
# KNOWLEDGE, ATTITUDE, AND PRACTICES OF MOTHERS TOWARD THEIR PRE-SCHOOL CHILDREN'S ORAL HEALTH: A QUESTIONNAIRE SURVEY AMONG A SUBPOPULATION IN SHARJAH UNITED ARAB EMIRATES.

**Noura Mahmoud**
BDS, Ajman University of Science and Technology, 2006

Presented to the Hamdan Bin Mohammed College of Dental Medicine
Mohammed Bin Rashid University of Medicine and Health Sciences
in Partial Fulfillment of the Requirements for the Degree of
Master of Science in Pediatric Dentistry
2016

# ABSTRACT


## Knowledge, attitude, and practices of mothers toward their pre-school children's oral health: a questionnaire survey among a subpopulation in Sharjah, United Arab Emirates

Dr Noura Mahmoud

Supervisors: Associate Professor Manal Al Halabi, Associate Professor Mawlood Kowash, Clinical Assistant Professor Iyad Hussein, and Associate Professor Amar Hasan

### Background

Parental knowledge and beliefs may have a possibly detrimental effect on young children's oral health. Oral hygiene and healthy eating habits in children is significantly affected by their parent's knowledge and awareness of the importance of dental health. Particularly crucial in the preventative cycle is the positive attitude toward good dental care as displayed by the parents. A positive correlation has been determined between parents' attitudes towards dentistry and better dental health of their children.

**Objective:** To assess the knowledge, attitude and practices of mothers toward their children's oral health in Sharjah, United Arab Emirates (UAE).

**Materials and Methods:** A cross-sectional study was conducted among 383 mothers (average age of the mothers was 36.61 (±7.86 years), of preschool children average age 3.49 (±1.63 years) who attended Sharjah Dental Center, UAE. Data were collected through an interview, using a structured preform.

**Results**: Adequate knowledge was found among (58.2%), and poor knowledge was found among (41.8%); (99% ) of the mothers exhibited excellent attitude and only (20%) were following good

practices towards their children's oral health. Poor knowledge and practices of mothers toward their children's oral health was significantly associated with mothers' occupation and education. Employed mothers scored significantly higher mean of knowledge than the others. Mothers with secondary level of education and university qualification had significantly higher scores of practice compared with mothers with primary education. Employed and student mothers had higher scores of attitude higher than unemployed mothers and mothers owning their own businesses. These differences were statistically significant. There were no significant differences in attitudes of mothers from different educational backgrounds.

**Conclusions & Recommendation:** This study demonstrated that although mothers had better than average knowledge and excellent attitude towards their children's oral health issues; most of them carried out improper practices towards their children's oral health. The results also demonstrated differences in mothers' knowledge, attitude and practices according to their educational and employment backgrounds. The data suggested the need for an establishment of awareness programs in order to improve knowledge and practices of the mothers towards their children's oral health.

# DEDICATION

***This thesis is dedicated to my parents and my two angles Zayed and Aisha***

***For their endless love, support and encouragement***

# DECLERATION

I declare that all the content of the thesis is my own work. There is no conflict of interest with any other entity or organization.

Name: Noura Mahmoud

Signature:

# ACKNOWLEDGMENTS

There have been many people walking alongside me during the last three years, without whom this thesis might not have been written and to whom I am greatly indebted.

First and foremost, I have to thank my parents, for their love and support throughout my life. Thank you for giving me strength to reach for the stars and chase my dreams. My sisters and brothers deserve my wholehearted thanks as well.

I would like to sincerely thank my supervisors Dr Manal Halabi, Dr Mawlood Kowash and Dr Iyad Hussein, in a special way. I express my heartfelt gratefulness for their guidance and support and I believe I learned from the best. Thank you for your confidence in me. To Dr Amar Hassan, I was grateful for your help in statistical data handling and analysis in this thesis. I learned a lot from his insights.

A very big thanks to my colleagues, indeed friends; I would like to thank each and every one of them for their contributions and support. I am truly blessed by their friendship.

I would like to thank Al Jalila Foundation for the sponsorship they awarded me which enabled my financial support for the Master degree.

I would like to extend my sincerest gratitude to Sharjah Dental Centre for their great contributions and participation in this study.

I am indebted to the dentists in Sharjah Dental Centre. They helped in organizing my visits to the centre and made the data collection process easy. Finally and without hesitation, I would like to thank the mothers who participated in this study

## TABLE OF CONTENTS

# List of Tables

# List of figures

# 1.0 INTRODUCTION

There is a significant correlation between a child's overall health and wellbeing and his or her oral and craniofacial condition [1]. This correlation includes and affects different developmental processes such as cognitive, physical, growth, social, emotional and learning development. Poor oral hygiene may have undesirable impacts on the well-being of the affected child [2]. Early Childhood Caries (ECC) has the most significant negative impact on children's oral health [3] . The American Academy of Pediatric Dentistry (AAPD) describes ECC as "the presence of one or more decayed (noncavitated or cavitated lesions), missing (due to caries), or filled tooth surfaces in any primary tooth in a child 71 months of age or younger" [4]. Several factors could contribute to a high rate of ECC. Children's dental care practices are influenced by several factors- a significant one of which is parents' attitudes towards their own dental care [5]. All data available regarding dental caries in the United Arab Emirates (UAE), a nation made up of seven Emirates (Abu Dhabi, Dubai, Sharjah, Ajman, Ras AlKhaima, Um AlQuwain and Al Fujaeirah), suggest high prevalence of caries with no evidence of decline [6]. The prevalence of dental caries in the UAE for children aged 5–6 years is higher than that for 12- year-old children [7], (95% and78.85% respectively). The prevalence of dental caries in children aged between 4 years and 6 years in Abu Dhabi is high with a decayed missing filled teeth (*dmft*) range of 5.1–8.4, while in Ajman it was between 72.9% and 76.1% with a *dmft* range of 4.4– 4.5 [8]. It is obvious that these findings are far from the goal of World Health Organisation (WHO) that 50% of 5–6 year olds would be free of dental caries in 2000 [7]. The prevalence of dental caries in 12-year-old children in the UAE was estimated in only two epidemiological studies concerning dental caries. The first was a nationwide survey that found the prevalence to be 54% and the (DMFT) to be 1.6. The second survey was conducted in two private schools in Abu Dhabi and it found the

prevalence of dental caries to be at 66.24% and a DMFT score of 3.24 [7]. To estimate the prevalence of dental caries in this age group for UAE children, more comprehensive studies are needed. There is no published evidence related to the status of oral health of children in the UAE except in Abu Dhabi (1991-2001)[9] and Ajman (2001-2010) [7]. The results showed a high level of caries in Abu Dhabi and Al Ain with no decline. In the United Kingdom (UK), according to a survey published by Public Health England (PHE) in September 2014, there exists a dramatic variation of tooth decay prevalence ranging from 2% to 34%, as demonstrated across the UK. Although 3-year-old children had an average of 3 decayed teeth, 88% of children in this age group had no decay at all. These positive results reflect trends of significant improvements in dental health following the introduction of fluoride toothpaste in 1976 [10] .In the United States of America (USA), statistics from the National Health and Nutrition Examination Survey (2011–2012) indicated that children aged 2–8 years had about 37% dental caries in primary teeth. Dental caries among children aged 2–5 was approximately 23%, matched with 56% for those aged 6–8. Greater caries prevalence was observed among Hispanic (46%) and non-Hispanic black children (44%) compared with non-Hispanic white children (31%) and Asian Children (36%) aged 2–8 years. The survey concluded that the prevalence of caries among Hispanic children aged 6–11 (27%) was higher than that of non-Hispanic white children (19%) as well as non-Hispanic Asian children (18%) [11].Decision makers on matters affecting the child's health and access to health care are usually the parents [12]. In fact, parents' personal dental hygiene habits present a very significant impact on their children's oral hygiene practices, as parents function as role models for their children [12]. Two of the most essential considerations influencing children's oral health are the cultural and moral interpretations of dental hygiene as displayed by the parents. Therefore, parents should be considered as key persons in ensuring the well-being of young children in an attempt to achieve the best oral health outcomes for children

[13]. The tooth brushing habits as well as dietary habits and nutritional choices of mothers are directly associated with that of their children, and as such they have a direct impact on the habits of their children [14]. Dental care professionals accept that efforts designed at improving parental oral health behaviours could result in improved oral health in their children. Nonetheless, a number of factors have been identified to indirectly influence mothers' health habits and their children's health [15]. Some of these factors include mothers' education, occupation, age, current knowledge, attitude, and behaviour relating to health [12]. There is growing evidence that targeting specific audiences is effective in influencing health promotion and education as well as preventive behaviours [16]. A study conducted in Ajman, UAE 2006 which aimed to estimate the prevalence and severity of dental caries in young children and to also explore its relation with sociodemographic characteristics and the dental services, found that the prevalence of dental caries was high (76.1%). The average decayed missing filled surfaces (*dmfs*) score was 10.2. Older children and male children of less educated mothers showed greater caries severity than others [17].Good fundamental oral health habits practiced throughout early infancy stages is essential such that suitable dental standards are established and then well-preserved and carried on into the adult life. The family is the first institution whereby child behaviour and development is impacted; mothers, who are the prime model for developing behaviour, play a crucial role in the behavioural and developmental upbringing of the offspring of the family [6]. Therefore, childhood is a critical period of life that needs to be monitored carefully so that the child will grow up healthy. Preventive education and the importance placed on dental care can be delivered to ensure that the best infant oral health care is established, as this is considered to be the foundation for the lifetime. In order to ensure this, the AAPD recommends that infant oral health care should begin ideally, and as early as prenatal stages, with prenatal oral health counselling. Furthermore, the AAPD recommends and stresses the importance of a preliminary oral

examination should be conducted within six months of the eruption of the first primary tooth and no later than one year of age [18].Preventive guidance, including anticipatory education and appropriate therapeutic intervention for the infant, is encouraged by the AAPD. These methods are usually discussed with the parents in their child's first dental visit and every subsequent visit. If access is available, anticipatory guidance can be also discussed in the prenatal period to educate expectant parents[19].To ensure and enhance a lifetime free from preventable oral disease, the AAPD acknowledges and emphasizes the importance of infant oral health – recognizing that it is one of the fundamental pillars upon which preventive programs and dental maintenance must be built. Recommendations by the AAPD in this regard such as preventive attitudes, oral health risk assessments, preventive guidelines, and therapeutic interventions subsequently should be monitored by dental, medical, nursing, and allied health professional programs [20].A good understanding of dental caries and an awareness of the risks of it, as well as baseline data on oral health and its determinants are necessary for setting appropriate planning and goals for preventive oral health programs.

The available current data on the *dmft* and DMFT within the UAE indicate that childhood dental caries is still a serious dental public health issues that warrants the immediate attention of the government and policy makers alike [21].To be able to address and combat this issue effectively, there exists a need to assess the oral health knowledge of the mothers, who act as the primary care-givers for the children, in an attempt to improve their oral health care access and knowledge. Therefore, the purpose of this study was to assess the knowledge and oral health practices of a selected subpopulation of mothers in Sharjah, UAE in order to subsequently be able to develop appropriate programs for oral health promotion for children in the area.

# 2.0 LITERATURE REVIEW

This chapter consists of three sections. The first section provides a brief overview of the dental caries progression and epidemiology of caries in infants and young children (Early Childhood Caries). The second section discusses caries background, prevalence, and aetiology including predisposing and contributing factors with special reference to dental health education. The third section describes the need for conducting this study.

Evidence on caries prevalence and severity form the foundation for caries prevention programs and treatment needs in a population.

## 2.1 EARLY CHILDHOOD CARIES (ECC)

Fass (1962) was the first to describe a particular pattern of dental caries in a young child as "nursing bottle mouth" [22]. The caries he described took the form of severe and rampant caries which include the maxillary incisors followed by the maxillary and mandibular first molars. This followed the eruption order, except for the mandibular incisors which are infrequently affected. Later, other terms had been used to describe this very condition such as, "baby bottle tooth decay", "night bottle mouth" and "nursing caries" [23].In 1985, the phrase “baby bottle tooth decay”, was recommended by the Healthy Mothers-Healthy Babies Coalition as an alternative to “nursing bottle mouth” that would be more appropriate for patient acceptance and would stress attention on the potential damage of using a nursing bottle [24]. The term “nursing caries” was encouraged to be used by many professionals such as Ripa (1988), Curzon and Pollard (1994) and Johnston (1994) [22]. However, Winter (1994) suggested the term “rampant caries in children with primary dentition” because caries in children under the age of five was not necessarily only

caused by nursing bottle [25]. The term "nursing caries" was used because it has been widely mentioned in the literature, accepting that other terms may be equally correct, including the fact of breast-feeding as a possible cause of the caries [22].Several reports suggest that milk might be less cariogenic than other sugar-containing liquids. Furthermore, it has been shown that enamel dissolution is inhibited due to phosphoproteins found in milk [10]. Furthermore, in-vitro studies on milk revealed it to have the ability to remineralise artificially demineralised enamel [26]. Recently, Tinanoff and O'Sullivan 1997 (year) used the term "Early Childhood Caries" or ECC which had been previously introduced in the USA as "the presence of one or more decayed (noncavitated or cavitated lesions), missing (due to caries), or filled tooth surfaces in any primary tooth in a child 71 months of age or younger".[24] In addition to ECC, whence children who and less than 3 years of age display any indication of smooth-surface caries, it is said that they display Severe Early Childhood Caries (S-ECC). Moreover, from ages three to five, one or more cavitated, missing (due to caries), or filled smooth surfaces in primary maxillary anterior teeth or a decayed, missing, or filled score of ≥4 (age 3), ≥5 (age 4), or ≥6 (age 5) surfaces constitutes S-ECC [19] .ECC is a severe dental disease with different influences on the child's oral and general health. It interferes with sleeping patterns, thereby affecting the quality of life for young children and resulting in pain and difficulty eating and drinking [27]. It also adversely affects growth and development [24]. Dental caries at early age is considered an accurate predictor for dental caries in future permanent dentition [28]. Inappropriate bottle-feeding is the main cause of ECC. This is why ECC has been categorized as 'bottle caries', 'nursing caries', 'baby bottle tooth decay', or 'night bottle mouth'[29]. Therefore, when describing any form of caries in infants and preschool children it is recommended to use the abbreviation ECC.

### 2.1.1 Classification of ECC

Several classifications have been used to describe ECC. Two commonly established categorizations for ECC include simple ECC and severe ECC, as defined by the AAPD[30].

1. Simple ECC is "the presence of one or more decayed, missing or filled tooth surfaces in any deciduous tooth in a child under 6 years of age";[31]

2. Severe ECC is "any sign of smooth-surface caries in children under 3 years of age, with 1 or more cavitated, missing or filled smooth surfaces in the primary maxillary anterior dentition in children between the ages of 3 and 5, or decayed, missing or filled scores of ≥ 4 (ages 3 to < 4), ≥ 5 (ages 4 to < 5) or ≥ 6 (ages 5 to < 6)".[31]

Wyne (1999) further proposed the following classification of ECC [32]:

**Type I** (mild to moderate) ECC: "The existence of isolated carious lesion(s) involving molars and /or incisors. The cause is usually a combination of cariogenic semi solid or solid food and lack of oral hygiene. The number of affected teeth usually increases as the cariogenic challenge persists"[32]. This type of ECC is usually found in children who are 2 to 5 years old.

**Type II** (moderate to severe) ECC: "Labio-lingual carious lesions affecting maxillary incisors, with or without molar caries depending on the age of the child and stage of the disease, and unaffected mandibular incisors. The cause is associated with inappropriate use of feeding bottle or at will breast-feeding or combination of both, with or without poor oral hygiene. Poor oral hygiene most probably compounds the cariogenic challenge. This type of ECC could be found soon after the first teeth erupt. Unless controlled, it may proceed to become type III ECC".

**Type III** (severe) ECC: "Carious lesions affecting almost all teeth including the lower incisors. This condition is found between ages 3 to 5 years. The condition is rampant and involves tooth surface/s generally that are unaffected by caries e.g. mandibular incisors".

### 2.1.2 Pattern and Clinical Appearance of ECC

ECC has a specific pattern and clinical picture as stated in many studies. It is an exact form of rampant caries with the only feature separating it from generalized rampant caries being the absence of decay in the mandibular incisor teeth [36,37] . The most frequently affected teeth of ECC are the maxillary incisors [21]. Depending on how long the carious progression remains active, involvement of other teeth (the canines, first and second primary molars) can take place but usually the severity of the lesions in these teeth is less than in the maxillary incisors [34]. Because the teat of the bottle is usually held above the tongue during sucking, the mandibular incisors are usually not affected as lower incisors are protected by the tongue and also by the flow of saliva from the submandibular ducts [34]. The pattern of infantile physiological tongue thrust during deglutition is thought to be important in protecting the lower incisors [34].In most cases of ECC, the first clinical sign is a band of dull white demineralization along the gingival line of the maxillary incisor teeth[34]. These white bands develop into cavities as the lesion progresses. This results in a brown or black collar around the necks of the incisors. In advanced cases of ECC, the crowns of the teeth may appear amputated leaving only decayed brownish-black root stumps lesions [34]. The labial, palatal, mesial, distal of maxillary incisors and of the maxillary and mandibular canines are the commonly involved surfaces in ECC, while the occlusal surface is commonly affected in the first and second primary molars[21] .

According to Ripa (1988 [34], the reason for the exclusive distribution of these patterns is related to three factors: 1) the chronology of tooth eruption; 2) the duration of the deleterious habit; and 3) the muscular pattern of infant sucking.

