are not being monitored, they do not adhere to oral hygiene practices during behavioral prevention oral health strategies implementation process. Such practices increase the risk of failure in the strategy to achieve its desired aim of improving the oral health of children. The lack of monitoring of children's oral health practices through the use of a continuing programme after the completion of the elementary school OHE implemented in the study by Daouda et al. (2016) led to gaps in the results of the authors' research in terms of the long-term prevention of dental caries. OHE's aim to change or improve the oral health behaviours of a child is an aspect that needs to be first inculcated in one's mind before being identified as an essential normal behavior that one needs to adhere to (Gambhir et al., 2013). Lai et al. (2015), in their prospective cohort study of oral hygiene programme effectiveness in 10-11-year-old children, indicated that monitoring of the intensive oral education programme by the dentists led to the overall success of the group in improving the dental knowledge of the children. The improvements include; improving their oral hygiene habits and reducing their plaque and caries scores in the long-term. Therefore, monitoring of the results of the oral behavioural prevention strategies needs to be monitored over a long period to achieve the best results through increased efficiency of results (Gambhir et al., 2013). De Farias et al. (2009) mentioned that their findings were not significant because they only monitored the oral health behaviours of the children after four months. Hence, the authors suggested that oral health education programmes need to be regularly monitored. This indicates that school oral health needs to be planned properly with specific objectives and monitoring plan. The administrative assistants can have a round of the classes and complete a checklist for each class about their level of engagement with school oral health programme.

The oral health intervention being implemented in Qatari schools need to clearly state out the procedures used for monitoring the children participating in the programme, the personnel involved, and the frequency of performing it. The identified

rate of monitoring changes needs to be regular for long periods. Also, parents and teachers may be used to monitor the progress of the children to ensure that all aspects surrounding the oral health of the children are captured.

Inclusion of oral health in the curriculum.

Integration of oral health education into normal school timetable allows a regular access to oral health education and enhances the success of oral health programmes (Jain et al., 2016). There are also extensive examples in the literature on how oral health can be inculcated into several subjects including Sciences, Sociology, Mathematics and Languages (Kwan et al., 2005). To enable the monitoring of oral health behaviors better for more extended periods, De Farias, De Araújo Souza, and Ferreira (2009) suggested that OHE be included in the school routines. Thus, better outcomes in terms of oral health behavioral changes will be realized. In developing countries that cannot sustain an oral health programme, teachers are trained on how to provide oral health education to the children because it is more cost-effective and efficient considering the few dentists available in such countries. Therefore, oral health education is included in the normal learning curriculum of students to enable the children's mind to notice it as being necessary and essential, and consequently adopt it as part of their behavior (Chandrashekar et al., 2014). The milestones attained after oral health programmes have been implemented may be improved and maintained through incorporating the oral health programme into the usual routines of the children at school. Bhardwaj et al. (2013) noted that when a programme ends, in case the children have not fully adopted oral hygiene practices into their daily behaviors, the improvements in their oral health may take a downward trend, hence also emphasizing the need for monitoring for more extended periods.

The Oral Health Programme to be implemented among children in Qatar schools, therefore, need to seek ways of cooperating with their government to ensure that the gains after the oral health programmes have been implemented remain sustainable. The cooperation with the government is similar to the ChildSmile, Designed-to-Smile, and MaliMali National Programmes (Macpherson et al., 2010; Morgan, 2015; Takeuchi et al., 2016). Moreover, the leadership of the schools in Qatar needs to seek ways of incorporating the proposed oral health programmes in the school timetable.

Regular oral health programme.

The oral health behavioural intervention in Qatar needs to incorporate oral health programmes implemented regularly. Various international pieces of literature have realized in their studies that when OHE programmes are implemented daily, more efficient results are obtained (D'Cruz & Aradhya, 2012; Daouda et al., 2016; Haleem et al., 2012). Comparisons between the use of a regular and periodic OHE indicate that regular OHEs has significantly improved the oral health of children in various areas (D'Cruz & Aradhya, 2012; Daouda et al., 2016).

Evidence from the literature suggest that periodic or regular school oral health programmes are often successful (Daouda et al., 2016). Even when a one-off oral health education programme is effective, its impact is not sustained without regular reinforcement. A dental caries prevention programme among a cohort of elementary school children of in Senegal which involved a periodic oral health education from first to sixth grade improved the oral hygiene behaviour (Daouda et al., 2016). Haleem et al. (2012) mentioned that social support and reinforcements in oral health programmes were included in the programmes by requesting pupils to appreciate the positive steps that their peers make in improving their oral hygiene practices. Shenoy and Sequeira (2010), in their comparative study of two oral health interventions, yielded good outcomes noted that then the intervention's strategies were reinforced through repeating them regularly made the benefits gained from the programme to be sustainable even 36 months after its end (Shenoy & Sequeira, 2010). Based on the findings by D'Cruz and Aradhya (2012), reinforcement of oral health information leads to the success of OHEs. The reason for the success of reinforced oral programmes is because it creates room for regular assessment of the behaviours of the participating children. Cooper et al. (2013), in their systematic review on oral health behavioural interventions, realized evidence supporting the idea that both the periodic and regular school-based oral health programmes usually succeed in attaining its objectives. According to Jain et al. (2016), the best way of enhancing the success rate of oral health programmes is by incorporating it into the school curriculum (De Farias, De Araújo Souza, and Ferreira, 2009; Chandrashekar et al., 2014). In the results by Jain et al. (2016) the advantages of integrating an oral health education programme into the regular school curriculum makes access to oral health education to be regular, and also lead to the enhancement of success rates of the interventions. Similar to the research

done by Cooper et al. (2013), Gambhir et al. (2013) systematically reviewed school based OHE programmes. The research done by various articles revealed that the best outcomes in school based OHEs are best obtained when findings are measured regularly with the follow-up being done after long periods. However, Halawany et al. (2012) differed with the results by Ghambir et al. (2013) by mentioning that the oral health programme it measured was successful despite being measured once after a short period. According to De Farias et al., (2009), the research was efficient within the time of its implementation and the four months that followed. However, after the intervention ended, the participants did not receive any oral health education or training; hence it is safe to mention that nothing was done after the intervention. Therefore, the researchers suggested that future oral health prevention programmes be incorporated into the school routines where the participants are obtained to ensure that the oral health improvement milestones are not lost (De Farias et al., 2009).

In Qatar, the school-based oral health prevention programme may adopt the above suggestion of implementing regularly. The procedures followed in the programme include implementing over a long period with regular dental check-ups for monitoring the prevalence and progress of dental diseases.

Framework for Childhood Caries Prevention Strategies in Qatar

The last objective of this study was to identify the overall conditions and circumstances necessary for effective dental caries behavioural prevention strategies in Qatar, among primary school children in both public and private settings. This objective was addressed by synthesizing all the findings in the study to construct a framework for dental caries in Qatar as presented in the preceding chapter.

Recommendations

The present research study provides a platform for highlighting a range of a number of recommendations, focused on research, practices and policy in relation to enhancing oral health. This includes addressing current ‘research gaps’ in the literature and the key areas illuminated in the study findings. As a result there are the following recommendations:

Recommendation for Policy.

- i. The research findings highlight the lack of oral health policies in the state of Qatar. Therefore, there arises a need to adopt a comprehensive school oral

health policy as a component of the overall school programme or as a separate project.

- ii. The study's findings also support the effectiveness of oral health programmes that involve various stakeholders, including dentists, parents, teachers, and pupils. Hence, there is a need for Qatar to develop oral health policies based on the input of all the stakeholders that will either be involved or affected by the programme.

Recommendation for Practice.

- i. The findings highlighted that the oral health interventions in the case study primary schools successfully built a culture of good dental hygiene behaviours at home and in the learning institutions. Thus, Qatar's stakeholder management needs to adopt oral health school programmes as part of their curriculum.
- ii. The study's findings highlighted the necessity for educating parents on managing their children's dental hygiene through an oral hygiene and diet programme. Therefore, the stakeholder of the school oral health programme need to develop and adopt dental health education for parents to guide them on how to ensure their children have and maintain good oral health behaviours.
- iii. The study's findings supported the implementation of dental health education and demonstrations by teachers to improve oral health and lower associated dental caries among children. The researcher found that teachers' oral health education using visual aids and physical demonstrations yielded more effective results as it helps improve dental hygiene. Thus, future implementations of oral health education interventions by schools in the State of Qatar need to include teachers and the use of visual aids in the education sessions. Therefore, the stakeholder of the school oral health programme need to develop and adopt dental health education for teachers to guide them on how to ensure their students have and maintain good oral health behaviours.
- iv. The study's findings also emphasize the significance of implementing school oral health programmes to improve pupils' knowledge and awareness of healthy oral health behaviours. Thus, the stakeholders in the State of Qatar need to improve the pupil's education to ensure they practice healthy oral health behaviours.

- v. The study's findings also supported the regulation of children's diet as an effective strategy to improve their oral health behaviours. Thus, the stakeholder in the State of Qatar should develop oral health programmes that include dietary modifications and encouragement both at home and in schools.

Recommendation for Research

- i. The study highlighted that oral health education successfully led to improve oral health when programmes involved parents and teachers, combined with the use of visual aids. This area merits further inquiry focused on exploring the impact of including teachers, parents, and dentists in oral health education, based on a partnership approach.
- ii. Further study is required to explore the policymakers' views and perception toward oral health and school oral health programmes in Qatar, the challenges and how to overcome difficulties, and how to sustain the change in oral health among children in the State of Qatar.
- iii. This study focused on student oral health programmes in the State of Qatar. Thus, future research should compare student oral health programmes in Qatar and other countries like the Arabian Peninsula or internationally.
- iv. The present study followed a methodology that combined a scoping review, case study, and co-production workshop. Future researchers need to implement the research on school oral health using workshops that have visual diagramming.
- v. This study also used qualitative research to elicit opinions regarding school oral health programmes from pupils, teachers, and parents. Future research needs to use the qualitative approach to elicit opinions from other stakeholders like dentists, dental hygienists, dental assistants, and education facilities' management regarding school oral health.

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APPENDICES

Appendix 1: Search Strategies

PsycINFO 1806 to May Week 5 2017

#	Searches	Results
1	(teeth adj5 (cavit\$ or caries or carious or decay\$ or lesion\$ or deminerali\$ or reminerali\$)).mp.	148
2	(tooth adj5 (cavit\$ or caries or carious or decay\$ or lesion\$ or deminerali\$ or reminerali\$)).mp.	110
3	(dental adj5 (cavit\$ or caries or carious or decay\$ or lesion\$ or deminerali\$ or reminerali\$)).mp.	319
4	(enamel adj5 (cavit\$ or caries or carious or decay\$ or lesion\$ or deminerali\$ or reminerali\$)).mp.	7
5	(dentin adj5 (cavit\$ or caries or carious or decay\$ or lesion\$ or deminerali\$ or reminerali\$)).mp.	2
6	(pulp\$ adj5 (cavit\$ or caries or carious or decay\$ or lesion\$)).mp.	6
7	(plaque and (teeth or tooth or dental or oral)).mp.	159
8	("DMF index" or "dental plaque index" or "oral hygiene index").mp.	17
9	1 or 2 or 3 or 4 or 5 or 6 or 7 or 8	604
10	((mouth adj6 care) or (oral adj6 care) or (dental adj6 care) or (teeth adj6 care)).mp.	1294
11	((plaque adj3 control) or (plaque adj3 remov\$)).mp.	33
12	((tooth or teeth or interdental) adj3 clean\$).mp.	44
13	(snack\$ or diet\$ or food\$ or drink\$ or beverage\$).mp.	156881
14	((mouth adj6 health) or (oral adj6 health) or (dental adj6 health) or (teeth adj6 health)).mp.	2300
15	((mouth adj6 hygien\$) or (oral adj6 hygien\$) or (dental adj6 hygien\$) or (teeth adj6 hygien\$)).mp.	632
16	(toothbrush\$ or tooth-brush\$ or "tooth brush\$" or toothpaste\$ or tooth-paste\$ or "tooth paste\$" or dentifric\$).mp.	362
17	(mouthwash\$ or mouth-wash\$ or "mouth wash\$" or mouthrinse\$ or mouth-rinse\$ or "mouth rinse\$").mp.	66
18	("sugar intake\$" or sweet\$ or candy or candies or gum\$).mp.	7949
19	8 or 9 or 10 or 11 or 12 or 13 or 19 or 20 or 21	164605
20	Health promotion/	20992
21	((dental or oral or mouth or teeth) and (instruct\$ or advice or advis\$ or educat\$ or teach\$ or train\$ or promot\$)).mp.	16490

22	((("interdental clean\$" or floss\$ or mouthwash\$ or mouth-wash\$ or "mouth wash\$" or mouthrinse\$ or mouth-rinse\$ or "mouth rinse\$" or toothbrush\$ or tooth-brush\$ or "tooth brush\$" or toothpaste\$ or tooth-paste\$ or "tooth paste\$") and (supervis\$ or demonstrat\$)).mp.	75
23	20 or 21 or 22	37170
24	(school\$ and (primary or elementary or junior or infant)).mp.	108527
25	child\$.mp.	673178
26	("school age child\$" or "school-age child\$" or "4-11 year\$ old\$").mp.	10747
27	24 or 25 or 26	732828
28	23 and 24 and 25 and 27	76

HMIC Health Management Information Consortium 1979 to January 2017

Search Strategy:

#	Searches	Results
1	(teeth adj5 (cavit\$ or caries or carious or decay\$ or lesion\$ or deminerali\$ or reminerali\$)).mp.	52
2	(tooth adj5 (cavit\$ or caries or carious or decay\$ or lesion\$ or deminerali\$ or reminerali\$)).mp.	56
3	(dental adj5 (cavit\$ or caries or carious or decay\$ or lesion\$ or deminerali\$ or reminerali\$)).mp.	236
4	(enamel adj5 (cavit\$ or caries or carious or decay\$ or lesion\$ or deminerali\$ or reminerali\$)).mp.	5
5	(dentin adj5 (cavit\$ or caries or carious or decay\$ or lesion\$ or deminerali\$ or reminerali\$)).mp.	0
6	(pulp\$ adj5 (cavit\$ or caries or carious or decay\$ or lesion\$)).mp.	2
7	(plaque and (teeth or tooth or dental or oral)).mp.	38
8	((mouth adj6 care) or (oral adj6 care) or (dental adj6 care) or (teeth adj6 care)).mp.	1019
9	((plaque adj3 control) or (plaque adj3 remov\$)).mp.	8
10	((tooth or teeth or interdental) adj3 clean\$).mp.	4
11	(snack\$ or diet\$ or food\$ or drink\$ or beverage\$).mp.	12479
12	((mouth adj6 health) or (oral adj6 health) or (dental adj6 health) or (teeth adj6 health)).mp.	1589
13	((mouth adj6 hygien\$) or (oral adj6 hygien\$) or (dental adj6 hygien\$) or (teeth adj6 hygien\$)).mp.	193
14	Health promotion/	6526
15	((dental or oral or mouth or teeth) and (instruct\$ or advice or advis\$ or educat\$ or teach\$ or train\$ or promot\$)).mp.	1628
16	(school\$ and (primary or elementary or junior or infant)).mp.	1376
17	child\$.mp.	34589
18	("DMF index" or "dental plaque index" or "oral hygiene index").mp.	0
19	(toothbrush\$ or tooth-brush\$ or "tooth brush\$" or toothpaste\$ or tooth-paste\$ or "tooth paste\$" or dentifric\$).mp.	104
20	(mouthwash\$ or mouth-wash\$ or "mouth wash\$" or mouthrinse\$ or mouth-rinse\$ or "mouth rinse\$").mp.	12
21	("sugar intake\$" or sweet\$ or candy or candies or gum\$).mp.	582
22	((("interdental clean\$" or floss\$ or mouthwash\$ or mouth-wash\$ or "mouth wash\$" or mouthrinse\$ or mouth-rinse\$ or "mouth rinse\$" or toothbrush\$ or tooth-brush\$ or "tooth	10

	brush\$ or toothpaste\$ or tooth-paste\$ or "tooth paste\$") and (supervis\$ or demonstrat\$)).mp.	
23	1 or 2 or 3 or 4 or 5 or 6 or 7 or 18	303
24	8 or 9 or 10 or 11 or 12 or 13 or 19 or 20 or 21	14830
25	14 or 15 or 22	8026
26	("school age child\$ or "school-age child\$ or "4-11 year\$ old\$").mp.	136
27	16 or 17 or 26	35213
28	23 and 24 and 25 and 27	53

Embase **Classic+Embase** 1947 to 2017 June 2

Search Strategy:

#	Searches	Results
1	(teeth adj5 (cavit\$ or caries or carious or decay\$ or lesion\$ or deminerali\$ or reminerali\$)).mp.	9603
2	(tooth adj5 (cavit\$ or caries or carious or decay\$ or lesion\$ or deminerali\$ or reminerali\$)).mp.	5408
3	(dental adj5 (cavit\$ or caries or carious or decay\$ or lesion\$ or deminerali\$ or reminerali\$)).mp.	55261
4	(enamel adj5 (cavit\$ or caries or carious or decay\$ or lesion\$ or deminerali\$ or reminerali\$)).mp.	5535
5	(dentin adj5 (cavit\$ or caries or carious or decay\$ or lesion\$ or deminerali\$ or reminerali\$)).mp.	4180
6	(pulp\$ adj5 (cavit\$ or caries or carious or decay\$ or lesion\$)).mp.	2532
7	(plaque and (teeth or tooth or dental or oral)).mp.	30661
8	((mouth adj6 care) or (oral adj6 care) or (dental adj6 care) or (teeth adj6 care)).mp.	73491
9	((plaque adj3 control) or (plaque adj3 remov\$)).mp.	3660
10	((tooth or teeth or interdental) adj3 clean\$).mp.	1481
11	(snack\$ or diet\$ or food\$ or drink\$ or beverage\$).mp.	1595772
12	((mouth adj6 health) or (oral adj6 health) or (dental adj6 health) or (teeth adj6 health)).mp.	43875
13	((mouth adj6 hygien\$) or (oral adj6 hygien\$) or (dental adj6 hygien\$) or (teeth adj6 hygien\$)).mp.	30398
14	Health promotion/	82917
15	((dental or oral or mouth or teeth) and (instruct\$ or advice or advis\$ or educat\$ or teach\$ or train\$ or promot\$)).mp.	146886

16	(school\$ and (primary or elementary or junior or infant)).mp.	119824
17	child\$.mp.	2535861
18	("DMF index" or "dental plaque index" or "oral hygiene index").mp.	940
19	(toothbrush\$ or tooth-brush\$ or "tooth brush\$" or toothpaste\$ or tooth-paste\$ or "tooth paste\$" or dentifric\$.mp.	18338
20	(mouthwash\$ or mouth-wash\$ or "mouth wash\$" or mouthrinse\$ or mouth-rinse\$ or "mouth rinse\$").mp.	6205
21	("sugar intake\$" or sweet\$ or candy or candies or gum\$.mp.	68558
22	("school age child\$" or "school-age child\$" or "4-11 year\$ old\$").mp.	8005
23	1 or 2 or 3 or 4 or 5 or 6 or 7 or 18	88747
24	((("interdental clean\$" or floss\$ or mouthwash\$ or mouth-wash\$ or "mouth wash\$" or mouthrinse\$ or mouth-rinse\$ or "mouth rinse\$" or toothbrush\$ or tooth-brush\$ or "tooth brush\$" or toothpaste\$ or tooth-paste\$ or "tooth paste\$") and (supervis\$ or demonstrat\$)).mp.	2950
25	14 or 15 or 24	228560
26	16 or 17 or 22	2556416
27	8 or 9 or 10 or 11 or 12 or 13 or 19 or 20 or 21	1762207
28	23 and 25 and 26 and 27	4248
29	Dental caries/	49826
30	Tooth plaque/	19398
31	exp Mouth hygiene/	21887
32	Mouthwash/	3301
33	Toothpaste/	7243
34	Dental health education/	5575
35	School/	69638
36	exp Child/	2591892
37	25 or 34	228560
38	26 or 35 or 36	3148570
39	27 or 31 or 32 or 33	1762207
40	23 or 29 or 30	88747
41	37 and 38 and 39 and 40	4319

Ovid MEDLINE(R) Epub Ahead of Print, In-Process & Other Non-Indexed Citations, Ovid MEDLINE(R) Daily and Ovid MEDLINE(R) 1946 to Present
 Search Strategy:

#	Searches	Results
1	(teeth adj5 (cavit\$ or caries or carious or decay\$ or lesion\$ or deminerali\$ or reminerali\$)).mp.	9585
2	(tooth adj5 (cavit\$ or caries or carious or decay\$ or lesion\$ or deminerali\$ or reminerali\$)).mp.	7983
3	(dental adj5 (cavit\$ or caries or carious or decay\$ or lesion\$ or deminerali\$ or reminerali\$)).mp.	65228
4	(enamel adj5 (cavit\$ or caries or carious or decay\$ or lesion\$ or deminerali\$ or reminerali\$)).mp.	4842
5	(dentin adj5 (cavit\$ or caries or carious or decay\$ or lesion\$ or deminerali\$ or reminerali\$)).mp.	4753
6	(pulp\$ adj5 (cavit\$ or caries or carious or decay\$ or lesion\$)).mp.	9838
7	exp TOOTH DEMINERALIZATION/	45069
8	Dental plaque/	16578
9	exp Dental Health Surveys/	21234
10	(plaque and (teeth or tooth or dental or oral)).mp.	27183
11	("DMF Index" or "dental plaque index" or "oral hygiene index").mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	14336
12	or/1-10	103044
13	exp Oral Health/	13065
14	exp Oral Hygiene/	17904
15	Mouthwashes/	5009
16	Dentifrices/	3792
17	((mouth adj6 care) or (oral adj6 care) or (dental adj6 care) or (teeth adj6 care)).mp.	47972
18	((plaque adj3 control) or (plaque adj3 remov\$)).mp.	3585
19	((tooth or teeth or interdental) adj3 clean\$).mp.	1487
20	(snack\$ or diet\$ or food\$ or drink\$ or beverage\$).mp.	1174216
21	((mouth adj6 health) or (oral adj6 health) or (dental adj6 health) or (teeth adj6 health)).mp.	49669
22	((mouth adj6 hygien\$) or (oral adj6 hygien\$) or (dental adj6 hygien\$) or (teeth adj6 hygien\$)).mp.	26271

23	or/14-22	1272496
24	Health education, dental/	5977
25	Health promotion/	65362
26	((dental or oral or mouth or teeth) and (instruct\$ or advice or advis\$ or educat\$ or teach\$ or train\$ or promot\$)).mp.	95202
27	or/24-26	158123
28	Schools/	31543
29	Schools/	31543
30	(school\$ and (primary or elementary or junior or infant)).mp.	53041
31	Child/	1554720
32	child\$.mp.	2207690
33	or/29-32	2233866
34	12 and 23 and 27 and 33	4035
35	("DMF index" or "dental plaque index" or "oral hygiene index").mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	14336
36	(toothbrush\$ or tooth-brush\$ or "tooth brush\$" or toothpaste\$ or tooth-paste\$ or "tooth paste\$" or dentifric\$).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	15105
37	(mouthwash\$ or mouth-wash\$ or "mouth wash\$" or mouthrinse\$ or mouth-rinse\$ or "mouth rinse\$").mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	6813
38	("sugar intake\$" or sweet\$ or candy or candies or gum\$).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	48192
39	("school age child\$" or "school-age child\$" or "4-11 year\$ old\$").mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	6483
40	12 or 35	103135
41	34 or 39	10493
42	((("interdental clean\$" or floss\$ or mouthwash\$ or mouth-wash\$ or "mouth wash\$" or mouthrinse\$ or mouth-rinse\$ or "mouth rinse\$" or toothbrush\$ or tooth-brush\$ or	2011

	"tooth brush\$" or toothpaste\$ or tooth-paste\$ or "tooth paste\$") and (supervis\$ or demonstrat\$)).mp.	
43	27 or 42	159589
44	13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 36 or 37 or 38	1305266
45	40 and 41 and 43 and 44	4036

Global Health 1973 to 2017 Week 21

Search Strategy:

#	Searches	Results
1	(teeth adj5 (cavit\$ or caries or carious or decay\$ or lesion\$ or deminerali\$ or reminerali\$)).mp.	6116
2	(tooth adj5 (cavit\$ or caries or carious or decay\$ or lesion\$ or deminerali\$ or reminerali\$)).mp.	5995
3	(dental adj5 (cavit\$ or caries or carious or decay\$ or lesion\$ or deminerali\$ or reminerali\$)).mp.	6743
4	(enamel adj5 (cavit\$ or caries or carious or decay\$ or lesion\$ or deminerali\$ or reminerali\$)).mp.	400
5	(dentin adj5 (cavit\$ or caries or carious or decay\$ or lesion\$ or deminerali\$ or reminerali\$)).mp.	100
6	(pulp\$ adj5 (cavit\$ or caries or carious or decay\$ or lesion\$)).mp.	200
7	(plaque and (teeth or tooth or dental or oral)).mp.	3192
8	((mouth adj6 care) or (oral adj6 care) or (dental adj6 care) or (teeth adj6 care)).mp.	3033
9	((plaque adj3 control) or (plaque adj3 remov\$)).mp.	293
10	((tooth or teeth or interdental) adj3 clean\$).mp.	243
11	(snack\$ or diet\$ or food\$ or drink\$ or beverage\$).mp.	714062
12	((mouth adj6 health) or (oral adj6 health) or (dental adj6 health) or (teeth adj6 health)).mp.	9926
13	((mouth adj6 hygien\$) or (oral adj6 hygien\$) or (dental adj6 hygien\$) or (teeth adj6 hygien\$)).mp.	2404
14	Health promotion/	18858
15	((dental or oral or mouth or teeth) and (instruct\$ or advice or advis\$ or educat\$ or teach\$ or train\$ or promot\$)).mp.	12994
16	(school\$ and (primary or elementary or junior or infant)).mp.	16761
17	child\$.mp.	300006
18	("DMF index" or "dental plaque index" or "oral hygiene index").mp.	163

19	(toothbrush\$ or tooth-brush\$ or "tooth brush\$" or toothpaste\$ or tooth-paste\$ or "tooth paste\$" or dentifric\$).mp.	1714
20	(mouthwash\$ or mouth-wash\$ or "mouth wash\$" or mouthrinse\$ or mouth-rinse\$ or "mouth rinse\$").mp.	907
21	("sugar intake\$" or sweet\$ or candy or candies or gum\$).mp.	26221
22	((("interdental clean\$" or floss\$ or mouthwash\$ or mouth-wash\$ or "mouth wash\$" or mouthrinse\$ or mouth-rinse\$ or "mouth rinse\$" or toothbrush\$ or tooth-brush\$ or "tooth brush\$" or toothpaste\$ or tooth-paste\$ or "tooth paste\$") and (supervis\$ or demonstrat\$)).mp.	259
23	1 or 2 or 3 or 4 or 5 or 6 or 7 or 18	9768
24	8 or 9 or 10 or 11 or 12 or 13 or 19 or 20 or 21	731759
25	14 or 15 or 22	31371
26	("school age child\$" or "school-age child\$" or "4-11 year\$ old\$").mp.	1822
27	16 or 17 or 26	303758
28	23 and 24 and 25 and 27	922
29	dental caries/	5712
30	dental plaque/	1636
31	toothpaste/	347
32	health promotion/	18858
33	schools/ or elementary schools/	9750
34	children/ or school children/	219941
35	23 or 29 or 30	9768
36	24 or 31	731759
37	27 or 33 or 34	305905
38	25 and 35 and 36 and 37	924