### 2.1.3 Prevalence of ECC and Dental Caries in Pre-School Children Worldwide

Dental caries is a major community health problem and remains the most predominant chronic dental disease in both children and adults, despite the fact that is mostly preventable. Dental caries was the most prevalent worldwide public health disease in 2010 [35]. Furthermore, caries affecting the primary teeth in preschool children, has been a source of main alarm in the field of child care[36].The prevalence of ECC varies greatly in different studies. The prevalence worldwide has been described to vary between 3% and 94%, depending on the context [34]. More specifically, this variation was linked to several factors such as "1) children studied; their age and the accessibility for examination; 2) socio-economic status; 3) ethnic and cultural factors and 4) criteria used for diagnosis" [34].Generally, the prevalence of ECC in one country cannot be compared with another [24]. Richardson *et al*.(2001) reported that even results from one ethnic group "cannot be extrapolated beyond that group, even within the same country" [37].In Western societies, approximately 80% of caries which are documented are found in children belonging to low socio-economic groups, certain immigrant groups, patients with learning disabilities and those with physical and medical disabilities, which represent 20% of the population[38]. Data collected on caries is oftentimes grouped into wide-ranging age categories and broader categories such as ethnicity and socio-economic class; therefore, only a few studies of caries determines the prevalence of it in preschool children in particular. Since 1967, declining *dmft* scores have been the tendency in industrialized countries whereas they remain high in unindustrialized, among other, countries.

In the UK, the Children's Dental Health (CDHS) survey of (2013) revealed that a third (31%) of 5 year olds within the UK were identified as having obvious decay experience in their primary teeth. In terms of the components of obvious decay experience, 28% of 5 year olds had decay into dentine[39].Comparatively, an epidemiological survey conducted among 1,151 randomly-selected school children in São Paulo, Brazil (2000) found that the prevalence of primary teeth dental caries among five-year-olds was 45.8% [40]. Interestingly, in Feira de Santana, Brazil (2007), the prevalence of dental caries among 186 children aged 12 to 30 months was 6.4% [41]. This may be a result of the water consumed; the water supply in Feira de Santana is optimally fluoridated. Mohebbi et al. (2006) reported the prevalence of ECC in 483 children in Tehran. The prevalence of ECC among the youngest age group, 12-15 months, was (3%), for 16-19 months was (9%), and for 20-25 months was (14%) [42].Using WHO criteria, a 2007 cross-sectional survey of a sample of 2,014 Chinese preschool-children aged 3-5 years found a prevalence of 55% of children with regular dental caries and 14% of children with rampant dental caries. Further, a correlation was established between the increase of age and the increase in the prevalence and severity of caries. A high proportion of young children had dental caries and most decayed teeth were untreated [40].In Saudi Arabia, a 2013 methodical review of population based dental caries among children found that dental caries and its severity were estimated to be approximately (80%) for the primary dentition with a *dmft* mean of 5.0[43]. Information on dental caries among children in the UAE and over the past 20 years has been collected from pathfinder surveys ; however, these did not represent all 7 Emirates. Reports on the experience of dental caries in primary dentition were mainly from Abu Dhabi. In 1991 there were 3 reports on caries in the primary dentition of 5–6-year-olds: mean *dmft* was described as 5.1 for 5-year-old children in Abu Dhabi; the second study reported 6.3 *dmft* for 6-year-olds in 3 cities in the UAE and the third reported an average *dmft* of 6.8, 4.0, 3.0 and 6.2 for Abu Dhabi, Dubai, Sharjah and

Fujairah respectively [unpublished report, P. Leous, 1991]. In 1998, a mean *dmft* of 7.7 was reported in 5-year-olds in Abu Dhabi [9]. These reports suggested an increasing trend of dental caries in the primary dentition of children in the UAE [8] .The prevalence of dental caries in the UAE is high and there is no evidence of decline. Furthermore, Abu Dhabi and Ajman are the only Emirates within the UAE with evidence on the status of children's oral health. Very little studies have been conducted to estimate the prevalence of caries among UAE children It is unclear whether the situation with regards to dental caries among children in other Emirates such as in Sharjah is similar to the results found in Ajman and Abu Dhabi[9]. A study conducted by Al-Nadeef (2010) found that only 17% of children were caries-free and the *dmft* index was 5.1 – ranging from 3.8 in Ajman to 6.6 in Dubai. More than (52%) had > 4 *dmft*. The main conclusions of this study posit that caries are highly predominant within the primary dentition of 5-year-old children and remain mostly untreated [7].

Generally, one can say that data are sparse with regards to the prevalence of dental caries among children and is inaccurate because: the examination and the prevalence of caries among preschool-age children are not widely available; samples assessed may not be completely representative of the population in question; cultural and ethnic differences within samples resulting in various and differing infant feeding patterns, thereby making the extrapolation of findings inappropriate; the careful examination of infants and toddlers is often difficult; and lastly because criteria for ECC identification have "varied among existing studies with respect to location of dental decay and number of teeth affected, e.g., any labiolingual lesion in a maxillary incisor or a *dmft* score of 5 or greater" [44] .

### 2.1.4 Aetiology of ECC

The effect of dental caries are manifold and the disease is affected by a number of things: firstly, the exposure to fluoride may affect the prevalence of dental caries, secondly the existence of caries in the dentine may also be affected by the salivary composition as well as the salivary flow, the consumption of dietary sugars also plays a role. The formative stages of dental caries entails microbiological alterations within the complex biofilm[45].At the beginning of the existence of the disease, it is reversible and henceforth may also be arrested at any stage [21].

With dental caries on one hand and ECC on the other, there is an important distinction that must be made between the two. Whereas dental caries oftentimes involved plague retentive areas, ECC surfaces on the labial surfaces of maxillary incisors which are generally not affected by decay [46]. Thus it is believed by many that there are varying risk factors that affect the progression of ECC. Commonly attributed to the prolonged breastfeeding or bottle use,[5] ECC posits that a higher risk of caries comes along with the use if the bottle at bedtime, though this is not the sole factor in caries development in early childhood. At suitable times, carious lesions are initiated and induced from various factors such as the interaction of cariogenic microorganisms, fermentable carbohydrates, and susceptible tooth surface. Nonetheless, however, these factors affecting the induction of carious lesions vary from population to population [24][47]. Holding that putting a child to sleep with a bottle and a high sugary diet are the strongest predictors of early childhood caries, there are many risk factors associated with ECC such as, but not limited to, high levels of *Streptococcus mutans*, and poor oral hygiene [24][3].Resultant from the interplay between bacteria that produce acid, and many host factors that include teeth and saliva, dental caries form overtime. It also results from an imbalance in the demineralization and remineralization between tooth minerals and oral microbial biofilms [48].

Because of the varying infant feeding practices which are the result of cultural, ethnic and socioeconomic factors, the comparison of different studies is difficult [49]. Folayan et al (2009) have found that "oral hygiene status was a significant risk factor for ECC" [36].

Swedish investigators (1997) revealed that MS concentration, the background of immigrants and the amount of candy consumed all act as predictors of caries development before 2.5 years of age [50]. Additional predictors for caries development as found by the investigators were the mother's level of education and the consumption by the children of beverages containing ample amounts of sugar. Whence all the aforementioned variables are present in the child at 1 year of age, the risk and the possibility of caries development was 87% [51]. Similarly, a Finnish study (2000) of 677 children between the ages of one and six and who attended one of 20 day-care centers found that there was an increase in MS with the consumption of sucrose snacks and it also found that with the regular use of fluoride tablets are MS reduced [52].An additional Finnish study (2012) demonstrated the best predictor of future development of caries in the 1.5 years following 19 months is there was visible plaque on the labial surfaces of maxillary incisors of children who averaged 19 months[53]. Owing the formation of caries to three primary individual factors, namely cariogenic substrate, cariogenic microorganisms, and a susceptible host, caries are considered as a multifactorial disease which is both contagious and infectious.

### 2.1.5 ECC and the host factors

#### *2.1.5 A. Teeth*

There are a number of factors that may affect tooth susceptibility to dental caries and these include: immunological factors, reduced saliva, immature enamel and defects of the tooth tissues.Tooth susceptibility to dental caries differs from one surface to another and from one subject to another. Several factors can play a major role in that such as: morphology of teeth,

vulnerable sites that favour plaque accumulation and stagnation [54] and the position of the tooth; these factors affect the predisposition tooth decay. The vulnerable sites for dental caries are enamel pits and fissures, approximal enamel smooth surfaces, cervical margins , exposed root surfaces due to gingival recession, deficient or over hanging restorations (recurrent caries). Furthermore, posterior teeth, as opposed to anterior teeth, are more likely to be affected by caries [54]. Teeth composition can also affect tooth predisposition to dental caries. Inorganic components (96% in enamel, 70% in dentine), organic elements and water are the main components that make up teeth; importantly, these components are mainly exaggerated by environmental features (water, diet and nutrition) [54]. The eruption of teeth into the mouth is accompanied by hypocalcified enamel. Over time and as the continuance of the process of enamel maturation, following tooth eruption, teeth are said to be less prone to decay. The enamel matures incorporating orally available ions together with fluoride. Therefore, susceptibly to caries directly after the eruption of the tooth is high until final maturation. Furthermore, enamel hypoplasia in young children has been projected as another affecting factor to caries in infancy [55].According to numerous cross-sectional and longitudinal studies, developmental defects of enamel (DDE) predispose individuals to the development of carious lesions due to the structural defects of the tooth surface, which facilitate the adhesion and colonization of cariogenic bacteria [47].

#### *2.1.5. B. Saliva*

Maintenance of ideal oral health and the creation of a proper ecologic balance are mainly achieved by saliva. Saliva affects caries aetiology through both the rate of secretion and composition (calcium and phosphate) and also by the buffering capacity and the cleansing action of oral microorganisms and food debris from the mouth [54]. The oral immune system (specific

and non-specific) in the saliva affects the cariogenic bacteria to a large degree [54].The functions of saliva include: lubrication and protection of oral tissues, buffering action and clearance, maintenance of tooth integrity, antibacterial activity, taste and digestion. Due to the fact that saliva is the only fluid in the mouth, the characteristics of the saliva and its composition have a direct impact on the oral environment. Saliva contains electrolytes such as sodium, potassium, calcium, magnesium, bicarbonate, phosphate, as well as, immunoglobulins, proteins, enzymes, mucins, urea, and ammonia [54]. As a direct impact on the oral environment, saliva affects the growth of cariogenic bacteria which reside in the mouth. These aforementioned components assist in the modulation of the bacteria attachment in oral plaque biofilm, they improve the pH and buffering capacity of saliva and they assist in the processes of remineralization and demineralization. These various qualities and characteristics are present in the saliva because of its components. Most worthy of note with regards to the functions of saliva is its pH and buffering capacity which eliminate excessive acidity or basic, therefore creating stability. Therefore cariogenic bacteria are likely to thrive when the pH of the mouth decreases (or becomes acidic) [56].Created by salivary glands when food is being thought of or when one is eating, stimulated saliva (SS) is an ideally mineral-rich and highly buffered solution. When all food is swallowed, this solution should act as a stabilizer for the pH of the biofilm [57].

Relatedly, Stephan (1940s) [21] has illustrated that the action of SS, in that it rinses the plaque, assists in the process of stabilizing plaque pH into a more basic, non-cariogenic value. When no eating, drinking, or thinking about such things occurs during periods of rest, the salivary glands produce unstimulated or resting saliva (RS) with 65% of RS produced by the submandibular glands. Since the submandibular glands produce less buffer, the pH of RS is usually lower than the SS. If the RS pH is too low (below 6.6), healthy biofilm can transform into cariogenicbiofilm [54].Therefore, saliva is very important in that it, based on the constituents of saliva, regulates

properties such as lubrication, while it also helps in ridding of unwanted substances, the breakdown of food substances, the neutralization of acids or bases, and in defense against demineralization [58].Due to its regular 'cleaning' function of the teeth as well as oral mucosa, the saliva, acts as a lubricant, a buffer and additionally as an ion reservoir for calcium and phosphate, both of which are necessarsy in the processes of remineralization of initial carious lesions [59].Saliva helps in regulating the balance between demineralization and remineralization in a cariogenic situation. The low pH in plaque can be inversed by the salivary buffering capacity, permitting oral clearance thus inhibiting demineralization of enamel. Flow rate and viscosity of saliva have a significant impact in caries development [58].

The parotid, sub maxillary, sublingual, and minor salivary glands vary in fluid secreted. Differing considerably from each other and owing to a complex composition, the various glands are affected in different ways by different factors such as type, intensity, and duration of stimulation, time of day, diet, age, sex, a variety of diseases, and many pharmacologic agents [54]. The compound nature of the factors involved in parameter of salivary configuration suggests why many of the early studies of saliva were conflicting and unclear. New studies using separately collected secretion directly from the glands, as wel as standardized stimulation and specific time of day should be more productive [60].

Theoretically, saliva can affect caries in four general ways [60]: less accumulation of plaque by mechanical cleansing, calcium, phosphate, and fluoride reducing enamel solubility, buffering and neutralizing the acids created by cariogenic organisms or hosted directly over diet, and by anti-bacterial action. Modification of existing views on the mechanism of caries would stimulate investigation into other properties of saliva, such as the role of salivary proteins in membrane phenomena and ion transport within the plaque [54].The strongest evidence relating to salivary

flow rate and caries is the broadly observed development of rapidly progressing, rampant caries in conditions in which there is a prominent impairment of salivary function [61]. Salivary pH is extremely variable. In the lack of exogenous stimulation the parotid secretion has been described as 5.5 + 0.014.18. With stimulation and the resultant quick increase in bicarbonate content, the pH in- creases rapidly to a mean of 7.4 + 0.5 [62]. In the submaxillary saliva the latent pH is somewhat higher, 6.4 ± 0.06, and increases to 7.1 -+- 0.3.18. In general, the pH is lower in the morning than in the afternoon, and is much higher after meals than before [63]. There are significant differences on individual-to-individual case and it is not shocking that there has been no potential to determine a significant association between saliva, pH, and caries [64]. Buffering capacity of the saliva against introduced acids is arguably more important than the salivary pH stabilizing functions [61]. The buffering ability is derived mainly from the carbonic acid-bicarbonate system, and to a lesser extent from phosphates and proteins. In several studies in caries-resistant individuals, saliva appears to possess a clear tendency towards higher buffering capacity in these individuals [24].Crucial in understanding how saliva is able to minimize acid challenges is the frequent use of chairside methods to check for saliva buffering capacities. Remineralization can take place when favorable conditions for mineral uptake are produced by a high salivary buffering capacity resulting in an elevation the surface pH of the enamel crystal [58].Clinicians would be assisted greatly in decisions pertaining to preventive or therapeutic interventions of the patient when the overall quality of saliva is determined – be it with regards to flow rate , viscosity, RS and SS pH, or buffering capacity[60]

### 2.1.6 Substrate (Fermentable Carbohydrates)

There are strong indications that suggest that sugards (such as sucrose, fructose and glucose) and other fermentable carbohydrates play a crucial role in the initiation and development of dental

caries [65]. The most significant cariogenic food is sucrose as it transforms non-cariogenic/anticariogenic foods to cariogenic forms. Sucrose decreases the levels of *S. sanguinis* and increases the proportions of *mutans streptococci* and *lactobacilli* [64]. Oral cleansing of carbohydrates is lowest throughout sleeping times, when salivary flow decreases and the interaction between plaque and substrates rises, favoring the progression of cariogenic species [4]. A healthy biofilm is thereby changed into a diseased one, consequently increasing demineralization [64].The previously mentioned term baby bottle tooth decay is often used interchangeably, or is synonymous, with ECC. This falls in line with the often practiced use of the bottle which contains sugary liquids, similar to breastfeeding; the correlation of the two highlights that dietary patterns play a role in cause the onset of the disease [66].

Children who oftentimes consume fruit juices and carbonated beverages have often been diagnosed with ECC [67]. Fruit juices are intrinsically acidic as they are naturally rich in sugar (fructose). Additionally, carbonated beverages may possibly have an acidic pH and a sugar sweetening formulas (commonly fructose). What is true about both fruit juices and carbonated drinks is that they both result in a significant decrease in plaque pH, which thereby initiates the carious process [25].

### 2.1.7 Milk and ECC

Milk can be human breast milk, cow's milk, or formula milk. As recommended by the WHO children should be breastfed until 24 months of age [68]. The prolonged exposure of teeth to daytime or nighttime breastfeeding, some argue, is associated with a risk of ECC[43]. Based on these reports, The American Dental Association (ADA) recommends that after the child's first birthday, the mother should wean from breastfeeding [19]. Regardless of these recommendations, Weerheijm and co-workers (2014) stated that there is no exact proper time to wean the baby

from breast feeding, as long as parents follow preventive actions, such as tooth brushing with fluoridated toothpaste and reducing the frequency of feedings [76]. The AAPD recommendation is that baby bottle use should not be extended beyond 1 year of age and elongated breast-feeding should be avoided. Additionally, saliva production declines significantly during sleeping hours, so any beverage or food in a baby's mouth during times of sleep will remain there for many hours; the presence of food and drink in the baby's mouth for this long time will thereby promote caries process and the development of caries [69]. Despite the many documented benefits of breastfeeding, such as it offers optimal infant nutrition, boosts the immune system and is economically beneficial for the family [52], there is conflicting evidence regarding the effects of breastfeeding on dental health. Some argue that prolonged breast-feeding carries a risk of developing dental caries or nursing caries [70] while at the same time numerous other epidemiological studies argue that dental caries decrease with breastfeeding [53]. The period of breast feeding is also debated. When consumption of breast milk is ad libitum and when there is frequent and nocturnal breastfeeding, breastfeeding is argued to increase the risk of ECC [71]. Regardless, however, the relationship between breastfeeding and ECC could not be established in many studies. Children three years old and below have the highest prevalence of ECC, this is due to incorrect nursing habits such as additional bottle-feeding and the use of a sweetened pacifier at night [72]. It has also been argued that bottle-feeding is cariogenic when children are allowed to sleep with a bottle in their mouth [23].Human milk might be more cariogenic than cow's milk. Human milk contains 7% lactose compared with 5% in cow's milk. The additional constituents in cow's milk overcome the harmful effects of lactose [73]. Human milk varies in composition from cow's milk in numerous important ways; for example, human milk contains lower protein content (1.2 g/100 ml versus 3.3 g/100 ml). Cow's milk contains significantly more calcium (114 vs 22.0 mg) and phosphorus (96 vs 9.8 mg/100 g). Even increasing the

concentration of lactose in cow's milk to 7% did not improve its capacity to demineralize plaque-covered enamel. It seems, therefore, that other factors such as casein content may account for the difference in the cariogenicity of the milk which resides for the most part in the mineral content [74][75]. Alpha-1 casein is a milk protein that is concentrated in the acquired pellicle, it adheres to saliva-coated hydroxyapatite and acts as an inhibitor of Mutans streptococci [76].Du and coworkers (2015) shed light upon the difference between breast-fed and bottle-fed children stating there is a higher risk of ECC for bottle-fed children compared to breast-fed children[20]. Milk-based formulas, despite some even having no sucrose, were found to be cariogenic in some studies. Relating to the earlier argument regarding prolonged bottle feeding and its association with high risks of ECC, nocturnal milk-bottle feeding is not the sole cause of ECC [2]. Associated with the use of baby bottles during the night, one witnesses a reduction in salivary flow, which leads to a decrease in salivary neutralization capacities; this pattern would cause food to accumulate around the tooth surfaces and elongated contact to fermentable carbohydrates [2].