Search modes - Boolean/Phrase

Interface - EBSCOhost Research Databases

Search Screen - Advanced Search

Database – CINAHL

#	Query	Results
S36	S11 and S25 and S30 and S35	802
S35	S31 or S32 or S33 or S34	445,700
S34	child*	402,812

S33	MH “Child+”	341,977
S32	(school* and (primary or elementary or junior or infant))	15,361
S31	MH “Schools”	5,531
S30	S26 or S27 or S28 or S29	55,381
S29	((demonstrat* or supervis*) and (toothbrush* or “tooth brush*” or tooth-brush* or floss* or “interdental clean*” or mouthrinse* or mouthwash* or “mouth rinse*” or “mouth wash*” or mouth-rinse* or mouth-wash*))	270
S28	((dental or oral or mouth or teeth) and (instruct* or advice or advis* or educat* or teach* or train* or promot*))	20,406
S27	MH “Health Promotion”	35,588
S26	MH “Dental health education”	318
S25	S12 or S13 or S14 or S15 or S16 or S17 or S18 or S19 or S20 or S21 or S22 or S23 or S24	225,345
S24	((mouth N6 hygien*) or (oral N6 hygien*) or (dental N6 hygien*) or (teeth N6 hygien*))	13,077
S23	((mouth N6 health) or (oral N6 health) or (dental N6 health) or (teeth N6 health))	10,518
S22	(snack* or diet* or food* or drink* or beverage*)	193,537
S21	(“sugar intake” or sweet* or candy or candies or gum*)	7,001
S20	(mouthwash* or mouthrinse* or “mouth wash*” or “mouth rinse*” or mouth-wash* or mouth-rinse*)	1,307
S19	19 ((tooth or teeth or interdental) N3 clean*)	154
S18	((toothbrush* or “tooth brush*” or tooth-brush* or toothpaste* or “tooth paste*” or tooth-paste* or dentifrice*))	2,739
S17	((plaque N3 control*) or (plaque N3 remov*))	783
S16	((mouth N6 care) or (oral N6 care) or (dental N6 care) or (teeth N6 care))	12,439
S15	MH “Dentifrices”	896
S14	MH “Mouthwashes”	1,047
S13	MH “Oral Hygiene+”	3,518
S12	MH “Oral Health+”	4,795
S11	S1 or S2 or S3 or S4 or S5 or S6 or S7 or S8 or S9 or S10	9,539
S10	(plaque and (teeth or tooth or dental or oral))	2,572
S9	(“DMF Index” or “dental plaque index” or “dental health survey*” or “oral hygiene index”)	91
S8	MH “Dental Plaque”	1,461
S7	MH “Tooth Demineralization+”	5,736
S6	(pulp* N5 (cavit* or caries or carious or decay* or lesion*))	418

S5	(dentin N5 (cavit* or caries or carious or decay* or lesion* or deminerali* or reminerali*))	230
S4	(enamel N5 (cavit* or caries or carious or decay* or lesion* or deminerali* or reminerali*))	520
S3	(dental N5 (cavit* or caries or carious or decay* or lesion* or deminerali* or reminerali*))	6,484
S2	(tooth N5 (cavit* or caries or carious or decay* or lesion* or deminerali* or reminerali*))	1,313
S1	(teeth N5 (cavit* or caries or carious or decay* or lesion* or deminerali* or reminerali*))	1,089

Proquest

ab(caries OR carious OR "tooth decay" OR caviti*) AND ab(school* OR child*) AND ab(prevent*)

Date Run:	03/06/17 09:25:07.114	
Description:		
ID	Search	Hits
#1	MeSH descriptor: [Tooth Demineralization] explode all trees	2086
#2	MeSH descriptor: [Dental Plaque] this term only	2225
#3	MeSH descriptor: [Dental Health Surveys] explode all trees	2808
#4	(teeth near/5 caviti*) or (teeth near/5 caries) or (teeth near/5 carious) or (teeth near/5 decay*) or (teeth near/5 lesion*) or (teeth near/5 deminerali*) or (teeth near/5 reminerali*)	809
#5	(tooth near/5 caviti*) or (tooth near/5 caries) or (tooth near/5 carious) or (tooth near/5 decay*) or (tooth near/5 lesion*) or (tooth near/5 deminerali*) or (tooth near/5 reminerali*)	996
#6	(dental near/5 caviti*) or (dental near/5 caries) or (dental near/5 carious) or (dental near/5 decay*) or (dental near/5 lesion*) or (dental near/5 deminerali*) or (dental near/5 reminerali*)	4478
#7	(enamel near/5 caviti*) or (enamel near/5 caries) or (enamel near/5 carious) or (enamel near/5 decay*) or (enamel near/5 lesion*) or (enamel near/5 deminerali*) or (enamel near/5 reminerali*)	979
#8	(dentin near/5 caviti*) or (dentin near/5 caries) or (dentin near/5 carious) or (dentin near/5 decay*) or (dentin near/5 lesion*) or (dentin near/5 deminerali*) or (dentin near/5 reminerali*)	585

#9	(pulp* near/5 cavit*) or (pulp* near/5 caries) or (pulp* near/5 carious) or (pulp* near/5 decay*) or (pulp* near/5 lesion*) or (pulp* near/5 deminerali*) or (pulp* near/5 reminerali*)	795
#10	"DMF index" or "dental plaque index" or "oral hygiene index"	2524
#11	plaque and (teeth or tooth or dental or oral)	6038
#12	#1 or #2 or #3 or #4 or #5 or #6 or #7 or #8 or #9 or #10 or #11	11072
#13	MeSH descriptor: [Oral Health] explode all trees	309
#14	MeSH descriptor: [Oral Hygiene] explode all trees	1947
#15	MeSH descriptor: [Mouthwashes] this term only	1332
#16	MeSH descriptor: [Dentifrices] this term only	844
#17	(mouth near/6 care) or (oral near/6 care) or (dental near/6 care) or (teeth near/6 care)	3243
#18	(plaque near/3 control) or (plaque near/3 remov*)	2259
#19	(toothbrush* or tooth-brush* or "tooth brush*" or toothpaste* or tooth-paste* or "tooth paste*" or dentifrice*)	4358
#20	(tooth near/3 clean*) or (teeth near/3 clean*) or (interdental near/3 clean*)	437
#21	(mouthwash* or mouthrinse* or "mouth wash*" or "mouth rinse*" or mouth-wash* or mouth-rinse*)	2691
#22	"sugar intake" or sweet* or candy or candies or gum*	6135
#23	snack* or diet* or food* or drink* or beverage*	85370
#24	(mouth near/6 health) or (oral near/6 health) or (dental near/6 health) or (teeth near/6 health)	3848
#25	(mouth near/6 hygien*) or (oral near/6 hygien*) or (dental near/6 hygien*) or (teeth near/6 hygien*)	3305
#26	#13 or #14 or #15 or #16 or #17 or #18 or #19 or #20 or #21 or #22 or #23 or #24 or #25	100310
#27	MeSH descriptor: [Health Education, Dental] this term only	264
#28	MeSH descriptor: [Health Promotion] explode all trees	5487
#29	(dental or oral or mouth or teeth) and (instruct* or advice or advis* or educat* or teach* or train* or promot*)	14983
#30	(demonstrat* or supervis*) and (toothbrush* or "tooth brush*" or tooth-brush* or floss* or "interdental clean*" or mouthrinse* or mouthwash* or "mouth rinse*" or "mouth wash*" or mouth-rinse* or mouth-wash*)	873
#31	#27 or #28 or #29 or #30	20842
#32	MeSH descriptor: [Schools] this term only	1483
#33	school* and (primary or elementary or junior or infant*)	24297
#34	"4-11 year* old"	24

#35	child*	122066
#36	#32 or #33 or #34 or #35	135363
#37	#12 and #26 and #31 and #36	816

Appendix 2: Ethics approval of the Ministry of Education in Qatar & Bangor University

Ministry of Education & Higher Education



وَزَارَةُ التَّعْلِيمِ وَالتَّحْقِيقِ الْعَالِي

26/10/2017

Dear Bangor University,

Greetings from the Ministry of Education and Higher Education.

We would like to inform you that we have no objection for applying the research study done by Mrs. Najat A.rabba Jobran Alyafei, in Qatar independent and private schools.

Thank you for your kind efforts and cooperation.

Best regards,
Dr. Abdulaziz Ali Al-Saadi
Director of Health and Safety



From: Lynne Williams <lynne.williams@bangor.ac.uk>

Sent: 05 October 2018 11:53 AM

To: Alyafei Najat; Susan Metcalfe; Sion Williams

Subject: RE: Re:LETTER

Project title : What works for who and in what circumstances? A realist inquiry for dental caries behavioural prevention strategy in Qatari primary schools
Project application no: 2018-16171

Dear Najat

Please accept this letter as confirmation that academic ethical approval for the project has been given by the School of Health Studies AEC on 22/5/2018

Best wishes

Lynne Williams (Chair)



Dr Lynne Williams RN, BSc, MSc, PhD

Dirprwy Bennaeth yr Ysgol (Menter ac Ymrwymiad)

Uwch Ddarlithydd

Prif Gymrodoriaeth AAU

Ysgol Gwyddorau Iechyd

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Ffôn: 01248 383170

Ffacs: 01248 383114

Prifysgol Bangor

Gwynedd

LL57 2EF

<http://www.bangor.ac.uk/healthcaresciences/research/people/lynnew.php.en>

https://www.researchgate.net/profile/Lynne_Williams2

<https://lynneolyn.wordpress.com/>

[http://research.bangor.ac.uk/portal/en/persons/lynne-williams\(046c554b-e4d3-46f5-bd4e-d048dca7847d\).html](http://research.bangor.ac.uk/portal/en/persons/lynne-williams(046c554b-e4d3-46f5-bd4e-d048dca7847d).html)



@lynneolyn

Appendix 3: Arabic & English Parents' case study information sheet

Version 1 January 2018

School of Healthcare Sciences



Exploring dental caries behavioural prevention strategy in Qatari primary schools: a case study

For Parents



Information about the study

You are invited to participate in this study which is conducted as part of the PHD degree of the researcher Najat Alyafei at Bangor University, UK. The aim of the study is to understand how best to develop prevention strategies for tooth decay among children in Qatari primary schools and looks at learning lessons from the current programme of oral health hygiene being implemented in primary schools to move forward in the future.

The study asks parents and their children as well as teachers and school nurses about their views on how the programme works in their school and any impact it may have on dental hygiene at home. The study looks at both public and private primary schools to have an overview of how the programme might have an impact.

Why have I been asked to take part?

You and your child have been asked to take part because your child's school was chosen as one of the primary schools in Qatar to participate in the study.

What does the study involve?

The study will involve the researcher Najat Alyafei asking to complete an interview with you and your child to ask about your awareness, knowledge about dental health, your approach to dental care and your involvement in the oral hygiene programme. In particular, Najat will ask about the impact of the oral health programme on your awareness, knowledge and doing oral health and how it may be improved in the future. The interview will last 1 hour and will be audio-recorded.

Are there any benefits or risks?

Your participation may benefit the development of the oral hygiene programme and its impact in schools and the community.

What will happen to my data?

All data collected will be confidential and anonymised, and you will not be identifiable in any report, thesis or publication which arises from this study. The data from this study will be stored securely as part of the regulations of Bangor University. If you choose to withdraw from the study then you have the right to request that your data is not used.

What if I don't want to take part?

It is up to you to decide whether or not you would like to participate in this study. Deciding not to take part will not impact on any other aspect of you or your child oral healthcare anywhere in Qatar, nor will it affect your child studies.

Further Information about the study?

If you want further information about this study then please contact :

Najat A. Alyafei

Email: hbp84c@bangor.ac.uk

Contact#: 40271454/66060782(7-2pm)

Who do I contact with any concerns about this study?

If you have any concerns or complaints about this study or the conduct of individuals conducting this study, then please contact Dr Lynne Williams, Chair HCMS AEC, School of Healthcare Sciences, Bangor University, Bangor Gwynedd LL57 2EF or e-mail lynne.williams@bangor.ac.uk (Telephone: +441248-383170)

الاصدار 1 يناير، 2018

كلية العلوم الصحية



دراسة حالة: السلوكيات المتعلقة لاستحداث استراتيجيات للوقاية من تسوس الأسنان في المدارس الابتدائية بقطر

معلومات عن الدراسة لولي الأمر



معلومات عن الدراسة:

أنت مدعو للمشاركة في هذه الدراسة والتي تعد جزء من درجة الدكتوراه للباحثة نجاة اليافعي بجامعة بنقور ببريطانيا. إن الهدف من هذه الدراسة هو الفهم لأفضل طريقة ممكن من خلالها تطوير استراتيجية وقائية لتسوس الأسنان بين أطفال المدارس الابتدائية في قطر ولأخذ دروس مستفادة من البرنامج الحالي المطبق في مدارس قطر للمضي به قُدماً للأفضل.

سوف تسأل الدراسة أولياء الأمور وأطفالهم ، وكذلك المعلمين وممرضات المدارس عن وجهات نظرهم حول كيفية عمل البرنامج في مدرستهم وأي استفادة قد حدثت في زيادة الاهتمام وتكرار تنظيف الأسنان في المنزل. ستبحث الدراسة في كل من المدارس الابتدائية الحكومية والخاصة للحصول على نظرة عامة حول مدى تأثير البرنامج والاستفادة منه.

لماذا يُطلب مني المشاركة؟

طُلب منك أنت وطفلك المشاركة لأن مدرسة طفلك قد تم اختيارها كأحدى المدارس الابتدائية في قطر للمشاركة في الدراسة.

على ماذا تحتوي هذه الدراسة؟

تحتوي الدراسة على مقابلة معك ومع طفلك تقوم به الباحثة نجاة اليافعي تستمر لمدة ساعة واحدة، سيتم تسجيلها صوتياً للتعرف على معلومات ومعرفتك لصحة الاسنان، وللتعرف على طريقتك بالعناية بالأسنان ومدى إشراكك في برنامج صحة الفم والاسنان. كما ستسألك الباحثة على وجه الخصوص عن مدى تأثير برنامج صحة الفم على زيادة وعيك ومعرفتك ومدى الاستفادة منه للقيام بعملية تنظيف الاسنان بالمنزل، وكيف من الممكن تحسينها في المستقبل؟

هل هناك أي فوائد أو مخاطر؟

قد تفيد مشاركتك في تطوير برنامج صحة الفم والاسنان ليزداد تأثيره في المدارس والمجتمع.

ماذا سيحدث لبياناتي؟

ستكون جميع البيانات التي يتم جمعها سرية ومجهولة المصدر ، ولن يتم التعرف عليك في أي تقرير أو مقالات علمية أو منشور ينشأ من هذه الدراسة. سيتم تخزين البيانات من هذه الدراسة بشكل آمن كجزء من لوائح جامعة بنفور. أما إذا اخترت الانسحاب من الدراسة ، فيحق لك أن تطلب عدم استخدام بياناتك.

ماذا لو لم أرغب في المشاركة؟

الأمر متروك لك لتقرر ما إذا كنت ترغب في المشاركة في هذه الدراسة أم لا، وهذا بالطبع لن يؤثر اتخاذ قرار بعدم المشاركة على أي جانب آخر من جوانب الرعاية الصحية الخاصة بك أو طفلك في أي مكان في قطر، كما أنه لن يؤثر على دراسة طفلك.

هل هناك مزيد من المعلومات حول الدراسة؟

إذا كنت تريد المزيد من المعلومات حول هذه الدراسة ، فيرجى الاتصال بـ:

الباحثة: نجاة اليافعي

ايميل: n_alsalahi@hotmail.com

هاتف مكتب: 40271454 - جوال: 66060782 من الساعة 7 ص- 2 ظهرا

بمن أتصل لأية مخاوف أو أسئلة حول هذه الدراسة؟

إذا كان لديك أي مخاوف أو شكاوى حول هذه الدراسة أو سلوك الأفراد الذين أجروا هذه الدراسة ،
يرجى الاتصال بالدكتورة لين ويليامز ، رئيس HCMS AEC ، كلية العلوم الصحية ، جامعة بنفور،

Bangor Gwynedd LL57 2EF or e-mail lynne.williams@bangor.ac.uk

(Telephone: +441248-383170)

Appendix 4: Arabic & English information sheet for children aged 6-9

Version 1 May 2018

SCHOOL OF HEALTHCARE SCIENCES



PARTICIPANT INFORMATION SHEET

FOR CHILDREN (AGED 6-9)

Study title:

How can tooth decay be prevented among primary school children in Qatar?



1. What is research?

Research is a careful way to find out the answer to an important question.

2. Why is this project being done?

We want to try and find out possible ways of preventing tooth decay among primary school children in Qatar. Tooth decay can cause toothache and loss of teeth.

3. What is tooth decay?

Tooth decay is when small germs dig a hole in the **teeth**. The bacteria produce acid from sugary food remnant on the surface of the teeth.



Why me?

You have been chosen because your school was selected as one of the two schools in Qatar to take part in the research.

Do I have to take part?

No you don't! It is your choice to decide if you want to take part.

You can still change your mind later. If you don't want to take part, just say no!

What will happen?

We would simply ask you and your parents some questions on toothbrushing and sugar intake.



Will taking part help me?

Taking part will not help you right now, but it will help us to know how to prevent tooth decay among primary school children in Qatar.

What else might happen?

There are no risks to you in taking part in this study.

What if something goes wrong?

Your mum, dad or carer will be able to talk to someone who will be able to tell them what they need to do about it.

What if I don't want to do the research anymore?

Just tell your mum, dad, carer at any time. They will not be cross with you.

What if I wish to complain about the study?

If you want to complain, you or your mum, dad or carer can talk to Dr Lynne Williams, Chair HCMS AEC, School of Healthcare Sciences, Bangor University, Bangor Gwynedd LL57 2EF or e-mail lynne.williams@bangor.ac.uk (Telephone: +441248-383170)



Will anyone else know

Only people in our research team will know. No one else will know because we will not use your name or address. We will use a number instead.

What happens to what the researchers find out?

We will store the information collected from you in a safe place where only the people in our research team can look at it. We will use the information to develop ways to prevent tooth decay among primary school children in Qatar. We will also put it in medical magazines and websites. No-one will know you were in the study.



Did anyone else check the study is OK to do?

This study has been checked by several people, to make sure it is alright.

How can I find out more about this study?

Your mum, dad, carer or other grown-up you trust may be able to answer your questions. Aunty Najat Alyafei can also tell you more about the study.

You can ask your mum, dad, or carer to email her at hbp84c@bangor.ac.uk or contact her at: 40271454/66060782 (7-2pm)



Thank you for taking the time to read this – please ask any questions if you need to

كلية العلوم الصحية



ورقة معلومات للمشاركين من للأطفال (من 6 إلى 9 سنوات)

عنوان الدراسة: كيف يمكن منع تسوس الأسنان بين أطفال المدارس الابتدائية في قطر؟



1. ما هو البحث؟

البحث هو طريقة متأنية لمعرفة الإجابة على سؤال مهم.

2. لماذا يتم تنفيذ هذا المشروع؟

نريد معرفة الطرق الممكنة لمنع تسوس الأسنان بين أطفال المدارس الابتدائية في قطر حيث أن تسوس الأسنان يسبب ألم الأسنان وفقدانها.

3. ما هو تسوس الأسنان؟

تسوس الأسنان هي تلك الحفر التي تقوم بها الجراثيم الصغيرة في الأسنان، نتيجة لتحول بقايا الطعام والحلويات الملتصقة بسطح الأسنان إلى أحماض مسببة تسوس الاسنان.



4. لماذا أنا؟

لقد تم اختيارك لأنه تم اختيار مدرستك كأحدى المدرستين المشاركة في البحث في قطر.

5. هل يجب علي المشاركة؟

لا، فالمشاركة ليست إلزامية. ولك أن تقرر بنفسك المشاركة من عدمها، وتستطيع أن تنسحب من المشاركة بعد ذلك إن لم ترغب بالأمر.

6. ماذا سيحدث؟

سوف نقوم بكل بساطة بطرح بعض الأسئلة عليك وعلى والديك عن طريقة تفريش الأسنان ومعدل أكل الحلويات.



7. هل المشاركة سوف تساعدني في أمر ما؟

لن تساعدك المشاركة حالياً في شيء، ولكنها ستساعدنا في معرفة كيفية منع تسوس الأسنان بين أطفال المدارس الابتدائية في قطر.

8. هل هناك أية مخاطر؟

لا، لا توجد أية مخاطر عليك من المشاركة في هذه الدراسة.

9. ماذا لو حدث خطأ ما؟

سيتمكن أحد والديك أو من يقوم بخدمتك ورعايتك من التحدث إلى الشخص الذي يمكنه إخباره بما يجب عليه القيام به حيال ذلك.

10. ماذا لو لم أكن أرغب في إجراء البحث بعد الآن؟

فقط أخبر أحد والديك أو من يقوم بخدمتك ورعايتك ولن يعارضوك.

11. ماذا لو كنت أود أن أشكو من الدراسة؟

إذا كنت ترغب في تقديم شكوى ، يمكنك أنت أو أحد والديك أو من يقوم بخدمتك ورعايتك من التحدث مع الدكتورة لين ويليامز ، رئيس HCMS AEC ، كلية العلوم الصحية ، جامعة بانجور ، بانجور جويند LL57 2EF أو البريد الإلكتروني lynne.williams@bangor.ac.uk (هاتف:

(+441248-383170



12. هل سيتعرف أي :

لا، لن يعرف بذلك سوى فريق بحثنا، كما أننا سنستخدم رقمًا لك بدلاً من اسمك وعنوانك حتى لا يتعرف عليك أحد.

13. ماذا سيحدث للنتائج التي سيجدها الباحثون؟

سنقوم بتخزين المعلومات التي تم جمعها منك في مكان آمن حيث سيتمكن فريق بحثنا فقط من الاطلاع عليها، وسوف نقوم باستخدام المعلومات لتطوير طرق لمنع تسوس الأسنان بين أطفال المدارس الابتدائية في قطر، وسننشرها في المجلات والمواقع الطبية ولن يعلم أحد بأنك كنت مشاركاً بالدراسة.



14. هل تحقق أي شخص آخر أن الدراسة مؤهلة للتنفيذ؟

نعم، لقد تم فحص هذه الدراسة من قبل العديد من الناس للتأكد من أنها مؤهلة للتنفيذ.

15. كيف يمكنني معرفة المزيد عن هذه الدراسة؟

قد يتمكن أحد والديك أو من يقوم بخدمتك ورعايتك أو غيره من الأشخاص البالغين الذين تثق بهم من الإجابة عن أسئلتك، وبالطبع فإن خالتك خالتك الباحثه نجاهة تستطيع الاجابة على جميع أسئلتك عن الدراسة. ولك أن تطلب من أحد والديك أو ممن يقوم بخدمتك ورعايتك أن يرسلها على البريد الإلكتروني: hbp84c@bangor.ac.uk أو الاتصال بها على: 40271454/66060782

من الساعة 7ص-2م.



نشكرك على الوقت الذي قضيته في القراءة - الرجاء طرح أي أسئلة إذا كنت بحاجة إلى ذلك

Appendix 5: Arabic & English information sheet for children aged 10-12

Version 1 May 2018

SCHOOL OF HEALTHCARE SCIENCES



PARTICIPAT INFORMATION SHEET FOR CHILDREN (AGED 10-12)

Study title

How can tooth decay be prevented among primary school children in Qatar?



What is research?

Research is a careful way to find out the answer to an important question.

Why is this project being done?

We want to try and find out possible ways of preventing tooth decay among primary school children in Qatar. Tooth decay can cause toothache and loss of teeth.

What is tooth decay?

Tooth decay is when small germs (bacteria) dig a hole in the teeth. The bacteria produce acid from sugary food remnant on the surface of the teeth.



Why me?

You have been chosen because your school was selected as one the two schools in Qatar to take part in the project.

Do I have to take part?

No you don't! It is your choice to decide if you want to take part.

You can still change your mind later. If you don't want to take part, just say no!

What will happen?

We would simply ask you and your parents some questions on toothbrushing and sugar intake.



Will taking part help me?

Taking part will not help you right now, but it will help us to know how to prevent tooth decay among primary school children in Qatar.

What else might happen?

There are no risks to you in taking part in this study.

What if something goes wrong?

Your mum, dad or carer will be able to talk to someone who will be able to tell them what they need to do about it.

What if I don't want to do the research anymore?

Just tell your mum, dad, carer at any time. They will not be cross with you.

What if I wish to complain about the study?

If you want to complain you or your mum, dad or carer can talk to Dr Lynne Williams, Chair HCMS AEC, School of Healthcare Sciences, Bangor University, Bangor Gwynedd LL57 2EF or e-mail lynne.williams@bangor.ac.uk (Telephone: +441248-383170)



Will anyone else know I'm doing this?

Only people in our research team will know. No one else will know because we will not use your name or address. We will use a number instead.

What happens to what the researchers find out?

We will store the information collected from you in a safe place where only the people in our research team can look at it. We will use the information to develop ways to prevent tooth decay among primary school children in Qatar. We will also put it in medical magazines and websites. No-one will know you were in the study.



Did anyone else check the study is OK to do?

This study has been checked by several people, to make sure it is alright.

How can I find out more about this study?

Your mum, dad, carer or other grown-up you trust may be able to answer your questions. Aunty Najat Alyafei can also tell you more about the study.

You can ask your mum, dad, or carer to email her at hbp84c@bangor.ac.uk or contact her at: 40271454/66060782 (7-2pm)



Thank you for taking the time to read this. please ask any questions if you need to

كلية العلوم الصحية



ورقة معلومات للمشاركين من للأطفال (من 10 إلى 12 سنوات)

عنوان الدراسة: كيف يمكن منع تسوس الأسنان بين أطفال المدارس الابتدائية في قطر؟



16. ما هو البحث؟

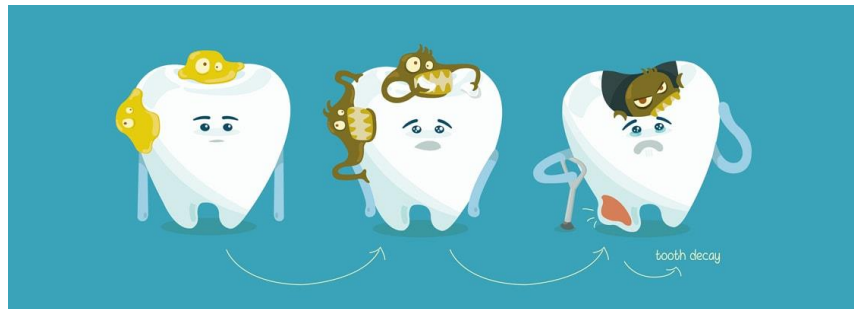
البحث هو طريقة متأنية لمعرفة الإجابة على سؤال مهم.

17. لماذا يتم تنفيذ هذا المشروع؟

لأننا نريد معرفة الطرق الممكنة لمنع تسوس الأسنان بين أطفال المدارس الابتدائية في قطر حيث أن التسوس يسبب ألم الأسنان وفقدانها.

18. ما هو تسوس الأسنان؟

تسوس الأسنان هي تلك الحفر التي تقوم بها الجراثيم الصغيرة في الأسنان، نتيجة لتحول بقايا الطعام والحلويات الملتصقة بسطح الأسنان إلى أحماض مسببة تسوس الاسنان.



19. لماذا انا؟

لقد تم اختيارك لأنه تم اختيار مدرستك كأحدى المدرستين المشاركة في البحث في قطر.

20. هل يجب علي المشاركة؟

لا، فالمشاركة ليست إلزامية. ولك أن تقرر بنفسك المشاركة من عدمها، وتستطيع أن تنسحب من المشاركة بعد ذلك إن لم ترغب بالأمر.

21. ماذا سيحدث؟

سوف نقوم بكل بساطة بطرح بعض الأسئلة عليك وعلى والديك عن طريقة تفريش الأسنان ومعدل أكل الحلويات.



22. هل المشاركة سوف تساعدني في أمر ما؟

لن تساعدك المشاركة حالياً في شيء، ولكنها ستساعدنا في معرفة كيفية منع تسوس الأسنان بين أطفال المدارس الابتدائية في قطر.

23. هل هناك أية مخاطر؟

لا، لا توجد مخاطر عليك من المشاركة في هذه الدراسة.

24. ماذا لو حدث خطأ ما؟

سيتمكن أحد والديك أو من يقوم بخدمتك ورعايتك من التحدث إلى الشخص الذي يمكنه إخباره بما يجب عليه القيام به حيال ذلك.

25. ماذا لو لم أكن أرغب في إجراء البحث بعد الآن؟

فقط أخبر أحد والديك أو من يقوم بخدمتك ورعايتك ولن يعارضوك.

26. ماذا لو كنت أود أن أشكو من الدراسة؟

إذا كنت ترغب في تقديم شكوى ، يمكنك أنت أو أحد والديك أو من يقوم بخدمتك ورعايتك من التحدث مع الدكتورة لين ويليامز ، رئيس HCMS AEC ، كلية العلوم الصحية ، جامعة بانجور ، بانجور جويند LL57 2EF أو البريد الإلكتروني lynne.williams@bangor.ac.uk (هاتف: +441248-383170)



27. هل سيتعرف أي شخص على مشاركتي بالبحث؟

لا، لن يعرف بذلك سوى فريق بحثنا، كما أننا سنستخدم رقمًا لك بدلاً من اسمك وعنوانك حتى لا يتعرف عليك أحد.

1. ماذا سيحدث للنتائج التي سيجدها الباحثون؟

سنقوم بتخزين المعلومات التي تم جمعها منك في مكان آمن حيث سيتمكن فريق بحثنا فقط من الاطلاع عليها، وسوف نقوم باستخدام المعلومات لتطوير طرق لمنع تسوس الأسنان بين أطفال المدارس الابتدائية في قطر، وسننشرها في المجلات والمواقع الطبية ولن يعلم أحد بأنك كنت مشاركاً بالدراسة.



2. هل تحقق أي شخص آخر أن الدراسة مؤهلة للتنفيذ؟

نعم، لقد تم فحص هذه الدراسة من قبل العديد من الناس للتأكد من أنها مؤهلة للتنفيذ.