Additionally, bottle feeding might cause ECC because the nipple does not allow the flow of saliva to the upper incisor. Furthermore, the lower incisors are adjacent to the main salivary glands and are secured from liquid substances by the bottle nipple and the tongue [77].A study by Roberts et al (2012) could not find any association between ECC and the type of feeding (bottle or breast), or the period of feeding [25]. Tsai and coworkers (2004) found that there was no relationship between night-time bottle use and caries, nor was a bottle containing a sugary drink recognized as a risk factor for caries [78]. The AAPD Guidelines recommend that at 6 months of age, the infant should be introduced to drink from cup, and bottle feeding should be actively discouraged after the age of 1 year [79].

### 2.1.8 Sugar and Dental Caries

The consumption of sweet foods, mainly between meals, can result in a continued drop in pH levels. Demineralization of the teeth occurs shortly thereafter due to the fact that there is no adequate time for the pH to return to normal levels [45].The decrease in pH levels which occurs during the fermentation of carbohydrates is a result of sucrose which promotes an increase in the proportions of *mutans streptococci* and *lactobacilli* and, simultaneously, a decrease in *S. sanguinis* proportions. What one can conclude from this is that acid production which is resultant from sucrose metabolism intrudes and interrupts the balance of the microbial community. This imbalance favors the growth of cariogenic species and by converting a health biofilm to a diseased one, the imbalance enhances demineralization. This suggests that sucrose may act as a typical fermentable carbohydrate foundation; however, in comparison with other carbohydrates, sucrose shows enhanced cariogenicity [80]. Furthermore, studies have found at an early age the prevalence of caries is linked to diets containing a high frequency of sugar consumption/snacking [80][81]. Children aged 2-10 years who consumed soft drinks often, as opposed to children with high water consumption patterns, were found to be 1.8 times more likely to experience dental caries [82].The absence of consistent results between dietary factors and caries is possibly due to the difficulty of assessing diet and the multifactorial nature of the disease process[65].

### 2.1.9 Starch and Dental Caries

The starch-caries matter is a compound problem, and remains significantly indistinguishable. It is often argued that food starches, the major nutritional carbohydrate consumed in modern societies[83], play only a negligible role in the development of dental caries. Whereas there exists an unquestionable link between sucrose and dental caries, there still remains much debate

regarding the relationship between between food starch and dental caries [65]. Not like sugars, starch must be hydrolyzed by amylase into sugars before it can be transported across the cell membranes of plaque micro-organism to be used [83].The current understanding of dental caries aetiology contemplates several precarious dietary cariogenic elements in which in depth evaluation of the starch-caries relationship is compulsory. These factors include: the frequency of contact of tooth surfaces to both sugars and starches, the availability of the starches, the nature of the microbial flora of dental plaque, the pH-lowering capability of dental plaque, and the current rate of salivary flow [84].Demonstrated by the study of caries in animals, treated food starches in modern human diets have a significant cariogenic potential. This potential is mainly associated with human plaque pH reaction, and enamel/dentine demineralization [89]. Their definite cariogenicity, however, is not available in studies in humans, as the available data does not provide strong evidence of definite cariogenicity [85]. Regardless of whether or not food starches appear to be principally caries inductive in the first condition, in the second condition the contribution to caries development is indeterminate and necessitates furhter explanation. It cannot be determined for sure whether or not there is a significant contribution by startches to the caries progression in modern human populations [86].

Less refined starchy foods which enhances the teeth's resistance against demineralization contain 'protective properties'. The fibrous content of these starches encourages individuals to chew more forcefully; and thus, rises the plaque pH. In addition, as phosphate is one of the main constituents of the enamel, organic phosphates present in less refined starches slow down dissolution of the enamel [65,87,88].

Results from an intra-oral demineralization test using enamel slabs [65,87,88] demonstrated that the cooked starch was completely hydrolyzed in 2 minutes, while raw starch required 30 minutes. Hence, the difference in demineralizing capacity is due to its rapid hydrolysis. This experiment

shows that uncooked starch is insignificantly cariogenic, whereas cooked starch significantly causes dental caries. However, the cariogenicity is still much lower than that of sucrose. Unrefined starches are less cariogenic as they are less rapidly hydrolyzed into sugars that are used by dental plaque than the refined starches, finely-ground starches and heat-treated starches[83].

### 2.1.10 Acquired Pellicle

The acquired pellicle is defined as "an acellular deposit of adsorbed salivary proteins and supplementary macromolecules on the dental enamel surface[89]."Macromolecules such as lysozyme, alpha-amylase, perioxidase, immunoglobulin A, immunoglobin G, glycosltransferase, proline-rich proteins, mucins, albumin are various components of dental pellicle . Furthermore, the breakdown of foodstuffs from both saliva and bacteria contribute in the pellicle matrix formation[89].The dental pellicle is made by preventing continuous deposition of calcium phosphate over a careful adsorption of negatively charged salivary glycoproteins. The pellicle permits the consequent union of micro-organisms, which form dental plaque[90].The adsorption of the main molecule film on a clean tooth surface is fast. The first degree of establishment of the dental pellicle is fast during the first hour, after which it declines. Differences in salivary flow and composition account for the variance in pellicle initiation[89]. The pellicle protects the enamel in contradiction to abrasion and attrition, and aids as a transmission barrier, so the main role of the pellicle is protective in nature. As the liquid layer in the pellicle is comparatively uninterrupted, molecule movement due to non-diffusion powers are inferior than in most parts of the salivary film, manipulating the soluble behavior of the enamel surface[90]. The formation of the dental pellicle is assisted by proline-rich proteins which are negatively charged and hence bind to the tooth surface. Other proteins are controlled in the

pellicle, such as alpha-amylase and statherin, which permit the adherence of more bacteria types to the pellicle. Definite receptors on the external surface of fimbria of bacteria such as *S. gordonii* and mutans *streptococci* are later capable to act together with the PRP proteins (proline-rich proteins) of the pellicle via a "lock and key" mechanism. Other gram-positive oral microbes such as S*treptococcus sanguis* are capable to attach to the negatively charged salivary glycoproteins bounded in the dental pellicle [(89)]. Gram-negative oral microbes such as *Fusobacterium nucleatum* then attach to the gram-positive microbes, developing dental plaque. Dental plaque is the first stage in the development of caries and is considered cariogenic in nature [(89)].

### 2.1.11 Acquisition and Microbial Succession of Oral Flora

The acquisition of cariogenic microorganisms advocates evidence that it is the first step in the development of ECC in children [(21)]. The main cariogenic microorganisms are streptococci, *mutans streptococci (MS), Streptococcu sobrinus and lactobacillus* [(21)]. These pathogens can colonize the tooth surface. The process of metabolism is begun by the bacteria that when combined with substances constituted of fermentable carbohydrate, produce acidic end products; this process eventually leads to the demineralization of tooth enamel, which hence causes dental caries[(19)].

If the mother harbors a reservoir of MS, it has been found that the MS may very well be transferred/transmitted to the child through saliva [(22)]. Although the precise method by which the transmission occurs is unknown, it is assumed that it is owed largely to the close contact of the mother and child [(34)].

Relatedly, the AAPD has reported unlike mothers with low levels of MS, mothers who have high levels of MS may put their infants and toddlers at an elevated risk for acquiring the organism [(91)].

There are many ways of transmitting *S. mutans* from the mother's mouth to the child's, such as by kissing or through the processes of 'cleaning' children's pacifiers or through tasting children's food or drink. Therefore, it is indeed essential and very crucial that mothers are aware and are knowledgeable about the transmissible nature of caries, so that it may be avoided [92].

### 2.1.12 Dental Plaque

The presence of visible plaque has been reported to be one of the risk factors of early childhood caries in children [60]. Variations in salivary pH are the result of the metabolic nature of bacteria residing in the biofilm. Acting on susceptible and vulnerable teeth, the organic acids produced by cariogenic plaque bacteria (which act in the fermentation of carbohydrates) results in the formation of caries [64]. The existence of or the absence of visible plaque has been a key factor in determining caries risk groups, as Alaluusua and Malmivirta (2002) have found that 91% of children subjects were correctly classified into caries risk groups, based on plaque visibility[91].

### 2.1.13 Cariogenic Micro-organisms

The main cariogenic microorganisms are the so-called *mutans streptococci*, particularly *Streptococcus mutans* and *Streptococcus sobrinus,* and *Lactobacillus*. These pathogens effectively inhabit tooth surfaces and lead to the production of acids. The disintegration of the tooth enamel takes place when the production of acid occurs at a faster rate than the processes of biofilm neutralization and also when in an environment below the ideal pH value (less than 5.5), [74]. The main microorganisms which are involved in the instigation of dental caries are MS and lactobacilli [93]. Lactobacilli are commonly associated with both disease advancement, as well as serving as an indication of fermentable carbohydrate contents [94]. Tooth demineralization in children is mainly the result of an exposure to a cariogenic diet as well as an early infection with

cariogenic bacteria. MS is four times higher in children who consume beverages having sucrose in their bottle than level of those who consumed milk from a baby bottle [95]. A child's dentine must be infected and colonized by *S mutans* in order for ECC to be caused; as such, poor feeding practices cannot be the cause of ECC. Studies have shown that children from the age of 6 months can be victim to the colonization by *S mutans* can and of their oral cavity [96]. The possibility of *S mutans* colonization appears to be higher in infants who drink sweetened beverages rather than milk from a bottle [98]. Bacterial infection is an essential factor for developing a clinical disease such as ECC. It is important to note that *S mutans* and lactobacilli may also appear in children's who are caries free [97].Substantial change in the plaque biofilm pH is resultant of bacteria that metabolize dietary fermentable carbohydrates (sugars and cooked starch) and subsequently produce acids that contribute to the formation of dental caries [98]. At rest, the pH of plaque biofilm is typically neutral. The breakdown of the structure of the tooth takes place when fermentable carbohydrates are ingested; when this occurs, the plaque biofilm pH drops undergoes a rapid decrease in order to create an acidic environment [98]. Repeated and continued acid disruption may lead to caries formation. Studies have shown that as opposed to their counterparts who are caries-free, children with S-ECC display significantly different microbiota which is characterized by lactobacilli comprising a large proportion of the biota. [99][100]. Lactobacilli are very important elements in the progression and the intensity of caries for the very fact of the high incidence of the Lactobacilli in caries lesions as well as Lactobacilli's capacity to produce a low pH environment and also persist in this environments [94].

### 2.1.14 Time

An increased risk of caries is also strongly related to recurrent acid attacks which do not give adequate time for teeth to recover. Small quantities of sugar and other fermentable carbohydrates

consumed frequently throughout the day, as opposed to in large quantities and occasionally, will lead to an increased risk of caries development. More important is the ability of sugar to be cleared quickly from the mouth rather than the amount of sugar consumed [101]. Sticky foods like breads or raisins remain in the oral cavity for a longer period of time, and increase the prospective for decay. Other choices such as calcium-rich foods like cheese, eaten straight after sugar, can help protect against demineralisation[17].

### 2.1.15 Periodontal Disease in Preschool children

Gingival disease is also one of the most important oral health issues that affect the quality of life of children [102]. Perhaps due to variations in bacterial composition of the dental plaque, alongside variations in hormone levels and cell response, epidemiological studies have shown an increase in gingivitis among individuals undergoing puberty, as opposed to those in preschool. [103]. In fact, pinpointing of a periodontal disease in the primary dentition is not likely and as such, young children who display "premature exfoliation, gross mobility of primary teeth or red, oedematous gingivae and/ or suppuration for which no other dental cause can be seen" should subsequently be referred for specialist advice. Since dental caries and gingival diseases are mostly induced by dental plaque, the prevention of plaque accumulation especially before the eruption of the permanent dentition, is necessary[104].

## 2. 2 CONTRIBUTING FACTORS TO CARIES IN PRE-SCHOOL CHILDREN

### 2.2.1 Parenting

Determining the oral health of children is highly influenced by the mothers; as primary care-givers, they have a lot of say in what the child eats and how s/he eats it. The lack of knowledge on part of the mother, and behaviors and beliefs that lead to poor feeding practices, poor oral hygiene maintenance, and failure to seek professional dental care appear to place a given child at a higher risk of developing caries that other children with more care. Furthermore, the belief that a child is not predisposed to caries or that primary teeth are not important are associated with early childhood caries (ECC) also appear to place a child at more risk of developing dental caries [(105)].Children are directly dependent on their parents for their health and access to health care as the parents are the decision makers [(12)]; more often than not, parents function as role models for their children, and therefore, the dental hygiene habits of the parents themselves have a very substantial impact on their children's oral hygiene practices. Other important factors influencing children's oral health are the parental cultural and moral interpretations. Therefore, in an effort to achieve the best oral health outcomes for children, parents should be considered as key persons to educate about the ideal dental hygiene practices such that the well-being of young children is ensured [(13)]. Tooth brushing habits, dietary habits, and nutritional choices of mothers are directly linked with those of their children. Therefore, an as agreed by many dental health professionals, improving the oral behavior and dental hygiene practices of parents, could consequently result in more favorable oral health for their children [(51)]. Besides the influence of parents, there exist other factors that may have an impact on children's health and hygiene habits [(15)]. Some of these factors include the level of education of the mother, her occupation, age, current knowledge,

attitudes, and behaviors towards health. These factors determine the decisions mothers make concerning the health of her child [106] . Interestingly, ECC is more prevalent in children belonging single-parent families as well as children with parents of low educational levels, particularly children of illiterate mothers [107].There is growing evidence that health promotion and education efforts must be targeted to specific audiences to influence preventive behaviors for children [16]. In order to establish an appropriate dental standard and maintain these standards throughout the adult life, it is essential to initiate basic and favorable oral health habits in the early infancy stages. It is essential to begin these habits with the family as it is the first institution that influences child behavior and development [6].

Infant oral health care should be identified as the basis upon which a lifetime of preventive practices and ideal dental hygiene and care can be built. In order to help assure optimal oral health in childhood, the AAPD suggests that prenatal oral health counselling for parents should be the foundation of the beginning of oral health care for children. This should be followed by an a dental visit at six months of age, and no later than 12 months, and following the eruption of the first primary tooth [18]. Milgrom (2012) highlighted that a mother's dental knowledge, behavior, as well as the general care of her child are various other factors that contribute to the risk of caries development [108].

### 2.2.2 Socio-economic Status and Dental Caries in Children

The socio-economic status of parents is seen to have an impact on the prevalence of dental caries in preschoolers. Social factors are unquestionably one of the strongest determinants of caries experience [106]. Furthermore, social differences were of prime concern to researchers rather than the measures of ethnicity [109]. Interestingly, there are links between an individual's socio-economic experience, particularly that of disadvantaged children, and negative health effects

[110]. For example, low birth weight which impacts oral health is usually seen in children born in low-income families. Alongside the fact that poor oral health may increase school absence, these children may struggle more in school. General health literacy is influenced by one's socio-economic status; and this, in turn, affects general health[109].

The children of low-income families often have their first visit to the dentist at a later age, they may go less regularly and only when are there are prominent dental issues and concerns. In addition, economically disadvantaged children begin brushing their teeth at a later stage in life and do so less frequently [110]. Moreover, there tend to exist greater and more serious dental problems with children living in poverty, those from specific ethnic minorities, and those with chronic health issues [111].Food insecurity, defined as, "inadequate access to food resulting in food shortages, interrupted eating patterns, and hunger" is also one of the most important and strongest determinants of caries in children with low socioeconomic status [112]. Greater prevalence of untreated caries is seen in children living in households with low to very low food security than children from fully food-secure households[112]. At an early age, socio-economic status plays a leading role in the development of dental caries [112]. A study in Manitoba, Canada (2011) looked at the prevalence and risk factors of ECC among preschoolers visiting public dental clinics. The study had found that low monthly family income, low level of parental education, irregular dental visits, and family structure were found to be strong risk indicators for dental caries among the study population[113]. In addition and interestingly, when the parental education is low, but the income is high, the risk of having ECC in children is higher than when both the parental education level and income are low [114].Employment, education and family income have been found, on multiple occasions, to have a significant impact on the existence of caries. Children belonging to families which have high incomes and an employed caregiver display a lower risk of caries development- this is true for lesions which are both cavitated and

non-cavitated. Additionally, children with caregivers who had obtained a high-school diploma at the minimum also had a lower prevalence of cavitated lesions [115].In the UAE, and especially in Abu Dhabi, although the family income of the population is high and dental services are free, the prevalence of caries is one of the highest in the world. This may be attributed to behavioural and cultural beliefs existing within the UAE. Al-Hosani and Rugg-Gunn [9] found that children with higher caries scores in Abu Dhabi come from higher income families. They justified this by arguing that high-sugar foods and drinks are readily available in shops and are being purchased and are willfully given to children by parents with a higher income.

Dental status has also been linked with deprivation [116]. Children living in deprived wards in Sheffield, England were one-and-a-half times more probable to have cases of decay as opposed to children from more well-off wards. Furthermore, as opposed to those children who are in more well-off wards, those children in deprived wards and whose teeth were decayed were likely untreated [117]. This study conducted in Leeds, England (2004) which sought to inspect the relationship between deprivation, ethnicity, and dental health and related behaviour in 2,677 5-year-old children, concluded that there exist differences between ethnic groups despite the overall finding that caries prevalence increased with higher levels of deprivation [118].