28. كيف يمكنني معرفة المزيد عن هذه الدراسة؟

قد يتمكن أحد والديك أو من يقوم بخدمتك ورعايتك أو غيره من الأشخاص البالغين الذين تثق بهم من الإجابة عن أسئلتك، وبالطبع فإن خالتك الباحثة نجاهة تستطيع الإجابة على جميع أسئلتك عن الدراسة. ولك أن تطلب من أحد والديك أو ممن يقوم بخدمتك ورعايتك أن يرسلها على البريد الإلكتروني:

hbp84c@bangor.ac.uk أو الاتصال بها على: 40271454/66060782 من الساعة

7ص-2م.



نشكرك على الوقت الذي قضيته في القراءة - الرجاء طرح أي أسئلة إذا كنت بحاجة إلى ذلك

Appendix 6: Arabic & English workshop information sheet

Version 1 January 2018

School of Healthcare Sciences



Exploring dental caries behavioural prevention strategy in Qatari primary schools: a case study

WORKSHOP



Information about the study

You are invited to participate in this third phase of the study which is conducted as part of the PHD degree of the researcher Najat Alyafei at Bangor University, UK. The aim of the study is to understand how best to develop prevention strategies for tooth decay among children in Qatari primary schools and looks at learning lessons from the current programme of oral health hygiene being implemented in primary schools to move forward in the future.

The study asks parents and their children as well as teachers and school nurses about their views on how the programme works in their school and any impact it may have on dental hygiene at home. The study looks at both public and private primary schools to have an overview of how the programme might have an impact. The workshop is designed to use the results from the earlier work with parents, children, and teachers and then develop a model to underpin the future programme for oral health in primary schools.

Why have I been asked to take part?

You participated in the second part of the study and completed an interview and the third phase is interested in exploring your views further in the workshop to help build a model that will guide the future development of the oral health programme.

What does the study involve?

The study will involve the researcher Najat Alyafei asking you take part in a workshop with 10-15 other participants drawn from 2 public and private schools. The workshop will last 2 hours and will be audio-recorded.

Are there any benefits or risks?

Your participation may benefit the development of the oral hygiene programme and its impact in schools and the community.

What will happen to my data?

All data collected will be confidential and anonymised, and you will not be identifiable in any report, thesis or publication which arises from this study. The data from this study will be stored securely as part of the regulations of Bangor University. If you choose to withdraw from the study then you have the right to request that your data is not used.

What if I don't want to take part?

It is up to you to decide whether or not you would like to participate in this study. Deciding not to take part will not impact on any other aspect of you or your child oral healthcare anywhere in Qatar, nor will it affect your child studies.

Further Information about the study?

If you want further information about this study then please contact :

Najat A. Alyafei

Email: hbp84c@bangor.ac.uk

Contact#: 40271454/66060782 (7-2pm)

Who do I contact with any concerns about this study?

If you have any concerns or complaints about this study or the conduct of individuals conducting this study, then please contact Dr Lynne Williams, Chair HCMS AEC, School of

Healthcare Sciences, Bangor University, Bangor Gwynedd LL57 2EF or e-mail
lynne.williams@bangor.ac.uk (Telephone: +441248-383170)

كلية العلوم الصحية



دراسة حالة: السلوكيات المتعلقة لاستحداث استراتيجيات للوقاية من تسوس الأسنان في المدارس الابتدائية بقطر

ورشة عمل (المرحلة الثالثة)



معلومات عن الدراسة:

أنت مدعو للمشاركة في هذه المرحلة الثالثة من الدراسة التي تجرى كجزء من درجة الدكتوراه للباحثة نجاة اليافعي في جامعة بنقور بالمملكة المتحدة. إن الهدف من هذه الدراسة هو الفهم لأفضل طريقة ممكن من خلالها تطوير استراتيجيات وقائية لتسوس الأسنان بين أطفال المدارس الابتدائية في قطر ولأخذ دروس من البرنامج الحالي المطبق في مدارس قطر للمضي به قُدماً للأفضل.

سوف تسأل الدراسة أولياء الأمور وأطفالهم ، وكذلك المعلمين وممرضات المدارس عن وجهات نظرهم حول كيفية عمل البرنامج في مدرستهم وأي تأثير قد يحدث على نظافة الأسنان في المنزل. تبحث الدراسة في كل من المدارس الثانوية العامة والخاصة للحصول على نظرة عامة حول كيفية تأثير البرنامج.

لماذا يُطلب مني المشاركة؟

لقد شاركت في الجزء الثاني من الدراسة وأكملت المقابلة، وبقيت المرحلة الثالثة المثيرة للاهتمام باستكشاف وجهة نظرك الإضافية في ورشة العمل للمساعدة في بناء نموذج من شأنه تطوير برنامج صحة الفم والأسنان.

على ماذا تحتوي هذه الدراسة؟

ستشتمل الدراسة على طلب الباحثة نجاة اليافعي لك للمشاركة في ورشة عمل تضم 10-15 مشاركاً آخرين من مدرستين حكومية وخاصة لمدة ساعتين وسيتم تسجيلها بالصوت.

هل هناك أي فوائد أو مخاطر؟

قد تفيد مشاركتك في تطوير برنامج صحة الفم وتأثيره في المدارس والمجتمع.

ماذا سيحدث لبياناتي؟

ستكون جميع البيانات التي يتم جمعها سرية ومجهولة المصدر، ولن يتم التعرف عليك في أي تقرير أو أطروحة أو منشور ينشأ من هذه الدراسة. سيتم تخزين البيانات من هذه الدراسة بشكل آمن كجزء من لوائح جامعة بنقور. إذا اخترت الانسحاب من الدراسة، فيحق لك أن تطلب عدم استخدام بياناتك.

ماذا لو لم أرغب في المشاركة؟

الأمر متروك لك لتقرر ما إذا كنت ترغب في المشاركة في هذه الدراسة أم لا. لن يؤثر اتخاذ قرارك بعدم المشاركة على أي جانب آخر من جوانب الرعاية الصحية الخاصة بك أو طفلك في أي مكان في قطر، كما أنه لن يؤثر على دراسة طفلك.

مزيد من المعلومات حول الدراسة؟

إذا كنت تريد المزيد من المعلومات حول هذه الدراسة، فيرجى الاتصال بـ:

الباحثة: نجاة اليافعي

ايميل: hbp84c@bangor.ac.uk

هاتف مكتب: 40271454 - جوال: 66060782 من الساعة 7 ص- 2 ظهرا

بمن أتصل لأي مخاوف أو أسئلة حول هذه الدراسة؟

إذا كان لديك أي مخاوف أو شكاوى حول هذه الدراسة أو سلوك الأفراد الذين أجروا هذه الدراسة ،
يرجى الاتصال بالدكتورة لين ويليامز ، رئيس HCMS AEC ، كلية العلوم الصحية ، جامعة بنفور،

Bangor Gwynedd LL57 2EF or e-mail: lynne.williams@bangor.ac.uk

(Telephone: +441248-383170)

Appendix 7: Arabic & English consent form for parents

Version 1 January 2018

School of Healthcare Sciences



CONSENT FORM For Parent

Title of Project: **Exploring dental caries behavioural prevention strategy in Qatari primary schools: a case study**

Name of Researcher: Najat Alyafei

Please initial box

1. I confirm that I have read and understood the information sheet dated[Version 1 January 2018] for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily.

☐

2. I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason, without my legal rights being affected.

☐

3. I confirm that I consent to the interview being audio recorded by the researcher as part of the study.

☐

4. .I give permission for the researcher to use anonymised quotes from the interview and for anonymised interviews to be shared with any other researchers or stored as data archives.

☐

5. I agree to take part in the above study.

☐

Name of Person

Date

Signature

Researcher

Date

Signature

When completed, 1 for informant 1 for researcher site file; 1 (original)

الإصدار 1 يناير 2018

كلية العلوم الصحية



نموذج الموافقة: ولي الأمر

عنوان المشروع: السلوكيات المتعلقة لاستحداث استراتيجيات للوقاية من تسوس الأسنان في المدارس الابتدائية بقطر

اسم الباحث: نجاة اليافعي

ضع علامة هنا

	1. أؤكد أنني قد قرأت وفهمت ورقة المعلومات المؤرخة [الإصدار 1 يناير 2018] للدراسة المذكورة أعلاه، وقد أتيحت لي الفرصة للنظر في المعلومات وطرح الأسئلة وقد أجيببت بشكل مُرضي.
	2. أفهم أن مشاركتي تطوعية وأنني حر في الانسحاب في أي وقت دون إبداء أي سبب ، دون أن تتأثر حقوقي القانونية.
	3. أؤكد أنني أوافق على المقابلة التي يجري تسجيلها صوتيًا من قبل الباحثة كجزء من الدراسة.
	4. أعطي الإذن للباحثة باستخدام اقتباسات من المقابلة تكون مجهولة المصدر (أي لن يُعرف من صاحبها) كما أسمح بمشاركتها وتكون مجهولة التعريف بي مع الباحثين أو تخزينها كمحفوظات للبيانات.
	5. أوافق على المشاركة في الدراسة المذكورة أعلاه.

التوقيع

التاريخ

اسم المشارك

التوقيع

التاريخ

اسم الباحث

عند الانتهاء: نسخة للمشاركة، 1 ملف موقع الباحث ؛ 1 (أصلي)

Appendix 8: Arabic & English consent form for teachers & nurses

Version 1 January 2018

School of Healthcare Sciences



CONSENT FORM: Teachers and School Nurses

Title of Project: **Exploring dental caries behavioral prevention strategy in Qatari primary schools: a case study**

Name of Researcher: Najat Alyafei

Please initial box

1. I confirm that I have read and understood the information sheet dated[Version 1 January 2018] for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily. ☐
2. I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason, without my legal rights being affected. ☐
3. I confirm that I consent to the interview being audio recorded by the researcher as part of the study. ☐
4. I give permission for the researcher to use anonymised quotes from the interview and for anonymised interviews to be shared with any other researchers or stored as data archives. ☐
5. I agree to take part in the above study. ☐

Name of Person

Date

Signature

Researcher

Date

Signature

When completed, 1 for informant 1 for researcher site file; 1 (original)

الإصدار 1 يناير 2018

كلية العلوم الصحية



نموذج الموافقة: المعلم وممرض المدرسة

عنوان المشروع: السلوكيات المتعلقة لاستحداث استراتيجيات للوقاية من تسوس الأسنان في المدارس الابتدائية بقطر

اسم الباحث: نجاة اليافعي

ضع علامة هنا

	3. أؤكد أنني قد قرأت وفهمت ورقة المعلومات المؤرخة [الإصدار 1 يناير 2018] للدراسة المذكورة أعلاه، وقد أتيحت لي الفرصة للنظر في المعلومات وطرح الأسئلة وقد أجيببت بشكل مُرضي.
	4. أفهم أن مشاركتي تطوعية وأنني حر في الانسحاب في أي وقت دون إبداء أي سبب ، دون أن تتأثر حقوقي القانونية.
	5. أؤكد أنني أوافق على المقابلة التي يجري تسجيلها صوتيًا من قبل الباحث كجزء من الدراسة.
	6. أعطي الإذن للباحث لاستخدام اقتباسات من المقابلة تكون مجهولة المصدر (أي لن يُعرف من صاحبها) كما أسمح بمشاركتها وتكون مجهولة التعريف بي مع الباحثين أو تخزينها كمحفوظات للبيانات.
	7. أوافق على المشاركة في الدراسة المذكورة أعلاه.

التوقيع

التاريخ

اسم المشارك

التوقيع

التاريخ

اسم الباحث

عند الانتهاء: نسخة للمشارك، 1 ملف موقع الباحث ؛ 1 (أصلي)

Appendix 9: Arabic & English consent form for children aged 6-9

Version 1 May 2018

SCHOOL OF HEALTHCARE SCIENCES



CONSENT FORM FOR CHILDREN (AGED 6-9)

Study title: How can tooth decay be prevented among primary school children in Qatar?



Please tick box

1. I understand the information about this study. I have been giving opportunity to think about the information and ask questions. ☐
2. I understand that I don't have to take part and I am free to stop at any time ☐
3. I agree for the interview to be tape-recorded. ☐
4. I give permission for the researcher to store and use what I say in the interview. ☐
5. I agree to take part in the above study. ☐

Name of child	Date	Thumbprint
Name of researcher	Date	Signature

When completed, 1 for informant 1 for researcher site file; 1 (original)

الإصدار 1 مايو 2018

كلية العلوم الصحية



استمارة الموافقة على الاطفال (الفئة العمرية 6-9)

عنوان الدراسة: كيف يمكن منع تسوس الأسنان بين أطفال المدارس الابتدائية في قطر؟



ضع علامة في المربع

1) لقد فهمت المعلومات حول هذه الدراسة، وأعطيت لي الفرصة

☐

للتفكير في المعلومات وطرح الأسئلة.

☐

2) أعلم أنه لا يجب علي المشاركة بالبحث وأنني حر في التوقف في أي وقت.

3) أوافق على أن تكون المقابلة مسجلة.

☐
☐

4) أعطي الإذن للباحث لتخزين واستخدام ما أقوله في المقابلة.

☐

5) أوافق على المشاركة في الدراسة المذكورة أعلاه.

بصمة الإبهام

التاريخ

اسم الطفل

التوقيع

التاريخ

اسم الباحث

عند الانتهاء: نسخة للمشاركة، 1 ملف موقع الباحث ؛ 1 (أصلي)

Appendix 10: Arabic & English consent form for children aged 10-12

Version 1 May 2018

SCHOOL OF HEALTHCARE SCIENCES



CONSENT FORM FOR CHILDREN (AGED 10-12)

Study title: How can tooth decay be prevented among primary school children in Qatar?