### 2.2.3 Parental Oral Health Knowledge and Attitudes

The positive attitude and knowledge of parents regarding good dental care are very important in the preventive cycle. Parent's knowledge and beliefs have a direct influence in young children's oral health maintenance and consequences, as it may directly affect the oral hygiene and healthy eating habits; as such, better oral health for children is associated with positive parents attitude towards dentistry [119] .Because of the fact that young children spend a lot of time with their

mothers and it is usually the mother who takes care of the child's dental health, the mother's level of education, her knowledge of oral health and fatalistic health beliefs are other important risk indicators/factors in caries development [108].Parental attitude towards the significance of oral hygiene plays an important and crucial role in the preservation of healthy children's teeth. A healthy lifestyle which increases self-confidence and helps with habit formation are necessary for upholding ideal hygiene habits and are usually created by the family [21]. Children's oral hygiene habits and the existence of oral diseases is mainly associated with the parental skills and attitudes towards oral hygiene. The parent/caregiver, usually the mother, has a critical role in the adoption of protective healthcare behaviors and as previously determined, parental feeding practices strongly influence children's eating behaviors [120]. Studies have shown a recurrent connection between low parental education and low family income and the effect of this on children's oral health [110]. In cases of low parental education, irregular dental visits are common and prominent tooth issues, or even toothaches, are the main driving force in seeking dental care. This is true in most cases as parents do not take the initiative to ensure their children receive regular dental care and check-ups in first years of life and in the formative stages. [121].

### 2.2.4 Oral Hygiene and Dental Caries in Pre-school Children

Many studies have found that it is during the preschool years that the primary socialization begins, and the school is where many health-related behaviours are be established [16]. Good oral management of the preschooler results in a motivated patient, happy to accept treatment, whilst encouraging confidence and improving the attitude of other family members with regards to oral health [109]. A field study evaluating a new strategy of dental care for preschoolers found that good oral health of the children may be economically beneficial for society. Equipped with

an organized public dental service and a systematic approach to dental care, these dental service facilities assist children and their families in early primary prevention (before the onset of caries attack) [43].

### 2.2.5 Frequency of Tooth Brushing

Reported frequency of tooth brushing was strongly related to caries experience in a three year clinical trial of 12 year old children. As opposed to those who reported brushing less than once per day, the caries increment was 20% lower in participants who reported brushing more than once a day. The overall frequency of the brushing and the rinsing method accounted for over 50% of the differences in caries increment between the two groups[91]. Furthermore, in a systematic review (2012) of fluoride toothpaste, it was shown that the effect of the fluoridated toothpaste, accompanied with twice a day brushing, lead to a 14% increase in caries prevention [82]. Moreover, a cross-sectional study of 7 year old Flemish (2002) children conducting less than once-a-day brushing were are a higher risk of decay and of varies development [122]. The NHS toolkit recommends at least two minutes of teeth-brushing, twice daily: once in the morning and once at night, with no eating or drinking afterwards[123] .

### 2.2.6 Fluoride-containing Toothpaste

Several systematic reviews have demonstrated that use of fluoridated toothpaste decreased the development of new dental caries. This effect increases with increased concentration of fluoride[124]. During the initial tooth development phase, whence there is an increase in fluoride exposure, whether through water, beverages, food, salt, fluoride supplements or dental products, a positive effect is documented in the teeth [101]. One meta-analysis (2003) (70 studies, n=42,300 participants) observed a significant reduction in caries with the use of fluoride toothpaste

compared with non-fluoride toothpaste or no toothpaste at all [125]. Another meta-analysis (2009) showed that use of standard concentration (1,000–1,500 ppmF) fluoride toothpaste reduced caries in primary teeth compared to placebo or no intervention (dmfs PF 31%, 95% CI 18 to 43%) [125]. These studies were conducted in China and it should be noted that the prevalence of dental caries in preschoolers is high in China. It is known that absolute benefit of fluoride toothpaste increases as baseline caries increases, thus this finding should be interpreted with caution when considering other populations [125] .

After being met with much conflict regarding low fluoride toothpaste and the extent to which it prevents caries in preschool children as well as the and the risk/benefit of early use of fluoride toothpaste, the Prevention and Management of Dental Caries in Children (Scottish Dental Clinical Effectiveness Programme-SDCEP) guideline has suggested that the use of the accurate amount of toothpaste with age appropriate fluoride concentration as follows: "under 3 years old use a small smear of paste containing not less than 1000 fluoride ppm, 3-6 inclusive: a pea size amount of paste containing not less than 1000 fluoride ppm , 7 years old and over tooth paste containing 1350-1500 ppm fluoride" [124]. This is confirmed and echoed by the NHStoolkit [123],[125]. In a recent study, Nazzal et al. (2016) confirmed the above recommendations of using toothpastes with >1000 ppm F concentration in children with an increased caries risk in addition to spitting excess toothpaste with no rinsing following brushing[126].

### 2.2.7 Age of Starting Tooth Brushing

In most of countries, there is agreement between pediatricians and dentists tooth-brushing, fluoride included, must commence with the eruption of the first tooth [121][127] [128]. It has been demonstrated that the younger the children are when they start tooth brushing the lower the

percentage of developing tooth decay[129]. One particular study found that 88% of children remained caries free, those of which began brushing at one year of age. This percentage of caries-free children decreased as the age of when these children began brushing their teeth increased: 81% of those who began brushing between 1-2 years of age and 66% of those who started tooth brushing after the age of two years were caries-free [125]. It is important to administer the correct dosages of fluoridated toothpaste, as the use of it has sometimes been associated with an increased risk of fluorosis, particularly when used during the first two years of life [130].

### 2.2.8 Responsibility for Tooth Brushing

It is recognized that young children (under the age of 7) should be supervised by an adult when brushing their teeth. [130] To ensure that the correct amount of toothpaste is dispensed, parents should oversee the tooth brushing process; they should also ensure that the child does not swallow the toothpaste and that the teeth are cleaned correctly [130]. Regardless of the importance of parental supervision, there are no empirical studies that have tested the effect of parental supervision of home brushing. However, two systematic reviews found that in preventing caries, supervised tooth brushing in a school setting is more effective than unsupervised tooth brushing [130]. Nonetheless, the term "supervision" was not clearly defined and there appeared to be a variety of interpretations of the term [125]. Some argued that supervision entailed the presence of an adult to guarantee that brushing has taken place while other advocate for the close monitoring of dental hygiene techniques of children and by guardians [125]. Age, manual dexterity or the impact of supervision on brushing technique variables was not considered in any of the reviewed studies. As neither supervision nor tooth brushing were terms which had a standardized interpretation, references to supervised tooth brushing within the research may be best

considered to simply signify an episode of exposure to fluoride toothpaste [125]. The manual dexterity is not yet well developed in children aged between 2 to 5 years old, and as such it is difficult, if not impossible, for these children to maintain acceptable oral hygiene [131]. Thus, parents/caregivers should supervise, on a daily basis, the oral hygiene habits and practices and must ensure that these practices are implemented regularly [47].

A systematic review (2012) which included 12 studies found that children who participated in supervised tooth brushing programmes showed a less risk of developing caries than those with unsupervised interventions both when compared to placebo (31.0% vs. 23.3%) and other fluoride containing controls (12.0% vs. 3.9%). There was also strong evidence that supervised brushing with fluoride-containing toothpaste had a superior caries preventive effects over non-supervised brushing[125]. Four years after the completion of a 30-month long trial (2011) of supervised tooth brushing with 1000ppm fluoride toothpaste at school, the prolonged and long-lasting benefits of intervention were demonstrated as the group with partook in intervention still had significantly less caries that those who did not partake in intervention [125].There is evidence from two Cochrane systematic reviews (2011) that supervised tooth brushing is associated with a reduction in the incidence of caries development. Meta-regression of relevant covariates in one of the reviews indicated that supervised brushing resulted in a statistically significant 10% greater PF (95% CI 4% to 17%) than unsupervised brushing[125]. In the second review, meta-regression of indirect comparisons suggested that the effect of self–applied supervised use of topical fluoride therapy (mostly toothpaste) was 11% (95% CI 3.7% to 17%) greater than that of operator-applied and unsupervised home use of such therapies [125].

## 2.3. PREVENTION OF ECC

Children's oral health may have a significant impact in their day to day practices such as eating, playing, and sleeping. Children's oral health is also related to the overall health and well-being of a child [66]. The existence of ECC affects the quality of life of a child because of its great impact it has on the child, his/her family, and the community at large [110].

Reducing the pathological factors or enhancing protective aspects can have a major role on prevention, intervention, and reversal of dental caries [111]. Preventative measures against formation of tooth decay can be achieved by using products containing fluoride, daily brushing and flossing, as well as proper dietary choices [132]. Providing dental care to pregnant women and women of childbearing age is critical [24]. Improper awareness of pregnant women regarding dental caries and overall dental health may be unfavorable toward preventive dental attitudes and practices; as such, the "fight" against ECC should commence in the pre- and perinatal period, to ensure maximum benefit and dental safety [21]. This will help in providing better oral health environments for the mother and will delay the initial transmission of the cariogenic bacteria from the mother to the child [24]. Providing sweetened beverages in cups to children, or feeding infants with biscuits or sweets, and other practices that cause ECC, are considered inappropriate feeding practices and are mainly related to improper parenting[46]. Prevention should therefore be include educational programs to enhance infant's feeding practices in order to reduce levels of *Mutans Streptococci* infection [30]. There are many other preventive measures that can be beneficial during this period. Topically or systemically applied fluoride has been regarded as having a great impact on caries reduction [133]. The most common method of systematically applied fluoride is drinking fluoridated water, which is efficient in reducing the severity of dental decay and the prevalence of caries. In its deficiency, other modalities such as the administration

of salt fluoridation or fluoride supplements (beverages, tablets, drops) should be consumed [29]. A supervised and regular use of fluoride mouth rinse and rinsing at certain times has been also associated with a decrease in caries increment in children [21]. Children who have received four or more fluoride varnish treatments, over a course of 2 years, showed a reduction of 35% in caries formation. Application or consumption of the fluoride varnish should start in infancy and take place before the initiation and progression of ECC [111].A positive effect of fluoride varnish on caries prevention was identified in 22 trials in one of the largest and most recent systematic review (2013) [125]. A meta-analysis of the effects of fluoride varnish on permanent teeth (13 trials) reported a pooled DMFS prevented fraction of 43% (95% CI 30% to 57%) compared with placebo or no treatment. Substantial heterogeneity was recorded (I2=75%). The effect of fluoride varnish on primary teeth (10 trials) was also statistically significant with a pooled *dmfs* prevented fraction of 37% (95% CI24% to 51%). Some heterogeneity was also noted in this analysis (I2 =59%) [125] .

### 2.3.1 Preventive Approaches

In planning preventative approaches to decrease and limit dental caries, the recommendations and intervention should either be directed to the whole population or to a subgroups of the population of specific individuals (e.g. those at high risk). The principles of oral health promotion – defined as "the process of enabling people to increase control over and to improve their health" – should lead to practical preventative methods [130]. Health promotion involves activities directed at specific health concerns, many of which are out of the individual control. Caries preventive approaches operate at the individual level with the exception of water fluoridation, which affects the community as a whole [130].Key in the prevention or controlling of

oral disease is the, also known as oral biofilm plaque control, practice of the daily removal of as much bacteria from the teeth, tongue, and adjacent oral tissues as possible [98]. Mechanical removal of oral biofilm through tooth brushing and flossing are the most widely accepted means of plaque control [98]. As plaque biofilm is a negative contributor to the formation of dental caries, plaque needs to be removed on a daily basis to prevent caries formation [123]. It is critical to complement daily brushing with flossing since toothbrush bristles are not effective interproximally. It was demonstrated by many studies that flossing reduces plaque biofilm, bleeding, and gingivitis. Moreover, it is generally accepted that the reduction in the incidence of interproximal tooth plaque is accomplished by flossing [98]. In two trials conducted in the UK (2006) among a subgroup of children, analysis found that there was a 40% reduction in caries in children aged five to six years who practiced flossing. Fluoride exposure was not reported and as such anticipated that participants had relatively low exposure to fluoride and poor oral hygiene [125].Fissure sealants are important preventative measures. A Cochrane systematic review of 16 trials found that first permanent molar teeth sealed with resin-based sealant had 78% less caries on occlusal surfaces after 2 years and 60% less after 4–4.5 years compared to unsealed molars. The researchers concluded that for children with a high risk of caries, the effectiveness of sealants was obvious; however, information on the effectiveness of sealants at different levels of caries risk was lacking in the study [130]. Dietary control is an important preventative measure. too. As previously demonstrated, dental caries is related and is caused from, alongside other factors, the frequent consumption of food and drinks containing fermentable carbohydrates [86]. The food pyramid is designed to encourage a healthy diet and it seeks to assist people in eating a balanced diet consisting of different types of foods and in the correct amounts[130]. A major concern about current dietary practices is the overconsumption and over-reliance on foods high in sugar and fats; not only is this dangerous for dental health but is also a risk factor for diabetes

and heart disease. The recommendations by the Oral Health Promotion Health Needs Assessment (2014)[118] is that the amount of sugar consumed and the rate at which it is consumed should change. The consumption of sugary foods should be limited to mealtime foods and drinks and added sugars should be restricted to a maximum of four times a day. It is crucial that dietary advice also underscore the risks of a highly acidic as well as a highly sugary foods. Advice can include: drink acidic products and fizzy drinks with a meal, drink fast and without holding in or 'swishing' the beverage around your mouth, or use a straw, complete the meal with cheese or milk as it will help eliminate the acid[130]. Advice should also highlight that milk and water can counterbalance the acid consumption of food and drinks.

### 2.3.2 Community-based Measures

Water fluoridation at the level of 0.7-1.2 mg fluoride ion/L (ppm F) was introduced in the US in the 1940s [40]. Studies show that fluoridated drinking water is important in the prevention of caries [92]. The fluoridation of community drinking water is the most reasonable and profitable method of delivering fluoride to all members in community [134]. The rationale behind the fluoridation of community drinking water is to balance, on one hand, reducing the cases of fluorosis and on the other hand, preventing dental caries. The Department of Health and Human Services in the USA has recently recommended to limit the fluoride in the water to the lower limit of 0.7 ppm F [135].Drinking fluoridated water has been considered as the most common way in which to apply fluoride as it has shown to be the most effective in reducing the intensity and the prevalence of dental caries in entire populations[44]. Children living in a fluoridated area have less risk and less prevalence of caries by 50% more than those a non-flouridated area [82].

Among all endogenous and exogenous methods of fluoride application, the most effective method is water fluoridation. Its crucial nature in the prevention of caries is well established [64]. For example, preschoolers in Ireland have showed a mean dmft of (0.9); this may be a result of the regular fluoridation of their drinking water [44].

### 2.3.3 Oral Health Education

Early intervention towards appropriate dietary and hygiene practices and habits could have a significant impact on the oral health of children and may result in the reduction and decrease of the incidence of ECC [16]. Children's oral health promotion programs have a direct effect on health behavior of families; it teaches families to provide the appropriate preventive measures in eliminating the risk of caries. Mothers who join these programs demonstrated a greater compliance with the recommended use of fluoride toothpaste and in fact began tooth brushing habits with their children at younger age than parents who did not get counseling [16][136]. Kowash et al.(2000) has reported a successful community-based initiative possible through home visits to mothers of children who are at a high risk of caries in Leeds, UK [137].A study in remote Aboriginal communities of Australia (2010) was conducted in order to evaluate dental health programme therein, focusing on oral health promotion activities at a community level. The study demonstrated that children of parents who received correct tooth brushing demonstrations alongside instructions about sugar consumption and the use of fluoride-containing toothpaste had a significantly lower caries increment [138]. Thus, there is respectable evidence that preventive and oral health education approaches are more effective and result in decreasing a later risk of caries development in children. [139].

### 2.3.4 Consequences of ECC

Untreated dental caries may result in dental pain that disturbs children's regular activities, such as eating, talking, sleeping, and playing [24]. Children who experience caries early in life and on primary dentition are at greater risk of developing further carious lesions in their permanent dentition[45], as a consequence this can result on the loss of the child's front teeth at an early age. Because of this and due to the fact that these years are critical for speech development, it is likely that the child may be challenged with further developmental delays relating to speech pronunciation [64]. Children affected by ECC may also experience various delays in physical development such as in height and weight [37]. The painful consequence of ECC may very well result in a loss of appetite, eventually causing malnutrition. Moreover, when extraction is required psychological trauma from dental procedures can have a direct impact in the child. Furthermore, teasing by siblings, peers, and even family members may lead to poor self-esteem [24]. An unlucky pattern occurs when the number of untreated caries are plenty and when there exist hurdles in the path to obtaining appropriate treatment. Because of the lack of treatment, a child's situation worsens and treatment becomes more troublesome [140]. The risk of developing new lesions in the future can be reduced by the early diagnosis and treatment of the carious lesion. Many studies show that when caries go untreated, the risk for developing new carious lesions is five times higher [141]. In general it can be determined that ECC is not self-limiting. If it is not treated in the correct time, the status of the caries and the teeth worsen and it becomes more challenging to manage, thus, raising the cost of treatment [64].

## 2.4 ATTEMPTS TO SOLVE THE PROBLEM OF ECC IN THE UAE

Regardless of the multiple efforts to reduce dental caries in the UAE, as previously mentioned, the *dmft* score of children in the UAE remains high and far from the goal of the WHO. The most extensive preventive oral health programme in the UAE was recommended in 1995-96 by WHO consultants. The prevalence of dental caries in the UAE continued to rise and the greatest carious lesions in children remained untreated. Few preventive measures had been taken and therefore in response to this, the WHO established this programme centered on decreasing the prevalence of caries. The Emirate of Sharjah had the major and most comprehensive programme; the programmed consisted of the fundamentals elements necessary for a successful prevention of caries. It entailed conducting daily oral health educational and tooth brushing sessions, television programmes discussing oral health and its importance, as well as newspaper cartoons and booklets on dental health distributed to all schools in Sharjah [(142)]. They mainly concentrated on healthy dental care practices such as tooth-brushing and the centrality of fluoride in a healthy dentine. This progamme initiated by the WHO illicited the start a number of other programmes and projects which varied in their scale and focus, each relevant to a specific emirate and conducted by some dental schools [(143)].

## 2.5 AIMS

The purpose of this quantitative study with descriptive design was to assess the knowledge, attitude and practices of mothers towards their children's oral health and relate this knowledge, attitude and practices to age, educational level and occupation.

### 2. 5.1 General

To assess the knowledge, attitude and practices of mothers toward their children's oral health in Sharjah (UAE).

### 2.5.2 Specific

1. Relate knowledge, attitude and practices to age, educational level and educational status of parents.
2. Highlighting the crucial role of parents in helping their children to develop healthy oral habits early in life.
3. Emphasize in the importance of developing appropriate prevention dental programmes for children in this area.

# 3.0 MATERIALS AND METHODS

## 3.1 Study Design, Location and Population

A cross-sectional study was conducted among UAE citizens. Mothers of preschool children who visited Sharjah Dental Center (SDC) from November 1st 2015 to February 29th 2016 were surveyed. SDC is considered the only specialized paediatric dentistry referral center in Sharjah and the Northern Emirates of the UAE (Sharjah, Ajman, AlFujairah, Ras al-khaima and Umm al Quwain). All general dental practitioners (GDPs) working in the primary health care centers of the Ministry of Health (MOH) refer paediatric patients to this center. Thus, the population of mothers visiting this center would be representative of the all mothers in the general population of the northern emirates of the UAE.. Initial attempts to obtain a random sample of mothers from randomly selected primary healthcare centers of MOH in the Northern Emirates was unsuccessful due to logistical and access issues.

Ethical approval was obtained from HBMCDM Research Ethics Committee and consent was obtained from participants. A pilot study was conducted to validate the questionnaire among 30 mothers visiting HBMCDM paediatric dentistry clinics. These questionnaires were not included in the final analysis.

Questionnaires were distributed to mothers bringing their children to the Pediatric Dentists in the SDC. The mothers of regularly scheduled paediatric dental patients at the center were invited to participate in the study upon arrival at the dental clinic. All questionnaires were administered by direct interviewing to avoid leading questions. Mothers were given the choice to skip any

questions they did not want to answer. No names or other identifying information was collected, the questionnaire was completely anonymous.

## 3.3 Sample Size

Cochrane's sample size calculation was used. A survey concept was used by assuming, the probability of having knowledge is 50%, hence based on this and looking for error not to exceed 4%. Where P is 50% , q is (1 – p) , B is the width of the 95% confidence interval and Z is the quartile of 95% confidence interval which equal to 1.96. According to the above power calculation, the suggested number of mothers completing the survey for this study was 400 mothers It was thought to distribute 620 questionnaires assuming a 20% non-response to obtain the desirable number of participants.

## 3.4 Inclusion and Exclusion Criteria

### 3.3.1 Inclusion Criteria

All mothers of preschool children visiting the pediatric dentist in the Sharjah Dental Center (SDC).

### 3.3.2 Exclusion Criteria

Mothers who do not wish to take part in the study.

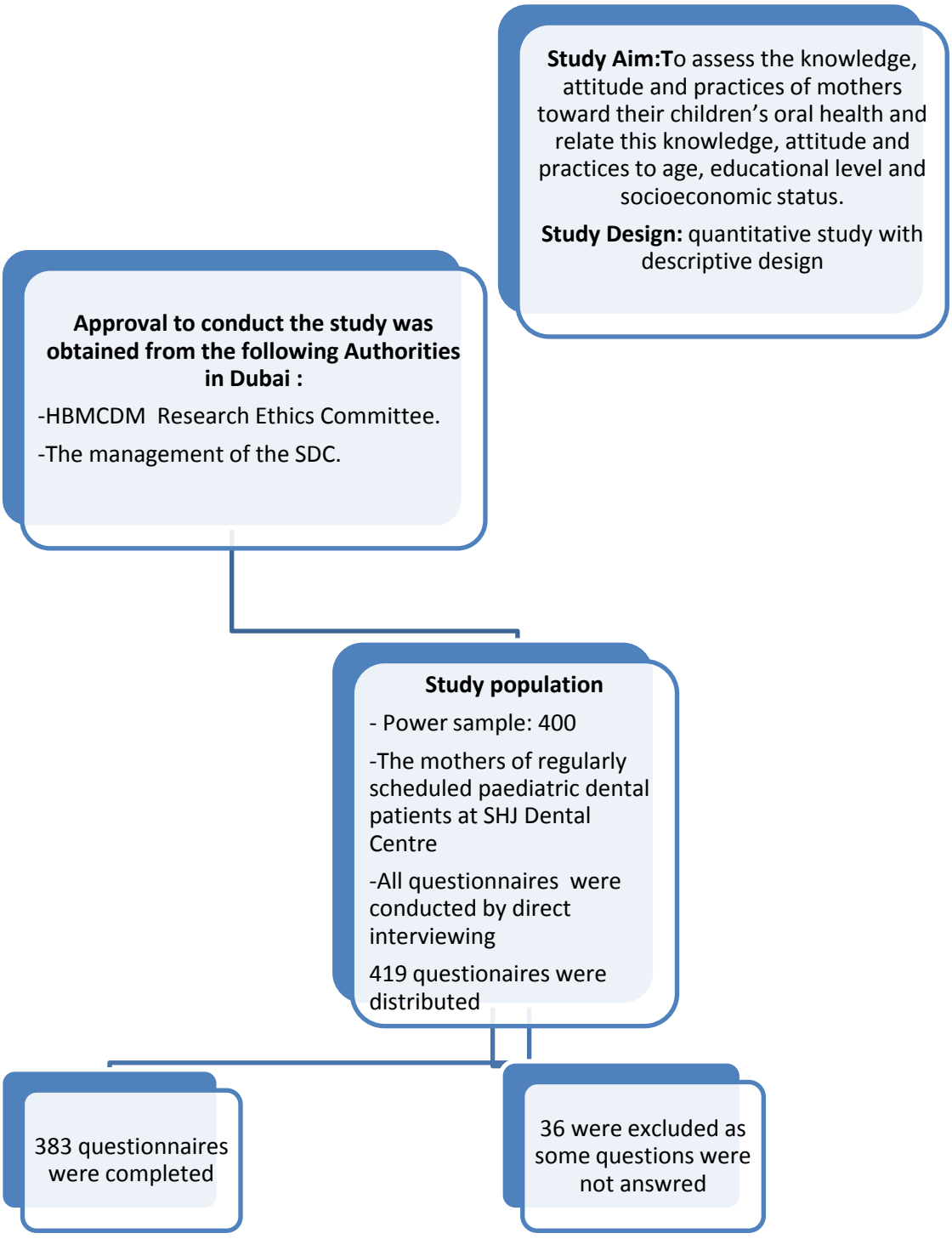
## 3.5 Questionnaire and Data Collection

The questionnaire used in this study was a modified structured one adopted from the questionnaire tested and used by Jain et al. in 2014 (1). The English version was translated to

Arabic language. The Arabic version was back-translated into English by another person fluent in both Arabic and English. The back-translated version was compared with the English version to verify that the questions were properly translated. A pilot study was conducted to validate the questionnaire among 30 mothers visiting HBMCDM paediatric dentistry clinics. These questionnaires were not included in the final analysis. Consent was signed by mothers before completing the questionnaire.

The first part of the questionnaire consisted of demographical information such as the age, gender of the child, parents' age, education and occupation. The second part consisted of 21 questions related to knowledge, attitude, and practices toward children's oral health. Ten questions were related to knowledge, five were related to attitude and six were related to practices. The responses for the attitude questions used the Likert scale and rated as (1) agree, (2) uncertain or (3) disagree.

The questionnaire was conducted by direct interview by a group of 4 trained general dental practitioners (GDPs) in SDC in addition to the primary investigator. A meeting was conducted with the assigned GDPs in order to explain the point of the questionnaire and the process of filling it precisely. At the end, all GDPs were calibrated and standardized by an expert paediatric dentist. Kappa statistics were calculated and an inter-examiner agreement of 80% was achieved between all direct interviewers.




A summary flow chart of study methodology is presented in Figure 1

## 3.6 Statistical Analysis

Data were entered in the computer using SPSS for Windows version 20.0 (SPSS Inc., Chicago, IL). Results were cross-tabulated to examine the independency between variables. Statistical analysis was performed using $X^2$(Chi square) or Fisher's exact test as appropriate.to test for association Where two or more continuous independent variables were examined, t-test and analysis of variance were used. An ANOVA frequency tables' bar and lines graphs were performed as descriptive statistics. Logistic regression was used to explain factors of knowledge. A p-value of less than 0.05 was considered significant in all statistical analysis. There were ten questions evaluating the knowledge of participant and the score of knowledge was calculated for each of them, a cutoff point was considered on function of the accumulation of the score of participant by plotting the data on a normal distribution curve, this was applied also to both practice and attitude.

## 3. 7 Ethical Considerations

This study was conducted in full conformance with the principles of the "Declaration of Helsinki", Good Clinical Practice (GCP), and within the laws and regulations of the UAE/Dubai Healthcare City. The ethical approval was obtained from the Research Ethics Committee at the Hamdan Bin Mohammed College of Dental Medicine, Mohammed Bin Rashid University.

# 4.0 RESULTS

## 4.1. Study Sample Characteristics

**Table 1: Demographic characteristics, educational level and occupation of the parents:**

| **Mother's Education** | **No. (%)** |
|---|---|
| **Illiterate** | 33 (8.6) |
| **Primary** | 22 (5.7) |
| **Secondary** | 120 (31.3) |
| **University** | 208 (54.3) |
| **Mother's Occupation** | |
| **Unemployed** | 179 (46.5) |
| **Student** | 33 (8.6) |
| **Business** | 46 (8.6) |
| **Employee** | 125 (32.6) |
| **Father's Education** | |
| **Illiterate** | 20 (5.2) |
| **Primary** | 22 (5.7) |
| **Secondary** | 166 (43.3) |
| **University** | 175 (45.7) |
| **Father's Occupation** | |
| **Unemployed** | 5 (1.3) |
| **Business** | 60 (15.7) |
| **Employee** | 318 (83) |

The characteristics of the 383 mothers of preschool children who participated in the study are summarized in Table 1. Children had an average age of 3.49 (1.63), average age of the mothers was 36.61 (7.86) and the average age of the fathers was 43.0.4 (7.69). For the mothers' education, 33 (8.6%) were illiterate, 22 (5.7%) had primary education, 120 (31.1%) had secondary education and the majority of the mother 208 (54.3%) had university education or higher. Regarding mothers' occupation, the data revealed that 179 (46.5%) were House-wives 33 (8.6%) were students, 46 (8.6%) had their own business and 125 (32.5%) were employees. Only

20 (5.2%) of fathers were illiterate, 22 (5.7%) completed their primary education, 166 (43.3%) had secondary education and 175 (45.75) completed their university qualification. As for the fathers' occupation only 5 (1.3) were unemployed, 60 (15.7%) managed their own businesses and the majority 318 (83%) were employees.

## 4.2 Overall knowledge, attitude and practice

Ten questions were asked covering knowledge and attitude. A summary of the questions and results of the answers of the mothers to each question are presented in Table 2.

| Items | No. (%) | Items | No. (%) |
|---|---|---|---|
| **How many teeth are there in a child's mouth** | | **Causes for gum disease?** | |
| 10 | 29 (7.6) | Improper brushing | 109(28.5) |
| 12 | 55 (14.4) | Tatar | 68(17.8) |
| 20 | 85 (22.2) | All of the above | 191(49.9) |
| 28 | 32 (8.4) | I don't know | 15(3.9) |
| I don't know | 182 (47.5) | **Which of the following do you think prevents the gum disease?** | |
| **Does the tooth paste contain fluoride?** | | Regular brushing | 89(23.2) |
| Yes | 215 (56.1) | Professional cleaning | 64(16.7) |
| No | 51 (13.3) | All of the above | 198(51.7) |
| I don't know | 117(30.5) | I don't know | 32(8.4) |
| **What is the role of fluoride in the tooth paste?** | | **Which of the following can lead to irregular teeth?** | |
| Prevent tooth decay | 198(51.7) | Thumb sucking/tongue thrusting/mouth breathing | 182 (47.5) |
| Prevents gum problems | 42(11.0) | Runs in family | 25(6.5) |
| Gives freshens | 5(1.3) | All of the above | 153(39.9) |
| I don't know | 138(36.0) | I don't know | 23(6.0) |
| **What is the most common dental disease in the child?** | | **Can irregular placed teeth be aligned in the correct position**? | |
| Tooth decay | 282 (73.6) | Yes | 290(75.7) |
| Bleeding gum | 0 | No | 25(6.5) |

| | | | |
|---|---|---|---|
| Discolored tooth | 48(12.5) | I don't know | 68(17.8) |
| I don't know | 53(13.8) | **Which of the following do you thing prevents tooth decay?** | |
| **Which of the following tooth items can lead to tooth decay?** | | Restricting sweets | 87(22.7) |
| Chocolates | 144(37.6) | Tooth brushing | 5(1.3) |
| Bakery products | 100(26.1) | Regular dental visits | 31(8.1) |
| Soft drinks | 136(35.5) | Fluoridated tooth paste | 23(6.0) |
| All of the above | 3(0.8) | All of the above | 237(61.9) |
| I don’t know | 0 | | |

To evaluate the overall responses of the mothers, a scoring system was established; scores were based on the number of correct / favourable answers given by mothers as described in the methodology section. The average score of knowledge was found to be 4.97 (SD = 1.89) and according to this scale, adequate knowledge was found among 223 (58.2%), and poor knowledge was found among 160 (41.8%).

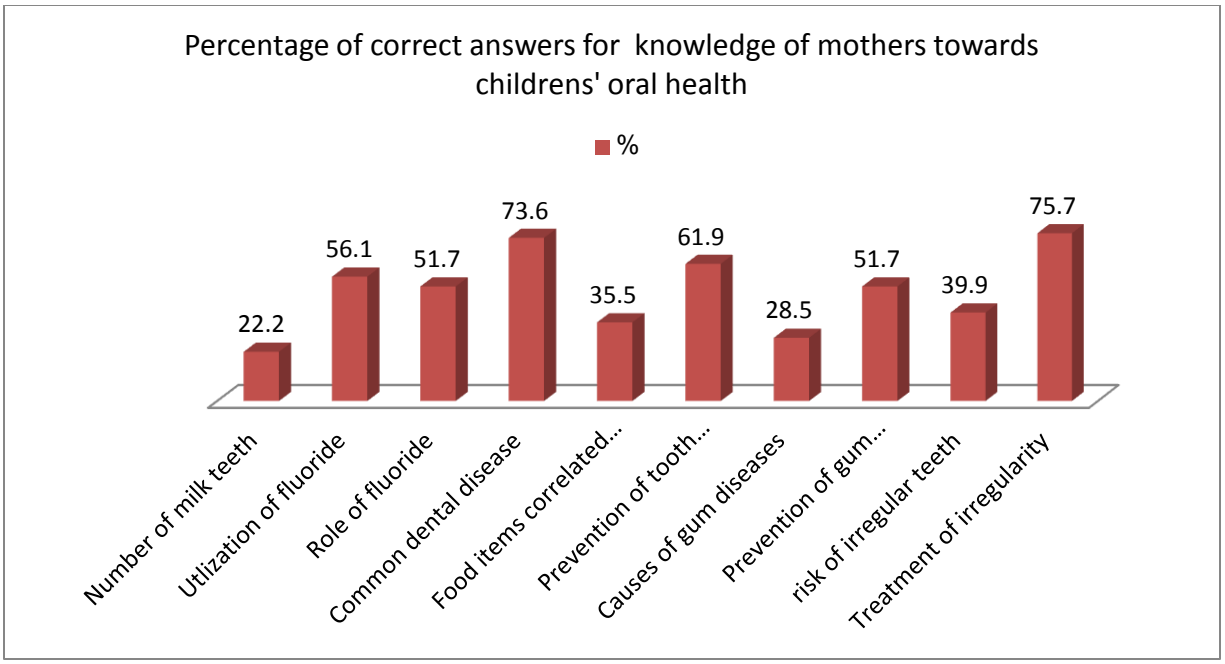



Figure 2. Percentage of correct answers for knowledge of mothers towards children oral health

The answers were given a rank according to the percentage of correct replies. Treatment of malocclusion and common dental problems ranked the highest scoring 295 (75.7%) and 282 ( 73.6%) respectively. The answers given for the number of milk teeth and causes of gum diseases ranked the least scoring 85 (22.2%) and 109 (28.5%) respectively.

### 4.1.3 Mothers' Practices

Table 3: Distribution of Practice items among mothers

| **When was the child's fist dental visit?** | **No (%)** |
|---|---|
| **6 months after birth** | 8 (2.1) |
| **After eruption of first milk tooth** | 87(22.7) |
| **1 year after birth** | 133 (34.7) |
| **Not yet visited** | 155 (40.5) |
| **When do you take your child to visit the dentist?** | |
| **Only during problem** | 152(39.7) |
| **Every 6 months** | 169(44.1) |
| **Every year** | 43(11.2) |
| **Not regular** | 19(5.0) |
| **When did you commence the cleaning of your child's teeth?** | |
| **Soon after first milk tooth eruption** | 75(19.6) |
| **After 4-6 of eruption of milk teeth** | 76(19.8) |
| **After the eruption of all milk teeth** | 63(16.4) |
| **I don't remember** | 169(44.1) |
| **How many times do you brush your child's teeth?** | |
| **Once in a day** | 71(18.5) |
| **Twice in a day** | 230(60.1) |
| **After meal** | 63(16.4) |
| **Not regular** | 19(5.0) |
| **When do you change your child's tooth brush?** | |
| **Once in 15 day** | 15(3.9) |
| **Once in a month** | 120(31.3) |
| **Every 2-3 months** | 143(37.3) |
| **Once the bristles fray out** | 13(3.4) |
| **Not regular** | 92(24.0) |
| **I don't know** | |
| **At what time do you give the sugary food items to your child?** | |
| **With meals** | 19(5.0) |
| **In between meals** | 266(69.5) |
| **Before going to bed** | 0 |
| **Not regular** | 98(25.6) |

All the six questions regarding practices of mothers toward their children's oral health are summarised in Table 3. Almost half of theof the mothers 155 (40.5%) had not taken their children to visit the dentist yet. Meanwhile, 133 (34.7%) visited their dentists for their children after the age of one year. Only 8 (2.1%) mothers visited the dentist 6 months after the birth of their children and 87 (22.7%) visited the dentist after the eruption of the first milk tooth.