Please tick box

1. I understand the information about this study. I have been giving opportunity to think about the information and ask questions. ☐
2. I understand that I don't have to take part and I am free to stop at any time ☐
3. I agree for the interview to be tape-recorded. ☐
4. I give permission for the researcher to store and use what I say in the interview. ☐
5. I agree to take part in the above study. ☐

Name of child

Date

Signature

Name of researcher

Date

Signature

When completed, 1 for informant 1 for researcher site file; 1 (original)

كلية العلوم الصحية



استمارة الموافقة على الاطفال (العنة العمرية 10-12)

عنوان الدراسة: كيف يمكن منع تسوس الأسنان بين أطفال المدارس الابتدائية في قطر؟



ضع علامة في المربع

- 1) لقد فهمت المعلومات حول هذه الدراسة، وأعطيت لي الفرصة للتفكير في المعلومات وطرح الأسئلة.
- ☐
- 2) أعلم أنه لا يجب علي المشاركة بالبحث وأنني حر في التوقف في أي وقت.
- ☐
- 3) أوافق على أن تكون المقابلة مسجلة .
- ☐
- 4) أعطي الإذن للباحث لتخزين واستخدام ما أقوله في المقابلة.
- ☐
- 5) أوافق على المشاركة في الدراسة المذكورة أعلاه.
- ☐

بصمة الإبهام

التاريخ

اسم الطفل

التوقيع

التاريخ

اسم الباحث

عند الانتهاء: نسخة للمشاركة، 1 ملف موقع الباحث ؛ 1 (أصلي)

Appendix 11: Arabic & English workshop consent form

Version 1 January 2018

School of Healthcare Sciences



CONSENT FORM: WORKSHOP

Title of Project: **Exploring dental caries behavioural prevention strategy in Qatari primary schools: a case study**

Name of Researcher: Najat Alyafei

Please initial box

1. I confirm that I have read and understood the information sheet dated[Version 1 January 2018] for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily. ☐
2. I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason, without my legal rights being affected. ☐
3. I confirm that I consent to the interview being audio recorded by the researcher as part of the study. ☐
4. I give permission for the researcher to use anonymised quotes from the interview and for anonymised interviews to be shared with any other researchers or stored as data archives. ☐
5. I agree to take part in the above study. ☐

Name of Person	Date	Signature
Researcher	Date	Signature

When completed, 1 for informant 1 for researcher site file; 1 (original)

الإصدار الأول يناير، 2018

كلية العلوم الصحية



نموذج الموافقة: ورشة عمل

عنوان المشروع: دراسة حالة للسلوكيات المتعلقة لاستحداث استراتيجيات للوقاية من تسوس الأسنان في المدارس الابتدائية بقطر

ضع علامة هنا

اسم الباحث: نجاة اليافعي

	1. أؤكد أنني قد قرأت وفهمت ورقة المعلومات المؤرخة [الإصدار 1 يناير 2018] للدراسة المذكورة أعلاه، وقد أتيت لي الفرصة للنظر في المعلومات وطرح الأسئلة وقد أجيب بشكل مُرضي.
	2. أفهم أن مشاركتي تطوعية وأنني حر في الانسحاب في أي وقت دون إبداء أي سبب ، دون أن تتأثر حقوقي القانونية.
	3. أؤكد أنني أوافق على المقابلة التي يجري تسجيلها صوتيًا من قبل الباحث كجزء من الدراسة.
	4. أعطي الإذن للباحث لاستخدام اقتباسات من المقابلة تكون مجهولة المصدر (أي لن يُعرف من صاحبها) كما أسمح بمشاركتها وتكون مجهولة التعريف بي مع الباحثين أو تخزينها كمحفوظات للبيانات.
	5. أوافق على المشاركة في الدراسة المذكورة أعلاه.

التوقيع

التاريخ

اسم المشارك

التوقيع

التاريخ

اسم الباحث

عند الانتهاء: نسخة للمشارك، 1 لملف موقع الباحث ؛ 1 (أصلي)

Appendix 12: Arabic & English forms for the participants interested in the study findings

*Version1 January 2018***School of Healthcare Sciences****Exploring dental caries behavioural prevention strategy in Qatari
primary schools: a case study**

Yes, I would be interested in hearing more about the study:

Name: _____

Address: _____

Telephone Number: _____

Email address (if any): _____

Best time to Contact you? Please tick one box:

Morning ☐

Afternoon ☐

Early evening ☐

Anytime ☐

Thank you very much

Now, please place this form in the provided envelope and return

الأصدار الأول، يناير 2018

كلية العلوم الصحية



دراسة حالة لوضع استراتيجيات سلوكية وقائية في المدارس الابتدائية بقطر

نعم، أحب أن تعلموني بنتائج الدراسة:

الاسم: _____

العنوان: _____

رقم الهاتف: _____

الايمل (إن وجد): _____

أفضل وقت للاتصال بك:

☐ صباحاً

☐ ظهراً

☐ عصراً

☐ بعد المغرب

☐ أي وقت

شكراً جزيلاً لك،،، رجاء تعبئتها وإرسالها

Appendix 13: Arabic & English information case-study sheet for teachers and school nurse

Version 1 January 2018

School of Healthcare Sciences



Exploring dental caries behavioural prevention strategy in Qatari primary schools: a case study

Teachers and School Nurses



Information about the study

You are invited to participate in this study which is conducted as part of the PHD degree of the researcher Najat Alyafei at Bangor University, UK. The aim of the study is to understand how best to develop prevention strategies for tooth decay among children in Qatari primary schools and looks at learning lessons from the current programme of oral health hygiene being implemented in primary schools to move forward in the future.

The study asks parents and their children as well as teachers and school nurses about their views on how the programme works in their school and any impact it may have on dental hygiene at home. The study looks at both public and private primary schools to have an overview of how the programme might have an impact.

Why have I been asked to take part?

You have been asked to take part because your school was chosen as one of the primary schools in Qatar to participate in the study.

What does the study involve?

The study will involve the researcher Najat Alyafei asking to complete an interview with you to ask about your awareness, knowledge about dental health, your approach to dental care in the school and your involvement in the oral hygiene programme. In particular, Najat will ask about the impact of the oral health programme on your awareness, knowledge and doing oral health work in the school and how it may be improved in the future. The interview will last 1 hour and will be audio-recorded.

Are there any benefits or risks?

Your participation may benefit the development of the oral hygiene programme and its impact in schools and the community.

What will happen to my data?

All data collected will be confidential and anonymised, and you will not be identifiable in any report, thesis or publication which arises from this study. The data from this study will be stored securely as part of the regulations of Bangor University. If you choose to withdraw from the study then you have the right to request that your data is not used.

What if I don't want to take part?

It is up to you to decide whether or not you would like to participate in this study. Deciding not to take part will not impact on any other aspect of you or your child oral healthcare anywhere in Qatar, nor will it affect your child studies.

Further Information about the study?

If you want further information about this study then please contact :

Najat A. Alyafei

Email: hbp84c@bangor.ac.uk

Contact#: 40271454/66060782(7-2pm)

Who do I contact with any concerns about this study?

If you have any concerns or complaints about this study or the conduct of individuals conducting this study, then please contact Dr Lynne Williams, Chair HCMS AEC, School of Healthcare Sciences, Bangor University, Bangor Gwynedd LL57 2EF or e-mail lynne.williams@bangor.ac.uk (Telephone: +441248-383170)

الاصدار 1 يناير، 2018

كلية العلوم الصحية



دراسة حالة: السلوكيات المتعلقة لاستحداث استراتيجيات للوقاية من تسوس الأسنان في المدارس الابتدائية بقطر

معلومات عن الدراسة للمعلم وممرض المدرسة



معلومات عن الدراسة:

أنت مدعو للمشاركة في هذه الدراسة والتي تعد جزء من درجة الدكتوراه للباحثة نجاة اليافعي بجامعة بنقور ببريطانيا. إن الهدف من هذه الدراسة هو الفهم لأفضل طريقة ممكن من خلالها تطوير استراتيجية وقائية لتسوس الأسنان بين أطفال المدارس الابتدائية في قطر ولأخذ دروس مستفادة من البرنامج الحالي المطبق في مدارس قطر للمضي به قُدماً للأفضل.

سوف تسأل الدراسة أولياء الأمور وأطفالهم ، وكذلك المعلمين وممرضات المدارس عن وجهات نظرهم حول كيفية عمل البرنامج في مدرستهم وأي استفادة قد حدثت في زيادة الاهتمام وتكرار تنظيف الأسنان في المنزل. ستبحث الدراسة في كل من المدارس الابتدائية الحكومية والخاصة للحصول على نظرة عامة حول مدى تأثير البرنامج والاستفادة منه.

لماذا يُطلب مني المشاركة؟

طُلب منك المشاركة لأنه قد تم اختيار مدرستكم كإحدى المدارس الابتدائية في قطر للمشاركة في الدراسة.

على ماذا تحتوي هذه الدراسة؟

ستشتمل الدراسة على عمل مقابلة معك تقوم بها الباحثة نجاه اليافعي حيث تتعرف فيها ولمدة ساعة على مدى معرفتك ووعيك بصحة الأسنان، وسلوكك اليومي وطريقتك في العناية بالأسنان في المدرسة، ومن ثم مدى مشاركتك في برنامج صحة الفم والاسنان؟ وعلى وجه الخصوص، سوف تسألك عن تأثير برنامج صحة الفم والاسنان على زيادة وعيك واهتمامك ومعلوماتك في مجال صحة الفم والاسنان بالمدرسة، وكيف من الممكن تحسينها في المستقبل؟ وسيتم تسجيل المقابلة صوتياً.

هل هناك أي فوائد أو مخاطر؟

قد تفيد مشاركتك في تطوير برنامج صحة الفم والاسنان ليزداد تأثيره في المدارس والمجتمع.

ماذا سيحدث لبياناتي؟

ستكون جميع البيانات التي يتم جمعها سرية ومجهولة المصدر ، ولن يتم التعرف عليك في أي تقرير أو مقالات علمية أو منشور ينشأ من هذه الدراسة. سيتم تخزين البيانات من هذه الدراسة بشكل آمن كجزء من لوائح جامعة بنقور. أما إذا اخترت الانسحاب من الدراسة ، فيحق لك أن تطلب عدم استخدام بياناتك.

ماذا لو لم أرغب في المشاركة؟

الأمر متروك لك لتقرر ما إذا كنت ترغب في المشاركة في هذه الدراسة أم لا، وهذا بالطبع لن يؤثر اتخاذ قرار بعدم المشاركة على أي جانب آخر من جوانب الرعاية الصحية الخاصة بك أو طفلك في أي مكان في قطر، كما أنه لن يؤثر على دراسة طفلك.

هل هناك مزيد من المعلومات حول الدراسة؟

إذا كنت تريد المزيد من المعلومات حول هذه الدراسة ، فيرجى الاتصال بـ:

الباحثة: نجاه اليافعي

إيميل: n_alsalahi@hotmail.com

هاتف مكتب: 40271454 - جوال: 66060782 من الساعة 7 ص- 2 ظهرا

بمن أتصل لأية مخاوف أو أسئلة حول هذه الدراسة؟

إذا كان لديك أي مخاوف أو شكاوى حول هذه الدراسة أو سلوك الأفراد الذين أجروا هذه الدراسة ، يرجى الاتصال بالدكتورة لين ويليامز ، رئيس HCMS AEC ، كلية العلوم الصحية ، جامعة بنقور،

Bangor Gwynedd LL57 2EF or e-mail lynne.williams@bangor.ac.uk

(Telephone: +441248-383170)

Appendix 14: Arabic & English Case-study interview questions for parents & children.

Version 1 January 2018

School of Healthcare Sciences



Exploring dental caries behavioural prevention strategy in Qatari primary schools: a case study

Parents and Children

Semi-structured Interview Guide

Background to the study

Aims

Reaffirm consent procedure

Reaffirm consent to tape record interview

Right to stop the interview at any time and withdraw from the research

Confidential nature of the research interview

THEMES

i. What do you know about ‘oral health’?

Probe

What does the term mean to you?

Where does your knowledge about it come from?

ii. How would you describe your daily routine of ‘oral health’ and looking after your teeth and gums?

Probe

What do you do?

Why?

iii. How do you think oral health is supported in your primary school?

Probe

Are parents involved in the school and talking about health in general?

Does the school talk about oral health?

Who is involved - the school nurse or someone else involved?

Describe what happens in your school?

Are you aware of a School programme about oral health being implemented?

If YES

What happened?

Did it make an impact?

For how long did it make an impact?

If no impact why?

How did you get to know about it?

Were you involved? How?

Has what you do at home changed after any education from school/or the school programme?

iv. Why do you think there are problems with oral health and how can they be tackled?

Probe

What are the reasons for problems with oral health for children?

Has your child/have your children had any difficulties? If so what?

How could things be improved?

What is important in making things better?

What can motivate children and parents to improve oral health do you think?

- v. How does the connection between school and home life impact on oral health?**

Probe

What makes this work/not work?

What would make things better?

Who is involved? When?

Is this constant or episodic?

- vi. What do you think are the particular issues that may influence improving oral health in a Qatari context.**

Probe

Are there issues specific to Qatar?

Are there cultural issues?

Are there any differences between girls and boys?

Are there any differences between public or private schools?

- vii. How can the behavior of children in improving their oral health be sustained among primary school children in Qatar?**

Probe

Who should be involved?

How can it be achieved?

How long do you think change can be maintained?

5. Explore additional issues raised

- i.** Are there any issues or ideas that you would like to raise that we haven't discussed so far?
- ii.** Are there any issues or ideas that we have mentioned before/earlier that you would like to discuss again?

Thank the person for their time and contribution

مدرسة علوم الرعاية الصحية



استكشاف الاستراتيجية السلوكية للوقاية من تسوس الأسنان لدى تلاميذ المدارس الابتدائية في قطر: دراسة حالة

أولياء الأمور والتلاميذ

دليل المقابلات شبه المنظمة

خلفية الدراسة

الأهداف

التأكيد على الحصول على الموافقة بإجراء المقابلات

التأكيد على الحصول على الموافقة بتسجيل المقابلات

الحق في التوقف عن إكمال المقابلة في أي وقت والانسحاب من البحث

سرية المقابلات التي تجرى ضمن البحث

الموضوعات

1- ماذا تعرف عن "صحة الفم"؟

أسئلة للبحث

ماذا يعني لك هذا المصطلح؟

من أين حصلت على هذه المعلومات؟

2- ما هي عاداتك اليومية للمحافظة على "صحة الفم" والعناية بالأسنان واللثة؟

أسئلة للبحث

ماذا اعتدت أن تفعل؟

لماذا؟

3- إلى أي مدى تجد أن المدرسة تعتني بصحة الفم؟

أسئلة للبحث

هل ينخرط أولياء الأمور في النقاشات التي تجريها المدرسة حول الأمور الصحية بصفة عامة؟

هل يكثر الحديث في المدرسة عن صحة الفم؟

من المنوط بالتحدث حول صحة الفم بالمدرسة: الزائرة الصحية بالمدرسة أم شخص آخر؟

صف ما يحدث في مدرستك؟

هل تعلم بالبرنامج المدرسي الخاص بصحة الفم الجاري تنفيذه حالياً؟

في حالة الإجابة بـ "نعم"

ماذا حدث؟

هل ترك ذلك أثراً لديك؟

ما مدة هذا التأثير؟

إذا لم يترك أثراً، اذكر السبب.