Regarding children's dental visits, about 152 (19.6%) of the mothers reported that they visited the dentist with their children only during problems, and 169 (44.1%) reported that they take their children to the dentist every 6 months, 43 (11.2%) reported to visit the dentist with their children every year and irregular visits to the dentists were reported among 19 (5%) mothers.

For the issue of commencing the cleaning of the child's teeth, 75 (19.6%) of the mothers reported that they started cleaning the teeth after first milk tooth erupted. Cleaning the teeth after 4-6 months of eruption of milk teeth was reported among 76 (19.8%) of the mothers. Cleaning the teeth only after the eruption of all milk teeth was reported among 63 (16.4%) of the mothers and 169 (44.1%) of the mothers reported not recalling the time they started cleaning their children's teeth.

For the frequency of brushing of a child's teeth, 71 (18.5%) of the mothers reported brushing once per day, 230 (60.1%) twice a day, but 63 (16.4%) after meals, and 19 (5%) of the mothers reported irregular brushing of their children's teeth.

Changing child's toothbrush was reported once in 15 days by 15 (3.9%) mothers, once every month by 120 (31.3%) mothers. Meanwhile, 143 (37.3%) reported changing the toothbrush every 2-3 months. Only 13 (3.4%) reported changing the brush once bristles fray out and 92 (24%) reported irregular replacement for their children's toothbrush.

Rinsing the child's teeth with water before going to bed was not reported by any of the mothers, Rinsing teeth as practice was reported by 89 (23.2%) of the mothers, The majority of mothers 266 (69.5) reported rinsing teeth between meals.

### 4.1.4 Source of Knowledge

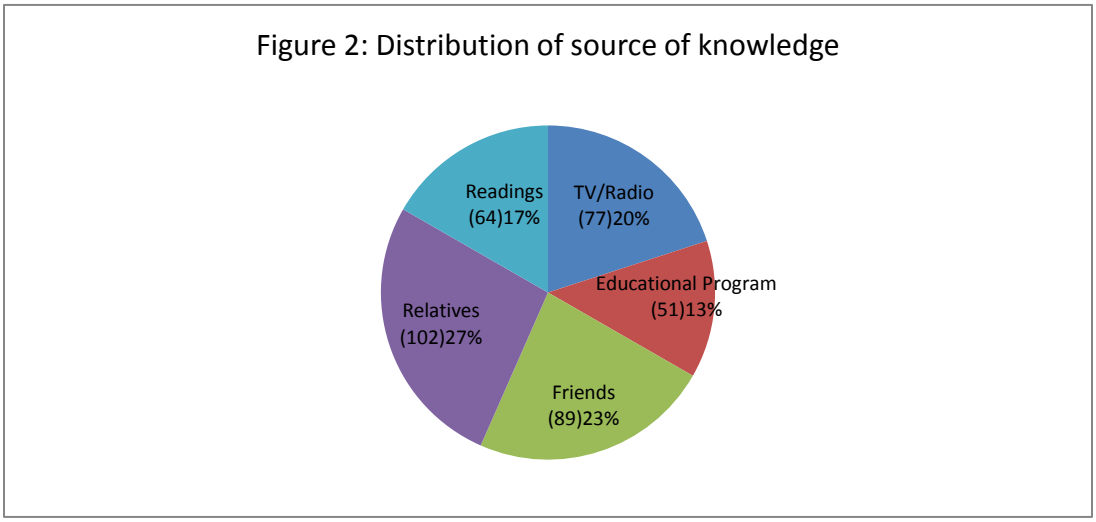



Figure 3. The distribution of the source of knowledge of mothers

Regarding the source of knowledge for the mother's dental information (Figure 3), data revealed that there were different sources of knowledge of mothers about oral health of their children, with relatives ranking first 102 (27%) followed by friends 89 (23%), other sources of knowledge TV/ Radio media 77 (20%), followed by readings 64 (17%) and on the bottom the educational programs 51 (13%).

### 4.1.5 Association between Mothers' Education and Knowledge, Attitude and Practice

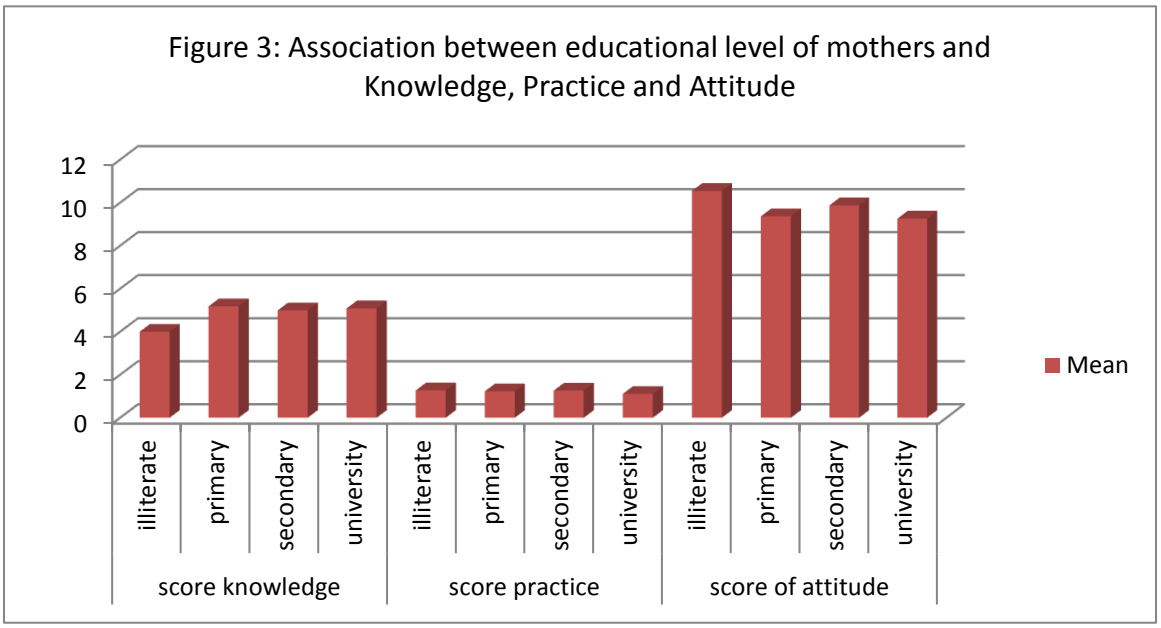



Figure 4, Association between educational level of mothers and knowledge, practice and attitude.

The association between the level of education of the mothers and their knowledge, practice and attitude was investigated according to the scale method described in the materials and methods section. Figure (4) demonstrates this association. Mothers with at least primary level of education scored a mean knowledge 5.18 (SD=2.15). Those who had secondary education had a score of 5.09 (1.92). Mothers with university qualification scored 5 (1.90) compared with illiterate mothers 4 (1.06). The differences between these scores were statistically significant with p-value = 0.02.

Mothers with secondary level of education and university qualification had higher scores of practice, 2.04 (1.33) and 1.8 (1.0) respectively compared with mothers with primary education

and illiterate mothers 1.64 (1.49) and 1.49 (0.80) respectively, the p-value was found to be 0.036. No statistically significant association was found between the level of education of the mothers and their attitude.

### 4.1.6 Association between Occupation of the Mothers and their Knowledge, Attitude and Practice

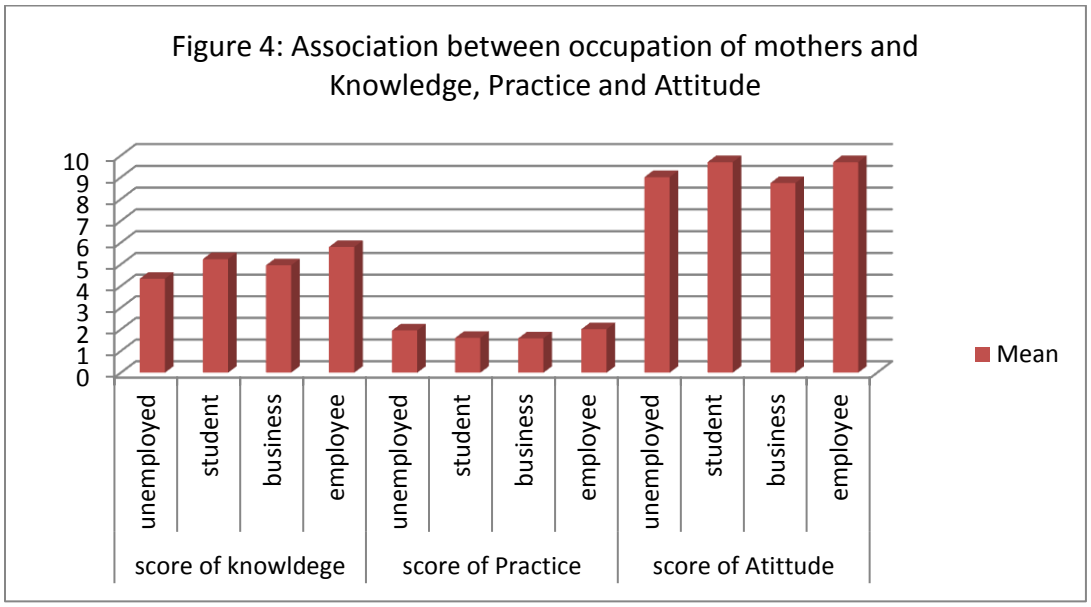



Figure 5, Association between occupation of mothers and their knowledge, practice and attitude.

Employed mothers scored significantly higher mean of knowledge than the others. The average ranks were as follows: employed mothers score was 5.8 (1.68) while student mothers scored 5.24 (1.62), Business women scored 4.96 (2.18) compared with unemployed mothers who scored 4.34 (1.76) with p-value < 0.001.

Employed mothers had higher scores of attitude with an average score of 9.69 (0.81), student mothers had 9.69 (0.47), and unemployed mothers had an average score of 9.01 (1.41) compared with women owning their private businesses who scored 8.74 (1.65). The difference was highly

statistically significant with p-value < 0.001. No association was found between mothers' occupation and practice of the mothers. .

### 4.1.7 Logistic Regression to Explain Factors of Knowledge

Table 4: Logistic regression to explain factors of knowledge

| Variable in equation | B | S.E. | Wald | Df | Sig. | Exp(B) |
|---|---|---|---|---|---|---|
| Gender | -0.024 | 0.238 | 0.01 | 1 | 0.921 | 0.977 |
| Age | 0.043 | 0.07 | 0.377 | 1 | 0.539 | 1.044 |
| Mother Education | -0.084 | 0.133 | 0.399 | 1 | 0.528 | 0.919 |
| Mother Occupation | 0.514 | 0.1 | 26.26 | 1 | 0.000 | 1.672 |
| Score of practice | 0.28 | 0.101 | 7.764 | 1 | 0.005 | 1.323 |
| Score of attitude | 0.418 | 0.105 | 15.98 | 1 | 0.000 | 1.519 |
| Constant | -5.068 | 1.102 | 21.137 | 1 | 0.000 | 0.006 |

*Fitness of the model p-value 0.002 and $R^2$ 0.164*

As demonstrated in Table 4, the fitness of the model was acceptable and 16.4% of the mothers' knowledge was explained by mothers' occupation, mothers' practice and mothers' attitude adjusted over gender and age of the child.

# 5.0 DISCUSSION

Parent's knowledge and beliefs have a significant impact on children's oral health maintenance and consequences. Proper knowledge yields good oral hygiene and healthy eating habits. Particularly in the preventive cycle, parent's knowledge and positive attitude toward good dental care are very important [51].

The demographic characteristics of the study population revealed a variety of educational backgrounds for the parents as well as fair representation of different employment status. The average age of the mothers interviewed was 36.61 years (±7.86) and the average age of the fathers was 43.04 years (±7.69).

Since mothers are the primary care providers for the children, they should be adequately exposed to the preventive oral health programs. This should be done during the first year of the life of the child if not earlier, which is the most important period [19]. The results of this study revealed that the main source of oral health education and knowledge for the participating mothers was from family and friends. This was followed by sources from the electronic media, such as radio, television and the internet. Only 13% of the participants acquired their knowledge from oral educational programs.

The fact that the main source of knowledge for mothers in this study was from family members and friends and not from health professionals or other sources highlights the importance of cultural factors such as strong family cohesion and the involvement of extended family members in taking care of the child as reported by Pine et al. (2004)[144].

Oral health preventive programs should be emphasized for young mothers, pre-school education, school-age children and adolescents on a consistent basis [16]. It has been reported that the

enhancement of education toward the dental health is one of the solid methods to increase knowledge in the field of oral health, especially when it is combined with other interventions for the promotion of health. This will lead to the reduction of the disparities in oral health [145].

Patients attending the dental clinic usually receive some oral health information. However, this was not demonstrated to be a reliable tool in our study population. Considering that the attendance to dental clinic as shown in this study was not sufficient, since only (44.1%) of mothers took their children to the dentist every 6 months, and (39.7%) took their children to the dentist only when a problem existed, it is imperative to establish proper knowledge and instill accurate information in the early stages of life regardless of the status of dental visits.

In the study at hand, only (47.5%) of mothers were unaware of the accurate number of the primary teeth that a normal child has. However, most of the mothers (99.9%) agreed that primary teeth are essential for children to chew food properly and that good oral health is related to good general health. This is satisfying and the information should be constantly applied to motivate mothers on the need to protect primary teeth. A study of carers of young children of different cultural backgrounds in California determined that lack of knowledge and beliefs about primary teeth produced barriers to early preventive care [146].

Optimal exposure to fluoride is essential for the prevention of dental caries [34]. The use of fluoride for prevention and control of caries is recognized to be both safe and effective [147]. There is evidence from a meta-analyses that fluoridated toothpaste is effective in reducing dental caries in children [133]. Although the majority of participant (56.1%) used a toothpaste containing fluoride for their children; (30.5%) were uncertain whether the toothpaste their child is using contains fluoride or not and only (13%) reported that they do not use a toothpaste containing fluoride as they thought that fluoride is either harmful or they didn't know what the exact benefit

of fluoride is. As it was stated by the WHO and numerous of other international health organizations that the use of fluoridated tooth paste is considered one of the most important approaches in preventing tooth decay [133]. This should be emphasized early in the parenteral counseling sessions during the prenatal period or immediately after birth. Establishing the presence of a deficiency regarding the knowledge of the importance of fluoride, one of the most cost effective, safe, and easy methods in caries prevention is considered to be disappointing.

The above is clearly related to the question regarding the role of fluoride as the majority (51.7%) of the study sample recognized that fluoride plays an important role in preventing tooth decay. However (36%) didn't know the exact benefit of fluoride. These results were comparable to the results of the studies done by Gussy *et al* 2008, Franzman *et al* 2004[148]. Kamolmatyakul and Saiong 2007 [149] stated that their study group had good knowledge about fluoride. However Moulana *et al 2012* [150], Suresh *et al 210* [151] reported poor knowledge about the same issue. We believe that having proper knowledge about the fluoride content of the toothpaste and its benefits have a great impact on the children's oral health status especially that the current data available on the *dmft* and *DMFT* indicate that childhood dental caries is still a serious dental public health problem in the UAE. Several systematic reviews have demonstrated that the use of fluoride toothpaste decreases the development of new dental caries[125]. This effect increases with increased concentration of fluoride and with increased baseline caries levels [125]. A further meta-analysis showed that use of standard concentration (1,000–1,500 ppm) fluoride toothpaste reduced caries in primary teeth compared to placebo or no intervention [125]. Therefore, it is also empirical to emphasize on the importance of using age appropriate fluoride concentration toothpaste. It has been suggested earlier that in order to balance the benefits of preventing dental caries against the potential harms of fluorosis associated with ingesting fluoride toothpaste,

children under three years of age should use no more than a smear of toothpaste and children 3-6 year old should only use a pea size amount of toothpaste [152].

The rate of dental caries is a significant indicator of lifestyle. Dental caries is considered a chronic degenerative disease similar to diabetes, heart disease and cancer. Therefore, the answers in our survey regarding the most common dental disease in children was satisfying as the majority of the participants (73.6%) could identify tooth decay as the most common dental disease among children. This was in line with other studies [150,151,153].

For the awareness about the role of sugar containing items in the production of dental caries, The results of this study were similar to the results of studies conducted by Kamolmatyakul and Saiong 2007 [150] where only (37.7%) of the mothers were aware that sugary item likes chocolates can lead to dental caries. Moreover, there was low awareness of various formulas of sugary items, which also can contribute to the production of dental caries. This was demonstrated in our finding that only (0.8%) reported that all of the mentioned food items can cause tooth decay. This highlights insufficient knowledge about the role of sugar and the relationship between the different forms of sugar consumption and dental caries. Parents occupy a strategic position in their children's food environment but to exploit this to the advantage of future diet and health enhancements, it is essential to guarantee that our interventions distinguish and act on current levels of motivation and understanding with respect to behaviour change. Having a lack of knowledge in understanding the main food items that is related to caries formation can affect caries progression to a great extant especially with food items that contain a large amount of sugar [154]. The recent guideline of the WHO in relation to dietary consumption of sugars in both adults and children, strongly recommends a reduction in the intake of free sugars to less than 10% of total energy intake, therefore compliance with dietary advice is of key

importance and motivational interviewing shows promise in relation to parents adopting good dietary practices for their children [155].

The AAPD has suggested that children one to six years do not drink more than four to six ounces of fruit juice per day, from a cup and as part of a meal or a snack. And also emphasized that night bottle-feeding with juices, the repetitive use of a sippy or no spill cup, and frequent consumption of sugar-containing snacks and drinks between meals (eg, juice, formula, soda) increases the risk of dental caries [156]. Majority of the mothers do not know the importance of time of intake of sugars, as (69%) give sugary snacks between meals while only (5.0%) limited the intake of sugary foods to meal times. Similar results were extracted from the reports by Moulana *et al 2012* [151] . In contrast, Blinkhorn *et al 2003*[85] reported that 78% of mothers restricted the intake of sugary food items to meal-times only.