كيف عرفت بالبرنامج؟

هل اشتركت بأي شكل؟ كيف؟

هل طرأ تغيير على سلوكك المنزلي بعد تعلم محتوى هذا البرنامج؟

4- لماذا ترى وجود مشاكل بصحة الفم وكيف يمكن التغلب عليها؟

أسئلة للبحث

ما السبب وراء مشاكل صحة الفم لدى الأطفال؟

هل يعاني طفلك/أطفالك من هذه المشاكل؟ ما نوعها؟

كيف يمكن تحسين الأمر؟

ما هي الأولويات في هذا الخصوص من وجهة نظرك؟

ما الذي يمكن فعله لزيادة دافعية التلاميذ وأولياء الأمور نحو تحسين صحة الفم؟

5- كيف تؤثر العلاقة بين المدرسة والحياة في المنزل على صحة الفم؟

أسئلة للبحث

ما عوامل نجاح هذه العلاقة؟

ما الإجراءات التي يمكنها تحسين صحة الفم؟

من المعني بهذه العلاقة؟ متى؟

هل تستمر هذه العلاقة على الدوام أم أنها موسمية من حين لآخر؟

6- ماذا ترى من خصوصية للمجتمع القطري التي قد تؤثر على صحة الفم؟

أسئلة للبحث

هل هناك أمور تخص قطر في هذا الشأن؟

هل هناك قضايا ثقافية؟

هل هناك اختلافات بين البنات والأولاد؟

هل هناك اختلافات بين المدارس الحكومية والمدارس الأهلية؟

7- كيف تضمن استمرار سلوك الأطفال في المحافظة على صحة الفم بين تلاميذ المدارس الابتدائية في قطر؟

أسئلة للبحث

من الذي يجب أن يعنى بالأمر؟

كيف يمكن تحقيق ذلك؟

ما المدة اللازمة للمحافظة على هذا التغيير؟

استكشف قضايا أخرى مطروحة:

- (1) هل لديك أية أفكار أو أمور أخرى لم نتطرق إليها؟
- (2) هل هناك أية أفكار أو قضايا ناقشناها وتود تناولها بمزيد من التفكير؟

تقدم بالشكر للمشاركين على وقتهم وحسن تعاونهم

Appendix 15: Arabic & English Case-study interview questions for teachers and nurses.

Version 1 January 2018

School of Healthcare Sciences



Exploring dental caries behavioural prevention strategy in Qatari primary schools: a case study

Teachers and Nurses

Semi-structured Interview Guide

Background to the study

Aims

Reaffirm consent procedure

Reaffirm consent to tape record interview

Right to stop the interview at any time and withdraw from the research

Confidential nature of the research interview

THEMES

i. What do you know about ‘oral health’?

Probe

What does the term mean to you?

Where does your knowledge about it come from?

ii. How would you describe your own daily routine of ‘oral health’ and looking after your teeth and gums?

Probe

What do you do?

Why?

iii. How do you think oral health is supported in your primary school?

Probe

Are parents involved in the school and talking about health in general?

Does the school talk about oral health?

Who is involved - the school nurse or someone else involved?

Describe what happens in your school?

Are you aware of a School programme about oral health being implemented?

If YES

What happened?

Did it make an impact?

For how long did it make an impact?

If no impact why?

How did you get to know about it?

Were you involved? How?

iv. Why do you think there are problems with oral health and how can they be tackled?

Probe

What are the reasons for problems with oral health for children?

Have you come across children with any difficulties? If so what?

How could things be improved?

What is important in making things better?

What can motivate children and parents to improve oral health do you think?

v. How does the connection between school and home life impact on oral health?

Probe

What makes this work/not work?

What would make things better?

Who is involved? When?

Is this constant or episodic?

vi. What do you think are the particular issues that may influence improving oral health in a Qatari context.

Probe

Are there issues specific to Qatar?

Are there cultural issues?

Are there any differences between girls and boys?

Are there any differences between public or private schools?

vii. How can the behavior of children in improving their oral health be sustained among primary school children in Qatar?

Probe

Who should be involved?

How can it be achieved?

How long do you think change can be maintained?

5. Explore additional issues raised

- i. Are there any issues or ideas that you would like to raise that we haven't discussed so far?
- ii. Are there any issues or ideas that we have mentioned before/earlier that you would like to discuss again?

Thank the person for their time and contribution

مدرسة علوم الرعاية الصحية



استكشاف الاستراتيجية السلوكية للوقاية من تسوس الأسنان لدى تلاميذ المدارس الابتدائية في قطر: دراسة حالة

المعلمون وممرضات المدرسة

دليل المقابلات شبه المنظمة

خلفية الدراسة

الأهداف

التأكيد على الحصول على الموافقة بإجراء المقابلات

التأكيد على الحصول على الموافقة بتسجيل المقابلات

الحق في التوقف عن إكمال المقابلة في أي وقت والانسحاب من البحث

سرية المقابلات التي تجرى ضمن البحث

الموضوعات

8- ماذا تعرف عن "صحة الفم"؟

أسئلة للبحث

ماذا يعني لك هذا المصطلح؟

من أين حصلت على هذه المعلومات؟

9- ما هي عاداتك اليومية للمحافظة على "صحة الفم" والعناية بالأسنان واللثة؟

أسئلة للبحث

ماذا اعتدت أن تفعل؟

لماذا؟

- إلى أي مدى تجد أن المدرسة تعتني بصحة الفم؟

أسئلة للبحث

هل ينخرط أولياء الأمور في النقاشات التي تجريها المدرسة حول الأمور الصحية بصفة عامة؟

هل يكثر في المدرسة الحديث عن صحة الفم؟

من المنوط بالتحدث حول صحة الفم بالمدرسة: الزائرة الصحية بالمدرسة أم شخص آخر؟

صف ما يحدث في مدرستك؟

هل تعلم بالبرنامج المدرسي الخاص بصحة الفم الجاري تنفيذه حاليًا؟

في حالة الإجابة ب "نعم"

ماذا حدث؟

هل ترك ذلك أثرًا لديك؟

ما مدة هذا التأثير؟

إذا لم يترك أثرًا، اذكر السبب.

كيف عرفت بالبرنامج؟

هل اشتركت بأي شكل؟ كيف؟

- لماذا ترى وجود مشاكل بصحة الفم وكيف يمكن التغلب عليها؟

أسئلة للبحث

ما السبب وراء مشاكل صحة الفم لدى الأطفال؟

هل صادفت أطفالاً ممن يعانون من هذه المشاكل؟ ما نوعها؟

كيف يمكن تحسين الأمر؟

ما هي الأولويات في هذا الخصوص من وجهة نظرك؟

كيف يمكن للأطفال وأولياء الأمور تحسين صحة الفم؟

12- كيف تؤثر العلاقة بين المدرسة والحياة في المنزل على صحة الفم؟

أسئلة للبحث

ما عوامل نجاح هذه العلاقة؟

ما الإجراءات التي يمكنها تحسين صحة الفم؟

من المعني بهذه العلاقة؟ متى؟

هل تستمر هذه العلاقة على الدوام أم أنها موسمية من حين لآخر؟

13- ماذا ترى من خصوصية للمجتمع القطري التي قد تؤثر على صحة الفم؟

أسئلة للبحث

هل هناك أمور تخص قطر في هذا الشأن؟

هل هناك قضايا ثقافية؟

هل هناك اختلافات بين البنات والأولاد؟

هل هناك اختلافات بين المدارس الحكومية والمدارس الأهلية؟

14- كيف تضمن استمرار سلوك الأطفال في المحافظة على صحة الفم بين تلاميذ المدارس الابتدائية

في قطر؟

أسئلة للبحث

من الذي يجب أن يعنى بالأمر؟

كيف يمكن تحقيق ذلك؟

ما المدة اللازمة للمحافظة على هذا التغيير؟

استكشف قضايا أخرى مطروحة:

(3) هل لديك أية أفكار أو أمور أخرى لم نتطرق إليها؟

(4) هل هناك أية أفكار أو قضايا ناقشناها وتود تناولها بمزيد من التفكير؟

تقدم بالشكر للمشاركين على وقتهم وحسن تعاونهم

Appendix 16: PI PUBLICATIONS

Najat Alyafei (2020). A Students' Health Centre Design for Qatar.

<https://medclinres.org/pdfs/2020/a-students-health-centre-design-for-qatar-mcr-20.pdf>.

Najat Abdrabbo Alyafei, Bushra Naaz Fathima Jaleel (2020). Preparing to meet the oral health needs of the elderly in Qatar - A model for Domiciliary Oral Health Care Services.

https://www.researchgate.net/publication/348014503_Preparing_to_meet_the_oral_health_needs_of_the_elderly_in_Qatar_-_A_model_for_Domiciliary_Oral_Health_Care_Services

Najat Alyafei (2020). The Development of School Oral Health Programmes in Qatar

<https://mbmj.org/index.php/ijms/article/view/308/514>

Najat Alyafei and Sara Gibreel (2020). Exceptional Design for an Adult Oral Health Screening Programme, Qatar <https://medclinres.org/pdfs/2020/exceptional-design-for-an-adult-oral-health-screening-program-qatar-mcr-20.pdf>

Najat Abdrabbo Alyafei, Bushra Naaz Fathima Jaleel, and Tintu Mathew (2020).

Knowledge, Attitude and Behaviour Towards Oral Health Care Among Parents /Caregivers of Children with Disabilities in Qatar.

<https://medclinres.org/pdfs/2020/knowledge-attitude-and-behavior-towards-oral-health-care-among-parents-caregivers-of-children-with-disabilities-in-qatar-mcr-20.pdf>

Najat Abdrabbo Alyafei, Bushra Naaz Fathima Jaleel, and Tintu Mathew (2020).

Exploring the Barriers to Oral Health Care Perceived by Parents/Caregivers of Children with Disabilities in Qatar. *Dentistry Access*. ISSN: 2161-1122

Najat Abdrabbo Alyafei (2020). Knowledge, Attitudes, and Behaviours of People in the Qatari Community towards Myrrh in Combating COVID-19. *Dentistry Access*. ISSN: 2161-1122. <https://www.longdom.org/open-access/knowledge->

[attitudes-and-behaviours-of-people-in-the-qatari-community-towards-myrrh-in-combating-covid19.pdf](#)

- Najat Abdrabbo AlYafei, Bushra Naaz Fathima Jaleel (2020). Job satisfaction of dental professionals in Asnani school oral health programme (2020). *International Journal of Dental Sciences*. E-ISSN: 2663-4708, P-ISSN: 2663-4694. Volume 2; Issue 2; 2020; Page No. 10-14. <http://www.dentaljournal.in/search/2-2-14>
- Najat Alyafei (2020). Can Myrrh Combat COVID-19? Review article. *Iberoam J Med*. Vol.2, n3, p.223-229. <https://app.periodikos.com.br/journal/iberoamericanjm/article/5ebfb5d80e882550525f640f>
- Najat Abdrabbo Alyafei (2020). Recommendations on Importance of Oral Health to Combat Coronavirus. Volume 19 Issue 5. Review article. *EC. ECRONICON Journal*. <https://www.ecronicon.com/ecde/ECDE-19-01413.php>
- Najat Abdrabbo Alyafei (2020). Analysing the Attitudes of Qatari People Toward Oral Health Instructions. *Mamples Scientific Publishers*. DOI: [https://doi.org/10.37191/Mapsci-2582-37-36-2\(1\)-025](https://doi.org/10.37191/Mapsci-2582-37-36-2(1)-025).
- Najat Alyafei (2020). Impact of Knowledge Level of Qatari People towards Oral Health. *eScientific-Journal of Oral Care and Dentistry*. Volume 2 Issue 1 <https://escientificpublishers.com/impact-of-knowledge-level-of-qatari-people-towards-oral-health-JOCD-02-0009>
- Najat Abdrabbo Alyafei, and Bushra Naaz Fathima Jaleel (2020). Association between Education level and Oral Health Behaviors in Qatari Adults (2020). *EC. ECRONICON*. Volume 19 Issue 3. <https://www.ecronicon.com/ecde/ECDE-19-01378.php>
- Alyafei, Najat (2018). Oral Health Behaviour of Qatari People Regarding Oral Cleaning Techniques. *Dentistry Access Journal*. DOI: 10.4172/2161-1122.1000498. https://www.researchgate.net/publication/326944448_Oral_Health_Behaviour_of_Qatari_People_Regarding_Oral_Cleaning_Techniques

Appendix 17: Table 3

S/N	Authors	Country	Methods	Summary of Findings and Comments
1	Angelopoulou et al., 2015	Greece	2-arm parallel prospective clinical trial of traditional one-off lecture on oral health issues by a dentist compared to additional 3-month oral health education by teachers using experiential learning method (field works, variety of presentation, workshops, group discussion). Teachers were trained and given a manual	Both groups had significant improvement in oral health knowledge at 6-month and 18 months. Oral health behaviour and attitude improved at 6 months but not significantly in both groups. Oral hygiene (plaque) was better in experiential learning group at 6 months. DMFT increased significantly in both groups. Engagement of pupils, involvement of teachers and repetition contributed to success of experiential learning
2	Daouda et al., 2016	Senegal	A cohort of 171 public school children followed up from first to sixth grade with periodic education and communication briefings (IEC) and primary care (descaling and extraction of tooth)	Mean DMFT was not statistically different between first and sixth grade. However, the DMFT at the sixth grade (0.36) appeared to be less than that of 12-year olds in Senegal (2.6). However, this is difficult to compare because

				DMF/T in Senegal was measured in 2009 while it was measured in 2016.
3	Am, Cooper et al., 2013	Different countries	Systematic review of behavioural interventions that promote twice daily tooth-brushing and reduced snacking on sugary foods among school children aged 4-12 years	Some evidence of positive impact on children's knowledge and plaque removal. Insufficient evidence of caries prevention and oral hygiene improvement
4	Yekaninejad et al., 2012	Singapore	Group randomised trial of oral health education among public elementary pupils with and without involvement of parents and school staff through oral health education booklet. The oral health education was 3 classroom-based session per week and homework using Health Belief Model.	Students whose parents and school staff were involved brush their teeth twice daily and perform dental flossing once a day more significantly than those whose parents were not involved at 3 months. Both groups had better oral health behaviour compared to control group with no intervention. Being theory-based was partly responsible for the success of the interventions.

5	Mohamadkhah et al., 2013	Iran	Quarzi-experimental study comparing digital media educational oral health film, traditional lecture and no intervention among 10-12 year old girls.	Oral health knowledge and practice of toothbrushing improved in the digital media group immediately and 3 months post-intervention. Practice of Dental flossing and mouthwash did not improve. Data of traditional lecture and control groups not reported.
6	Shenoy and Sequeira, 2010	India	A comparative study of periodic dental health education using audio-visual aids at 3- and 6-week interval among 12- and 13-year olds for 18 months	Dental health education conducted at a 3-week interval was more effective than that conducted at 6-week intervals in improving oral health knowledge, practices, oral hygiene of school children. Reinforcement through repetition contributed to the sustained impact of the intervention even at 36 months.
7	Damle et al., 2014	India	A comparative study of oral health education using models and charts with classroom-based supervised tooth-brushing by parents among 12 to 15 year old pupils in rural and urban areas	Reduction in mean plaque score was significantly higher in the intervention groups in both rural and urban schools compared to control groups. No significant change was

				recorded in DMFT. Involvement of parents may have contributed to the effectiveness of the programme.
8	Hebbal et al., 2011	India	A cluster-randomised controlled trial of health education through audio-visual aids compared with chalkboard education and no education among 12-year olds in 3 primary schools in India	Knowledge score in the audio-visual group increased more significantly and plaque score reduced more significantly compared to the other groups 6 weeks after the health education session. The use of audio-visual aids might have enhanced the understanding of the children and motivated behavioural changes.
9	Naidu and Nandlal, 2017	India	An intervention study with teacher-led health education integrated into academic curriculum using the flip charts and models for brushing demonstration for 6 months and distribution of tooth-brush.	Knowledge, attitude and practice of oral health improved after the intervention. Mean plaque score and dental caries were also lower in the intervention group. Active involvement of teachers, integration into academic curriculum and consistent reinforcement contributed to the success of the programme.

10	Gonzalez-Del-Castillo-McGrath et al., 2014	Mexico	Randomised controlled trial of 6 sessions of motivational interviewing in addition to audio-visual informative session compared to informative session alone for parents of 6-10 years old pupils. Assessment was carried out a year after the start of the intervention	Periodic motivational interviewing of parents was more effective than traditional audio-visual education alone in decreasing plaques and preventing caries.
11	Haleem, Siddiqui and Khan, 2012	Pakistan	Cluster randomised control trial of oral health education led by dentists, teachers, and peers; self-learning	Dentist, teacher and peer-led oral health education were effective in improving oral health knowledge and hygiene (plaque, sulcus bleeding etc). Peer-led education was almost as effective as dentist-led education.
12	D'Cruz and Aradhya, 2013	India	A double-blind intervention study comparing oral health education delivered by power point presentation, power-point presentation with demonstration of toothbrushing and no-intervention.	Improved oral hygiene knowledge, practices and decreased plaque levels was found among the experimental groups. Use of teaching aids including power-point and models may have contributed to the effectiveness of the interventions.

13	Angelopoulou, et al., 2014	Greece	A comparative study of experiential learning (group discussion, field works, presentation) and traditional lecturing among 13-year old children.	Experiential learning was more effective than traditional lecturing in improving oral health attitude and behaviour at 6 months, in improving oral hygiene and gingival health at both 6 and 18 months and in reducing caries incidence 18 months post-intervention. Engagement of pupils, involvement of teachers and repetition contributed to success of experiential learning
14	Bhardwaj et al., 2013	India	A longitudinal study of school-based oral health education programme which included instructions on the importance of maintenance of oral hygiene, use of appropriate oral hygiene aids and demonstration of the method of tooth brushing over 4 months among school children ages 12 and 15.	Overall mean plaque score and gingival score decreased significantly among the participants. There was no significant difference in dental caries status before and after the intervention
15	Mohammadi et al., 2015	Iran	A comparative study motivational Interviewing of parents in the presence of the children and video lectures of parents and pupils ages 4-6 years.	Both interventions were effective resulting in reduced plaque and improved gingival health. Motivational interview was more effective

				than video lecture. Personalization and repetition of motivational interviews likely contributed to its better effectiveness
16	Pakpour et al., 2014	Iran	Cluster-randomized controlled trial of gain-framed, loss-framed, or no messages among adolescents. The gain- and loss-framed pamphlets each contained six positive or negative messages and three related full-colour images.	Adolescents who received loss-framed message reported improved oral hygiene attitude and behaviour after 2 weeks and less dental plaques after 24 weeks.
17	Jain et al., 2016	India	Before and After study that assessed effectiveness of oral health training of teachers to educate school children (aged 8-10 years) for 2 half-hour periods per week over a period of 7 months	Pre and post training data showed a significant improvement in oral health knowledge and practices of school teachers and children.
18	Doichinova and Mitova, 2014	Belgium	Oral hygiene education and motivation of 30 children aged 6-12. In each 15 minute-session, 12 minutes were dedicated to motivation, demonstration and education followed by 3 minutes of oral hygiene practice.	The toothbrushing skills (brushing all surfaces) and oral hygiene index improved after 3 months of intervention

19	Lai et al., 2016	Taiwan	Prospective cohort study of oral health education and daily flossing and brushing after lunch on every school day, under the detailed instruction of school nurses for one term among 10-11 years old pupils. Assessment was done after 10 years	Long-term effectiveness on dental knowledge, oral hygiene habits, plaque scores were demonstrated among the intervention group. Active engagement of pupils through supervised tooth brushing possibly contributed to the long-term effectiveness of the programme.
20	Mohamadkhah et al., 2014	India	Quazi-experimental study of oral health education involving lecture, group discussions and motivational counselling among pupils aged 10-12	Knowledge, attitude and practice relating to oral hygiene behaviours (tooth-brushing, mouthwashing, dental flossing and dental visit) improved significantly with oral health education compared to the control group
21	Olubunmi and Olushola, 2014	Nigeria	An interventional study which compared video education, verbal education in native language and no intervention.	Controlling for child's age and fathers education, revealed that oral hygiene of the participants in the video group and verbal education were significantly better by 28.6% and 23.4% compared to the control group

22	Chandrashekar et al., 2014	India	An intervention study comparing oral health education by teacher, oral health education by dentist and oral health education by teacher combined with supply of oral hygiene aids (toothbrush, toothpaste). The interventions were conducted every fortnight for 5 months among 15 year old students	Children supplied oral hygiene aid experienced more improvement in plaque index than those who had oral health education alone. No significant difference in DMFT among the groups. Supply of oral hygiene aids contributed to behavioural change among the children and
23	Gupta, 2008	USA	Programme evaluation of oral health education component of school sealant programme. The oral health education component used hand-on training and visual component (videos and pictures) by trained health educators provided dental health education to the children in 30 minutes of classroom lectures covering various aspects of oral health.	The programme led to increased oral health knowledge among the children. The programme was successful partly because it was regular and interactive.
24	Macnab et al., 2008	Canada	Before and after study. community. The intervention consisted of daily brushing, fluoride application, educational presentations, and a recognition/incentive scheme.	Oral hygiene practice improved among the children. Significantly less proportion of children had cavity after 3 years of the programme

25	Saied-Moallemi et al., 2009	Finland	Comparison of class based oral health puzzles to parent-led intervention using brushing diary and health education pamphlet, combination of the interventions, and no intervention among 9-year olds	Interventions involving parents (parent-led and combined) led to significant reduction in dental plaques and gingival bleeding
26	Petersen et al., 2016	Thailand	An intervention study which compared enhanced oral health education programme (teacher-supervised tooth brushing, twice-a-semester oral health education and communication of oral hygiene need of pupils to parents) with no intervention as control	Plaques and Dental caries incidence reduced significantly among the intervention group. Schools with higher compliance recorded higher benefits. Involvement of teachers likely contributed to compliance and success of the intervention
27	Tai et al., 2009	China	Cluster randomized control trial of oral health promotion programme with multiple interventions: annual teachers' workshop, biweekly children's education, annual mothers' education, oral hygiene poster presentation, oral hygiene contest, dental hospital tour once in 3 years, supplies of toothpaste every 2 months, preventive & curative services in nearby hospitals	More children in the intervention schools adopted regular oral health behavioural practices. Significant difference in mean plaque and sulcus bleeding between the intervention and the control group. Improvement likely due to multiple interventions, involvement of parents and teachers, engagement of pupils

28	Takeuchi et al., 2017	Tonga	Evaluation of oral health programme in kindergarten and primary schools. Oral health interventions include health education, supplies of oral hygiene aids, oral health workshops for staff and oral health festival	Improvement in oral hygiene behaviour(toothbrushing) and reduction in prevalence of dental caries. Collaboration between different stakeholders, including Ministries of Health and Education, was largely responsible for the success of the programme
29	Tarvonen et al., 2017	Democratic People's Republic of Korea	Longitudinal study of dental care interventions including supervised tooth brushing, continuous oral health education and distribution of tooth brushes. Group 1 had frequent health education started at school reception (age 7 years) while Group 2 had less frequent interventions but started at kindergarten (age 4 years)	Both groups experienced decreased prevalence of dental caries. The results gave some indication that the intensified intervention showed no additional benefit compared to the less intense intervention started at an earlier age.
30	Chachra et al., (2011)	India	A comparative study of oral health promotion (oral health lecture, practical demonstration and fortnightly mouth rinse with fluoride) led by dentists, teachers trained by dentists and teachers trained by volunteers who were previously trained by dentists	All the intervention groups had significant improvement in knowledge, attitude and practice of oral hygiene and reduction in dental caries in 6 months. However, direct health education by dentist appeared to be

				most effective of all the interventions. Combination of multiple interventions likely responsible for effectiveness in all groups
31	Albino and Tiwari (2016)	Different countries	A literature review of behavioural interventions for childhood caries at individual, family and community levels from 2011 to 2015	Most interventions that utilized motivational interviewing were successful as they involved individuals in decisions about oral health within the context of their respective life circumstances.
32	Macpherson et al., 2013	UK	Evaluation of National Supervised Toothbrushing Programme in Scotland. The intervention was supervised toothbrushing in nurseries and distribution of fluoride toothpaste and toothbrushes for home use	Uptake of the programme correlated with decrease in dental caries
33	De Farias et al., 2009	Brazil	Randomised control trial. The dentist conducted a 4-month (two sessions per month) dental health education programme, in a classroom with the experimental group, totaling eight 1-hour lessons. Participatory, descriptive classes using chalk and	The experimental group has a significantly lower dental plaques and higher oral health knowledge after the intervention. However, there was no association between oral hygiene indicators, VPI and the information level of the schoolchildren. Improvement likely due to

			blackboard, illustrative and educational drawings, dental mannequins, and dynamic competitive games.	the participatory nature of the intervention and its regularity.
34	Halawany et al., 2018	Saudi Arabia	Before and after study. Four-minute animation video, a lecture presentation, and educational corners on toothbrushing, healthy diet, regular dental visit twice and anatomy of teeth	Statistically significant improvement in knowledge and self-reported behaviour in the post intervention group. There was a significant increase in the level of knowledge by 11.24% and level of self-reported behaviour by 25% after intervention ($P < 0.001$).
35	Habbu and Krishnappa, 2015	Different countries	Systematic review	Improvement in oral hygiene and gingival health, dental caries, oral health knowledge, attitude and behaviour in few studies
36	Gambhir et al., 2013	Different countries	Systematic review of ten papers	The analysis of all the studies indicated that knowledge, attitude and oral hygiene could be significantly improved through dental health education with all the 10 studies showing positive effects. Majority of the programmes which aimed to reduce plaque levels and

				improve gingival health were successful except one
37	Lai et al., 2016	Taiwan	Prospective cohort study was designed to include 120 schoolchildren aged 10–11 years with instructions on how to practice daily flossing and brushing under the supervision of school nurses for one semester (the intervention group) and to recruit a comparison group with no intervention from 120 classmates matched by gender (the nonintervention group). Both groups participated in a questionnaire survey and received dental examinations after 10 years follow-up.	Better overall plaque score in the intervention group, lower DMFT values and DMFS, significantly better dental knowledge and habits and dental conditions
38	Kaewkamnerdpong and Krisdapong, 2018	Thailands	Survey	School oral health-related environments, especially available food choices, were associated with sweets consumption behaviour and caries levels. Children in schools with integrated oral health education had better brushing habits.

39	Aishah Alsumait et al., 2019	Kuwait	<p>A cross-sectional study included 440 primary school children aged 11 to 12 years old and their mothers. Participants were classified into two groups: school - based oral health prevention programme (SOHP) and non - school based oral health prevention programme (non-SOHP). The group of SOHP had been enrolled in the prevention programme for at least 3 years where they had applications of fluoride varnish twice-a-year and fissure sealants when needed. Mothers had, at least, one oral health education session. The non -SOHP group had negative consents and had not been exposed to the prevention programme activities. All dental examinations were performed at schools by using mobile dental units. They were determined caries by using the DMFT indices: (D/d) means decayed, missing (M/m), and filled (F/f), teeth, (T/t)/surface (S/s).</p> <p>The children's oral health-related quality of life (OHRQoL) was assessed using a self -administered</p>	<p>The enrolment of children aged 11 to 12 years old in the school -based oral health prevention programme (SOHP) services was associated with a positive impact on children's caries level and with no significant impact on mothers' knowledge, attitude, practice, or oral health-related quality of life (OHRQoL).</p>
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			validated Child Perceptions Questionnaire 11–14 (CPQ11–14), and Mothers’ OH knowledge, attitude, practice, and oral health-related quality of life (OHRQoL) were also assessed.	
40	Hamlet Gasoyan et al., 2019	Republic of Armenia	<p>The study evaluates the prevalence and levels of dental caries among rural schoolchildren in 2013 (before the implementation of the preventive programme, referred to as a pre-intervention group) and 2017 (4 years after the start of the programme, referred to as an intervention group) in two randomly selected schoolchildren in villages. Then a repeated study design of a cross-sectional was used.</p> <p>In 2013, “Brush drome” were the toothbrushing stations that were installed at school based in 14 rural schools of nine villages.</p> <p>Each school children brush his/her teeth just after their lunch in the “Brush drome” that is a room next to the cafeteria that have multiple sinks and individual cabinets. The intervention of toothbrushing was all 5 of</p>	The study indicates a significantly lower level of caries among schoolchildren in the studied two villages where the intervention was implemented. The described intervention is particularly suitable in rural settings where water fluoridation is not available and homes have limited availability of running water.

		<p>the weekdays after the lunch break. The students were supervised to use toothbrush and fluoridated paste at school. Oral hygiene education was coupled for the children and parents. The supervision was conducted overall 135 school days. Oral health products were given to children for home use. Either the primary school teacher or the school nurse were provide children with training on proper toothbrushing technique and supervised too. They were using the sand time and brushing for 2 minutes. School children were using the “Brush drome” highly throughout the intervention. The school children's parents were trained on the proper technique of toothbrushing to motivate and monitor their children at home twice a day.</p>	
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