Regarding the question about methods of prevention of tooth decay, the majority (61.9%) of mothers answered the favourable answer. Majority believed that in order to prevent tooth decay, a multiple method approach should be employed. Restricting sugar use plays an important role in caries control. However, during the past decades, dietary habits of young people have changed worldwide. Unhealthy snacking of processed foods, take-away type meals and beverages is more common than ever before. This tendency increases the intake of refined carbohydrates, added sugars and fats among young adults [14]. Other factors were included in answering this question as the majority of mothers also recognized that tooth brushing, regular dental visits and fluoridated tooth paste are essential factors in the prevention of dental caries.

Although there is a much lower prevalence of destructive periodontal diseases in children than in adults, children can develop severe forms of periodontitis. In some cases, this destructive disease is a manifestation of an unknown underlying systemic disease. In other young patients, the underlying cause for increased susceptibility and early onset of disease periodontal is unknown.

These diseases are often familial, suggesting a genetic predisposition for aggressiveness [157]. Periodontal diseases are most frequently caused by pathogenic microorganism in the oral biofilm or dental plaque that accumulate around the teeth due to poor oral hygiene[158]. Accordingly, (49.9%) of mothers reported that calculus and improper brushing are possible causes of gum disease and the majority (51.7%) could identify the preventive measures to prevent periodontal diseases in our study sample.

Malocclusions are common in the general population of children, and often require lengthy and expensive treatment to correct [159]. While many malocclusions are believed to be caused by genetic (inherited) factors, some may be caused by environmental factors, particularly nonnutritive sucking behaviors. Since non-nutritive sucking habits are modifiable factors, knowledge of how such behaviors contribute to malocclusion is important in preventing them[160]. In this study, knowledge about the causes of malocclusion was fair as (47.5%) of participants reported that thumb sucking/tongue thrusting/mouth breathing are one of the causes, while only (6.5%) reported that it runs in family, (39.9%) answered the favorable answer and (6.0%) didn't know the cause, this was in line with the study done Suresh *et 2010* [151] .

Early diagnosis and successful treatment of developing malocclusions can have both short and long-term benefits while achieving the goals of occlusal harmony and function and dentofacial esthetics [161]. According to the AAPD guidelines primary dentition stage, habits and cross bites should be diagnosed and, if predicted not likely to be self-correcting, they should be addressed as early as feasible to facilitate normal occlusal relationships [160]. In this study, it was shown that the majority (75.7%) believed that malocclusion can be treated, while (17.8%) didn't know whether improperly aligned teeth can be treated and (6.5%) reported that no treatment can be performed for their children in case of malocclusion.

A majority (99.9%) of the mothers believed that, it is essential to take the child for regular dental visits, which was comparable to the results of Moulana *et al 2012* [150] this belief was not translated into practice since only (44.1% ) of the surveyed mothers took their children to see a dentist every 6 months. It is recommended that the earlier a child visits to dentist, the better would be his/her likelihood of being caries free [162] and it was clearly identified by many researchers that the initiation of preventive approaches early in life and shortly after the eruption of the first tooth is of great importance in maintain good oral health throughout the life time [34] In this study even though a large proportion of the mothers agreed that regular dental visits are required, (39.7%) of the participants believed that they should take their children only if there is a problem.

It is a fact that primary teeth are of great importance, and maintaining them has tremendous impact not only on the oral health status but also on the general health of the child as was stated earlier in the literature review part. Many mothers had good knowledge of the importance of deciduous teeth, agreed that the teeth are important to chew food properly and are strongly related to the general health. Around (99.9) % of mothers agreed that they should be brushing their children's teeth, which reflects a positive attitude.

The younger the children are when they start tooth brushing, the lower the possibility of developing tooth decay is. Mechanical cleaning of teeth helps to decrease *dmft* in children [163]. For those who begin tooth brushing prior to three years of age are more probably going to remain caries free [102]. Wong et al. (2012) [122] found that children whose parents started to brush their teeth before 12 months of age had more healthy teeth compared to children whose tooth-brushing started later.

In this study, only (19%) of mothers began brushing their children's teeth immediately after the eruption of the first primary tooth. In contrast to that Wulaerhan J 2014 [(164)] found that 95% of the parents in rural Australia thought that they must start brushing when the first tooth erupts and according to the AAPD guideline, oral hygiene measures should be implemented no later than the time of eruption of the first primary tooth.

A Cochrane review found the effect of fluoride toothpaste increases with higher frequency of use. There were statistically significant associations between estimates of *DMFS* prevented fractions (PF) and frequency of use, with a 14% increase in with twice daily brushing as opposed to once daily [(125)]. This study revealed that the majority of mothers (60.1%) brush their children's teeth twice daily, while only (5%) do not brush regularly.

Five Randomized Clinical Trials (RCTs) were identified that investigated the effect of replacing toothbrushes on oral health. However, the outcome assessed was plaque reduction rather than dental caries. All five studies were carried out overseas. Only two were conducted in children and these were carried out in Burma and Iran. Currently, there is insufficient evidence to recommend when a worn toothbrush should be replaced[(125)]. In this study (37.3%) change the toothbrush every 2-3 months, while (3.9%) do that every 15 days and (24%) do not do that regularly.

It had been demonstrated that the occurrence and severity of ECC is correlated with the educational level of the parents [(119)]. Lower prevalence of dental caries and lower mean *dmft* scores had been associated with higher levels of parental education [(108)].

In this study, mothers with higher education had better knowledge concerning the oral hygiene practices and the importance of deciduous teeth. This is similar to a Polish study in 2004 which reported that mothers with lower level of education also had low levels of oral health knowledge

[165]. It has been postulated that the parents with a general, better level of education may be able to measure suitable sources of information and understand that information more completely [166].

The overall mean score of knowledge obtained for each group of mothers demonstrated significant differences in relation to their level of education. Mothers with elementary education had a mean score of 5.18 (SD=2.15) and mothers with high school education had a mean score of knowledge of 5.09 (SD=1.92) University educated mothers had a mean score of knowledge of 5 (SD=1.90) while illiterate mothers had the lowest score of 4 (SD=1.06) .As mentioned above these differences between the levels of education and knowledge were statistically significant. It is peculiar to note that mothers with elementary and secondary education had better mean score of knowledge than the mothers with a university degree. The authors postulate that the elementary and secondary educated mothers might depend more on health educational programs as a source of knowledge while university educated mothers are more likely to seek the knowledge independently from available sources such as the internet. The independent sources might not be completely accurate and might be affected by certain point of views. An example of that is the fluoride controversy as many sources on the internet claim that fluoride is a harmful substance for children. On the other hand Mothers with secondary level of education and university qualification had higher scores of practice, 2.04 (1.33) and 1.8 (1.0) respectively compared with mothers with primary education and illiterate mothers 1.64 (1.49) and 1.49 (0.80) respectively, the p-value was found to be 0.036. No statistically significant association was found between the level of education of the mothers and their attitude. A study conducted in Ajman, UAE for the estimation of the prevalence and severity of dental caries in young children, and to explore its relation with sociodemographic characteristics and the dental services, found that the prevalence of dental caries was high (76.1%). The average decayed missing filled surfaces

(*dmfs*) score was 10.2. Older children and male children of less educated mothers showed greater caries severity than others [17]. These results are in agreement with our results as they demonstrated that the level of education positively affected the caries experience. In our study, the level of education positively affected the practices of mothers which will inevitably affect the caries experience of the children.

Employed mothers scored significantly higher mean of knowledge than the others. The average ranks were as follows: employed mothers score was 5.8 (1.68) while student mothers scored 5.24 (1.62), Business women scored 4.96 (2.18) compared with unemployed mothers who scored 4.34 (1.76) with p-value < 0.001.

Employed mothers had higher scores of attitude with an average score of 9.69 (0.81), student mothers had 9.69 (0.47), and unemployed mothers had an average score of 9.01 (1.41) compared with women owning their private businesses who scored 8.74 (1.65). The difference was statistically significant with p-value < 0.001. No association was found between mothers' occupation and their practice.

It was reported in many previous studies that employment, education and family income were significantly related to caries prevalence. Children in families with an employed caregiver and higher incomes had a lower prevalence of caries for both the cavitated and non-cavitated lesions. Additionally, children with caregivers who had at least a high school diploma had a lower prevalence of cavitated lesions [115]. Further investigations about the relationship of employment and education of the mother with their knowledge attitude and practices might shed more light on these findings.

However, in the UAE especially in Abu Dhabi ; although the family income of the population is high and the dental health services are free. The caries prevalence is one of the highest in the

world. This can be attributed to behavioural and cultural beliefs. Al-Hosani and Rugg-Gunn [9] found that children with higher caries scores in Abu Dhabi come from higher income families. They justified this by the fact that high sugar foods and drinks are readily available in shops and being purchased and given to children more easily by parents with higher income. The average score of knowledge in our study sample was found to be 4.97 (1.89) as calculated by plotting the accurate answers on a normal distribution graph and extrapolating the average point. According to the scale that was used for scoring, adequate knowledge was found among 223 (58.2%), and poor knowledge was found among 160 (41.8%).Treatment of malocclusion and common dental problems ranked the highest in the average score of knowledge among participants. A total of 295 (75.7%) and 282(73.6%) respectively answered these 2 questions correctly. A majority (56.1%) of mothers used a toothpaste containing fluoride, (51.7%) could identify the fluoride role and (51.7%) could report the factors that contribute to the prevention of gum diseases. However least favourable answers were counted for the questions related to the food items that can cause tooth decay as only (35.5%) could recognize the several food items that can play a role on caries formation and only (28.5%) could report the causes of gum diseases. The scores for answers given for the number of milk teeth and causes of gum diseases ranked the least, 85 (22.2%) and 109 (28.5%) respectively. All these results were suggestive of poor knowledge of some aspects considered to be of great importance in the maintenance of a good children's oral health. This necessitates the need for effective oral health education programs. Of the total study group, (99.9%) exhibited excellent attitude and only (20%) were following good practice towards their children's oral health. This might lead us to conclude that in our study, favourable attitude did not translate into good practice. The scores of the answers for the practice questions were shockingly low. We always believe that practicing good oral hygiene is the most important part is maintaining oral health. This requires great attention and efforts to improve of the many

poor practices employed by mothers especially with in the very early stages of the child's life. It is important to emphasize the importance of the first dental visit as it was discussed previously as this is not only important in detection of early dental disease but also in the establishment of a dental home for the child facilitating any future needs for preventive and interventional services.

Many researchers have tried to measure the relationship between attitude, knowledge and practice in oral health [167]. Primarily, they specified that strong knowledge of oral health shows better oral care practices[45]. Secondly, people with a more positive attitude towards oral health usually have better knowledge on how to take care of their teeth [45]. Finally, the change to healthy attitude and practices can be produced by if sufficient information and motivation are provided [46].However, some authors opinion that knowledge does not necessarily translate into practice. An example of that is the mothers' knowledge about the timing of the first dental visit before the child's first birthday, such understanding does not essentially transform into practices that will prevent ECC[164].

Overall, mothers showed poor oral health knowledge, and practices. Keeping in mind the varying attitudes in the society, it is important to plan proper oral health programs directing different groups through the strategies designed for specific desires. More weight should be placed on improving the level of knowledge of mothers, which would be reflected in their own oral health behavior. Kowash (2015) suggested dental health programmes to solve the continuing problem of ECC in the UAE. The programmes should focus on educating and changing the behaviour of parents or caregivers. Moreover, the dental health messages should be practical and culturally sensitive [168] .

## 5.1 STUDY LIMITATIONS

The limitations in this current study are as follow:

- The study population was representing only one centre in Sharjah. It would have been more beneficial if parents all around the seven emirates had the chance to participate, but this was unachievable due to difficulty in getting access to all centres, time limitation, number of researchers and facilities to accommodate the large number of participants.
- There might have been bias in the choice of sample since the mothers were already seeking dental care for their children. The effect of this bias on the knowledge, attitude and research is unknown.
- There was a problem with the first section of the questionnaire regarding the demographic information such as age, educational level and occupation, many of the mothers felt uncomfortable answering related questions this might be due to cultural issues.
- As it is generally identified, that data collected via a direct interview is time consuming and lacks details and in depth information on the subject being researched, limitation can be well noticed in accuracy or honesty.As this study focused mainly on parents of preschool children, it was worthwhile to know whether the mothers had elder children as this might have affected the knowledge, attitude and practices of the parents toward their child's oral health.
- Additionally, this questionnaire was focusing on preschool children, it was of a great importance to investigate the knowledge of the parents about the age of eruption of the first permanent tooth in order to establish preventive measures and early attention to this important milestone in a child's dental development.

- Furthermore, oral health behaviour of both parents affects their children's oral health behaviour. As this study has interviewed only mothers, it is essential to conduct further epidemiological research involving both the parents.

# 6.0 CONCLUSIONS

- Adequate knowledge was found among (58.2%), and poor knowledge was found among (41.8%), 99% of the mothers exhibited excellent attitude and only 20% were following good practices towards their children's oral health.
- Poor knowledge and practices of mothers toward their children's oral health was significantly associated with mothers' occupation and education.
- Employed mothers scored significantly higher mean of knowledge than the others. Employed and student mothers had higher scores of attitude than unemployed mothers and mothers owning their own businesses. These differences were statistically significant
- Mothers with secondary level of education and university qualification had significantly higher scores of practice compared with mothers with primary education.
- Overall, mothers with elementary and secondary education had better mean score of knowledge than the mothers with a university degree.
- The results of this study revealed that the main source of oral health education and knowledge of participants was from family and friends, followed by sources from the electronic media, and least from the oral health education programs.
- Majority of mothers used a toothpaste containing fluoride; they were able to identify the role of fluoride in dental health and could report the factors that contribute to the prevention of gum diseases.

- The majority of sampled mothers were unable to answer questions related to the food items causing dental caries and causes of periodontal diseases accurately. The mothers' knowledge about the accurate number of milk teeth ranked the least.

# 7.0 RECOMMENDATIONS

The survey conducted in this study can be conducted in all other Emirates of the UAE to provide a better and more comprehensive view of the issue at hand. The relationship between the mothers' educational level and employment status can be investigated further to shed a clearer light on the findings in this study. The findings of this study implied the need for properly structured educational programs for the mothers, dentists and allied health professionals as well as day care providers. These recommendations are summarized below.

## 7.1 Improvement of mothers' attitude, knowledge and practice

In order to implement active programs to prevent ECC problems, the investigation of knowledge, attitude and practice is crucial. Prompting the oral health behaviours of parents is difficult as there is unpredictability between dental knowledge and parents' oral health care practices. However, based on influencing factors, these programs should include not only the educational characteristics but also aspects of attitude and most importantly, how the practical behaviors can be developed. Therefore, implementation of these programs should involve the most important persons mothers/caregivers and health policy personnel, not only paediatric dentists but associated health professionals, nursery staff, and teachers in kindergarten.

## 7. 2 Programs related to children's oral health

Following implementation of knowledge and attitude enhancing programmes to mothers/caregivers, it is to be encouraged to apply proposed proper oral health program for the children that would contain teeth cleaning, which has to be modified according to the age of the child. At first, oral hygiene is the responsibility of the parent's, then the parent should help the child, and progressively, the child undertakes the responsibility. This be determined the child's

anatomic/physiological growth, skills, motivational forces, lifestyles and anatomic and physiological changes related with growth.

### 7..3 Programmes for dentists and allied health professionals

During prenatal, perinatal and postnatal periods general dentists can provide oral health services to pregnant women/mothers, while pediatric dentists can offer oral health services to children beginning from infancy over adolescence. They capture the parents' attitudes and practices as they have the chance to see children much earlier.

A strategic way for all oral health providers to address the concerns of parents and be more successful in good oral health care for children is the application of an anticipatory guidance programs and discussions. Dental home should be arranged no later than when the child reaches 12 months of age in order to assure that early access to oral health providers have been established. This way it will be confirmed that the complete variety of oral health-promotion and interceptive disease-prevention services will be delivered.

### 7.4 Programmes for child-care centers personnel

Child-care center personnel include nursery staff and center-based program staff such as staff in day-care centers, pre-kindergartens, nursery schools and teachers in kindergarten. Improvement of health promotion in out-of-home child-care surroundings could advance the oral health of preschool age children.

## REFERENCES


1. Doctoral P, Link C. Evidence-Based Preventive Healthcare in the CWB Family Support Homes : The Healthy Learners Pilot Program The Harvard community has made this article openly available . Please share how this access benefits you . Your story matters . Accessed. 2015;

2. Lewis CW, Grossman DC, Domoto PK, Deyo R a. The role of the pediatrician in the oral health of children: A national survey. Pediatrics. 2000;106(6):E84.

3. Syed S, Nisar N, Mubeen N. Early childhood caries: a preventable disease. Dent Open J. 2015; 2(2): 55- 61.

4. Ramamurthy PH, Swamy HS, Bennete F, Rohini M, Nagarathnamma T. Relationship between severe-early childhood caries, salivary mutans streptococci, and lactobacilli in preschool children of low socioeconomic status in Bengaluru city. J Indian Soc Pedod Prev Dent [Internet]. 2014;32(1):44–7. Available from: http://www.ncbi.nlm.nih.gov/pubmed/24531601

5. Filstrup SL, Briskie D, da Fonseca M, Lawrence L, Wandera A, Inglehart MR. Early childhood caries and quality of life: child and parent perspectives. Pediatr Dent [Internet]. 2003;25(5):431–40. Available from: http://www.ncbi.nlm.nih.gov/pubmed/14649606

6. Hashim R, Thomson WM, Ayers KMS, Lewsey JD, Awad M. Dental caries experience and use of dental services among preschool children in Ajman, UAE. Int J Paediatr Dent. 2006;16(4):257–62.

7. El-Nadeef M a I, Hassab H, Al-Hosani E. National survey of the oral health of 5-year-old children in the United Arab Emirates. East Mediterr Health J. 2010;16(1):51–5.

8. Al-Bluwi GSM. Epidemiology of dental caries in children in the united arab emirates. Vol. 64, International Dental Journal. 2014. p. 219–28.

9. Al-bluwi GSM. Epidemiology of dental caries in children in the United Arab Emirates. 2014;219–28.

10. Public Health England. Dental public health epidemiology programme Oral health survey of three-year-old children 2013 A report on the prevalence and severity of dental decay. 2013; Available from: www.gov.uk/phe\nwww.facebook.com/PublicHealthEngland

11. Statistics NC for H, Charles J. Rothwell, M.S., M.B.A. D, Nathaniel Schenker, Ph.D. DD, Jennifer H. Madans, Ph.D. AD for S, Surveys D of H and NE, Kathryn S. Porter, M.D., M.S. D. No Title.

12. Hooley M, Skouteris H, Boganin C, Satur J, Kilpatrick N. Parental influence and the development of dental caries in children aged 0-6 years: A systematic review of the literature. J Dent. 2012;40(11):873–85.

13. Lopes MF. “ To Brush or not to Brush ” – Parental knowledge about their child ’ s oral health. 2014;

14. Tanner T. Healthy young adults’ oral health and associated factors. Crosssectional epidemiological study. 2015.

15. Abanto J, Tsakos G, Paiva SM, Raggio DP, Celiberti P, Bönecker M. Agreement between children aged 5-6 years and their mothers in rating child oral health-related quality of life. Int J Paediatr Dent. 2013;373–9.

16. Wagner Y, Greiner S, Heinrich-Weltzien R. Evaluation of an oral health promotion program at the

time of birth on dental caries in 5-year-old children in Vorarlberg, Austria. Community Dent Oral Epidemiol. 2014;42(2):160–9.

17. Hashim R, Williams S, Thomson WM. Severe early childhood caries and behavioural risk indicators among young children in Ajman, United Arab Emirates. Eur Arch Paediatr Dent. 2011;12(4):205–10.

18. Reisine S, Tellez M, Willem J, Sohn W, Ismail a. Relationship between caregiver's and child's caries prevalence among disadvantaged African Americans. Community Dent Oral Epidemiol. 2008;36(3):191–200.

19. Syed S, Nisar N, Mubeen N. Early Childhood Caries : A Preventable Disease. :55–61.

20. Makhdoom S, Anwar M, Qureshi Z. ASSESSMENT OF EARLY CHILDHOOD CARIES ( ECC ) AND ITS RELATIONSHIP WITH FEEDING PRACTICES — A STUDY. :254–7.

21. Vadiakas G. Case definition, aetiology and risk assessment of early childhood caries (ECC): a revisited review. Eur Arch Paediatr Dent. 2008;9(3):114–25.

22. Dentistry C. Nursing Caries Prevalence Among Preschool. 2011;5(January):37–41.

23. Febres C, Echeverri DDSEA, Keene HJ. and their relationship to baby bottle tooth decay. 1997;

24. Begzati A, Berisha M, Mrasori S, Xhemajli-latifi B, Prokshi R, Haliti F, et al. Early Childhood Caries ( ECC ) — Etiology , Clinical Consequences and Prevention.

25. Roberts G, PECleaton-Jones, Fatti P, Richardson B, Sinwel R, Hargreaves A, et al. Pattern of breast and bottle feeding and their association with dental caries in 1 to 4 year old South African children. 2. A case control study of children with nursing caries. Community Dent Health 1994; 11: 38-41.

26. Tinanoff N, O'Sullivan DM. Early childhood caries: overview and recent findings. Pediatr Dent [Internet]. 1997;19(1):12–6. Available from: http://www.ncbi.nlm.nih.gov/pubmed/9048407

27. Abanto J, Carvalho TS, Mendes FM, Wanderley MT, Bo¨ necker M, Raggio DP. Impact of Oral Diseases and Disorders on Oral Health-related Quality of Life of Preschool Children. Community Dent Oral Epidemiol 2011; 39: 105–114.

28. Kaste LM, Marianos D, Chang R, Phipps KR. The Assessment of Nursing Caries and its Relationship to High Caries in the Permanent Dentition. J Public Health Dent. 1992; 52(2):64-8.

29. Congiu G, Franca P. Early Childhood Caries ( ECC ) Prevalence and Background Factors: A Review. Oral Heal Prev Dent. 2014;12(1):71–7.

30. American Academy of Pediatric Dentistry. Policy on Early Childhood Caries ( ECC ): Classifications , Consequences , and Preventive Strategies. 2014;(6):50–2.

31. Chandna P, Adlakha VK. Infant Oral Health.

32. Wyne AH. Early childhood caries: nomenclature and case definition. Community Dent Oral Epidemiol 1999; 27: 313-15.

33. Mayanagi H, Saita MH, Kamiyama K. Cross-sectional comparisons of caries time trends in nursery school children in Sendai JCDOE 1995;23:344-9. No Title.

34. Kowash MB. Early Childhood Caries - A Continuing Oral Health Problem : A Review.

2014;5:111–7.

35. Marcenes W, Kassebaum NJ, Bernabe E, Flaxman A, Naghavi M, Lopez A, et al. Global burden of oral conditions in 1990–2010: A systematic analysis. J Dent Res. 2013;(92):592–7.

36. Folayan MO, Kolawole K a, Oziegbe EO, Oyedele T, Oshomoji O V, Chukwumah NM, et al. Prevalence, and early childhood caries risk indicators in preschool children in suburban Nigeria. BMC Oral Health [Internet]. BMC Oral Health; 2015;15(1):72. Available from: http://www.biomedcentral.com/1472-6831/15/72

37. Masumo R, Bardsen A, Mashoto K, Astrom A. Prevalence and socio-behavioral influence of early childhood caries, ECC, and feeding habits among 6 – 36 months old children in Uganda and Tanzania. BMC Oral Health. 2012;12(1):24.

38. Of I, Status S, Factors P, Child ON, Review OH-A, Literature OF. Review Article. 2015;3(2):153–7.

39. Health & Social Care Information Centre. Children ' s Dental Health Survey 2013. 2015;(July):1–106.

40. Bagramian R a., Garcia-Godoy F, Volpe AR. The global increase in dental caries. A pending public health crisis. Am J Dent. 2009;22(1):3–8.

41. Scavuzzi AI, Junior AD, Couto GB, Vasconcelos MM, Soares RP,Valenca PA. Longitudinal study of dental caries in Brazilian children aged from 12 to 30 months. The international journal of paediatric dentistry.2007 Jan;17(2):123-128.

42. SIMIN Z. MOHEBBI, JORMA I. VIRTANEN, MOJTABA VAHID-GOLPAYEGANI MMV. Early childhood caries and dental plaque among 1-3-year-olds in Tehran, Iran. J Can Dent Assoc. 2006;(December):177–81.

43. Wyne AH. Caries prevalence, severity, and pattern in preschool children. J Contemp Dent Pract. 2008;9(3):24–31.

44. Khan-patel M. PREVALENCE OF NURSING BOTTLE CARIES (EARLY CHILDHOOD CARIES) IN YOUNG CHILDREN IN POLOKWANE. 2012;

45. Zafar S, Harnekar S, Siddiqi a. Early childhood caries: etiology, clinical considerations, consequences and management. Int Dent SA [Internet]. 2009;4(3):24–36. Available from: http://www.moderndentistrymedia.com/july_aug2009/zafar.pdf

46. Leong PM, Gussy MG, Barrow S-YL, de Silva-Sanigorski A, Waters E. A systematic review of risk factors during first year of life for early childhood caries. Int J Paediatr Dent [Internet]. 2013;23(4):235–50. Available from: http://www.ncbi.nlm.nih.gov/pubmed/22925469

47. Corrêa-Faria P, Paixão-Gonçalves S, Paiva SM, Pordeus IA, Marques LS, Ramos-Jorge ML. Association between developmental defects of enamel and early childhood caries: A cross-sectional study. Int J Paediatr Dent. 2014;103–9.

48. Harris R, Nicoll AD, Adair PM, Pine CM. Risk factors for dental caries in young children: a systematic review of the literature. Community Dent Health. 2004; 21(Suppl):S71-85.

49. Milnes AR. Description and epidemiology of nursing caries. J Public Health Dent 1996; 56(1): 38-50.

50. Markova N, Ilieva E. Epidemiology and Predictors of Early Childhood Caries / Ecc /.

51. Rothe V, Kebriaei A, Pitner S, Balluff M, Salama F. Effectiveness of a presentation on infant oral health care for parents. Int J Paediatr Dent. 2010;20(1):37–42.

52. Hermont A, Martins C, Zina L, Auad S, Paiva S, Pordeus I. Breastfeeding, Bottle Feeding Practices and Malocclusion in the Primary Dentition: A Systematic Review of Cohort Studies. Int J Environ Res Public Health [Internet]. 2015;12(3):3133–51. Available from: http://www.mdpi.com/1660-4601/12/3/3133/

53. Mba LJK, Mph AM, Mph SB, Mph JV, Mph MN. Insights in Public Health Healthy Mothers Healthy Babies : Awareness and Perceptions of Existing Breastfeeding and Postpartum Depression Support among Parents and Perinatal Health Care Providers in Hawai ‘ i. 2015;74(3).

54. Kleinberg I. Etiology of dental caries. J Can Dent Assoc. 1979;45(12):661–8.

55. Milgrom P, Riedy CA, Weinstein P, Tanner ACR, Manibusan L, Bruss J. Dental caries and its relationship to bacteria infection, hypoplasia, diet and oral hygiene in 6 to 36 month old children Community Dent Oral Epidemiol 2000; 28: 295-306.

56. Hurlbutt M. Dental caries: a PH-mediated disease. Can J Dent Hyg. 2010;9–16.

57. Li Y, Zhang Y, Yang R, Zhang Q, Zou J, Kang D. Associations of social and behavioural factors with early childhood caries in Xiamen city in China. Int J Paediatr Dent. 2011;21(2):103–11.

58. Animireddy D, Thimma V, Bekkem R, Vallala P, Kotha SB, Ankireddy S. Evaluation of pH, buffering capacity, viscosity and flow rate levels of saliva in caries ‐ free, minimal caries and nursing caries children: An in vivo study. Contemp Clin Dent. 2014;5(3):324–8.

59. Preethi BP, Reshma D, Anand P. Evaluation of flow rate, pH, buffering capacity, calcium, total protein and total antioxidant capacity levels of saliva in caries free and caries active children: An in vivo study. Indian J Clin Biochem 2010;25:425-8.

60. Mandel ID. Relation of Saliva and Plaque to Caries. J Dent Res Suppl. 1974;53:246–67.

61. Siqueira WL, Bermejo PR, Mustacchi Z, Nicolau J. Buffer capacity, pH, and flow rate in saliva of children aged 2-60 months with Down syndrome. Clin Oral Investig. 2005;9(1):26–9.

62. Dentistry C. A Perpetual Challenge To Clinician. 2011;5(January):4–11.

63. Bradshaw DJ, McKee a S, Marsh PD. Effects of carbohydrate pulses and pH on population shifts within oral microbial communities in vitro. J Dent Res. 1989;68(9):1298–302.

64. Zafar S, Harnekar S, Siddiqi a. Early childhood caries: etiology, clinical considerations, consequences and management. Int Dent SA [Internet]. 2009;4(3):24–36. Available from: http://www.moderndentistrymedia.com/july_aug2009/zafar.pdf

65. Article R. Diet , Dental Caries and Other Degenerative Diseases Oral Biology. 2015;2(2).

66. Cidro J, Zahayko L, Lawrence HP, Folster S, McGregor M, McKay K. Breast feeding practices as cultural interventions for early childhood caries in Cree communities. BMC Oral Health [Internet]. ???; 2015;15(1):49. Available from: http://www.biomedcentral.com/1472-6831/15/49

67. Mattheus D. Journal of Dental Problems and Solutions Oral Health Outcomes for Children in Hawaii : Not Much to Smile About. 2015;2:34–7.

68. World Health Organization. Dentition status and criteria for diagnosis and coding (Caries). WHO Oral Health Surveys . Basic Methods. 4th ed. Geneva: WHO; 1997. 39-44.

69. Childhood E, Health O, Professionals CH. Early Childhood Oral Health Guidelines for Child Health Professionals, 2nd Edition. 2009.

70. Chan SCL, Tsai JSJ, King NM. Feeding and oral hygiene habits of preschool children in Hong Kong and their caregivers' dental knowledge and attitudes. Int J Paediatr Dent. 2002;12(5):322–31.

71. Hunter ML, Hood C a, Hunter B, Kingdon a. Reported infant feeding, oral hygiene and dental attendance patterns in children aged 5 years and under referred for extraction of teeth under general anaesthesia. Int J Paediatr Dent. 1997;7(4):243–8.

72. Congiu G, Campus G, Sale S, Spano G, Cagetti M, Luglie P. Early childhood caries and associated determinants: a cross-sectional study on Italian preschool children. Journal Of Public Health Dentistry [serial online]. 2014;(2):147.

73. Ooi G, Townsend G, Seow WK. Bacterial colonization, enamel defects and dental caries in 4-6-year-old mono- and dizygotic twins. Int J Paediatr Dent. 2014;24(2):152–60.

74. Seow WK. Biological mechanism of Early Childhood Caries. Community Dent oral Epidemiol 1998 26: supplement 1:8-27.

75. Bowen William H. and Lawrence Ruth A. Comparison of the Cariogenicity of Cola, Honey, Cow Milk, Human Milk, and Sucrose. Pediatrics 2005; 116; 921-926.

76. Thomson ME, Thomson CW, Chandler NP. In vitro and intra-oral investigations into the cariogenic potential of human milk. Caries Res. 1996;30:434–438.

77. Davies GN. Early Childhood Caries - A Synopsis. Community Dent Oral Epidemiol. 1998;26(1):106–16.

78. Tsai AI, Chen C-Y, Li L-A, Hsiang C-L, Hsu K-H. Risk indicators for early childhood caries in Taiwan. Community Dent Oral Epidemiol 2006; 34: 437–445.

79. Guideline on Infant Oral Health Care. Am Acad Pediatr Dent. 2014;36(6):141–6.

80. Paes Leme, H. Koo, C.M. Bellato,G. Bedi, and J.A. Cury. The Role of Sucrose in Cariogenic Dental Biofilm Formation— New Insight. J Dent Res 2006 ,85(10):878-887.

81. Rosenblatt A. and Zarzar P. Breast-feeding and early childhood caries: an assessment among Brazilian infants. International Journal of Paediatric Dentistry 2004; 14: 439–445.

82. Armfield J, Spencer A, Roberts-Thomson K, Plastow K. Water Fluoridation and the Association of Sugar-Sweetened Beverage Consumption and Dental Caries in Australian Children. American Journal Of Public Health. 2013;103(3):494-500.

83. Shelhamer A. Parental Influence on Children's Oral Health. 2004;

84. 3.University of Newcastle Dental School. Bite-Sized Tutorials: Why Plaque Forms at Specific Sites. Retrieved October 11 2009 from http://ncl.ac.uk/dental/oralbiol/oralenv/tutorials/plaquesites.htm. No Title.

85. Mohebbi SZ, Vehkalahti AMM. Early Childhood Caries and a Community Trial of its Prevention

in Tehran , Iran Supervised by : Reviewed by : Opponent : 2008.

86. Bradshaw DJ, Lynch RJM. Diet and the microbial aetiology of dental caries: new paradigms. Int Dent J. 2013;63 Suppl 2:64–72.

87. Zaki N a. a., Dowidar KML, Abdelaziz WEE. Assessment of the Healthy Eating Index-2005 as a predictor of early childhood caries. Int J Paediatr Dent [Internet]. 2014;n/a – n/a. Available from: http://doi.wiley.com/10.1111/ipd.12150

88. Yaduwanshi KR. Risk factors for adolescent caries incidence in the Iowa Fluoride Study. 2014;

89. No TitleAcquired enamel pellicle and its potential role in oral diagnostics. Siqueira WL1, Helmerhorst EJ, Zhang W, Salih E, Oppenheim FG.

90. Early Childhood Caries in children 12-24 months old in Mitchell's Plain, South Africa. 2008;(February).

91. Council O. Guideline on Caries-risk Assessment and Management for Infants , Children , and Adolescents. 2014;127–35.

92. Begzati A, Meqa K, Merita L. Mothers' Behaviours and Knowledge Related to Caries Experience of Their Children. Oral Heal Prev Dent. 2014;12(2):133–41.

93. Van Houte, J., Gibbs, G. and Butera, C. Oral Flora of Children with "Nursing Bottle Caries". Journal of Dental Research.1982; 61, 382-385.

94. Li Y, Argimón S, Schön CN, Saraithong P, Caufield PW. Characterizing Diversity of Lactobacilli Associated with Severe Early Childhood Caries : A Study Protocol. Adv Microbiol. 2015;5(January):9–20.

95. Mohan A, Morse DE, O'Sullivan DM, Tinanoff N. The relationship between bottle usage/content, age, and number of teeth with mutans streptococci colonization in 6- 24-month-old children. Community Dent Oral Epidemiol 1998; 26: 12-20.

96. Tinanoff N, Kanellis MJ, Vargas CM. Current understanding of the epidemiology mechanisms, and prevention of dental caries in preschool children. Pediatr. Dent. 2002; 24 (6): 543–51.

97. Toi , C.S, Cleaton-Jones, P.E., Daya, N.P. Mutans Streptococci and other caries-associated acidogenic bacteria in five-year-old children in South Africe. Oral Micobiology and immunology 1999: 14: 238-243.

98. Darby ML, Walsh MM. Dental hygiene theory and practice. 3rd ed. St. Louis: Elsevier, Saunders; 2010. p. 284-303.

99. Callaway, A., Kostrzewa, M., Willershausen, B., Schmidt, F., Thiede, B., Kupper, H. and Kneist, S. Identification of Lactobacilli from Deep Carious Lesions by Means of Species-Specific PCR and MALDI-TOF Mass Spectrometry. Clinical Laboratory. 2013;59, 137.

100. Li, Y., Ge, Y., Saxena, D. and Caufield, P.W. Genetic Profiling of the Oral Microbiota Associated with Severe Early-Childhood Caries. Journal of Clinical Microbiology. 2007; 45, 81-87.

101. Moynihan P, Petersen PE. Diet, nutrition and the prevention of dental diseases. Public Health Nutr [Internet]. 2004;7(1A):201–26. Available from: <Go to ISI>://WOS:000189377500007

102. N. E, Esfahanizadeh N. Dental health education programme for 6-year-olds: a cluster randomised

controlled trial. Eur J Paediatr Dent [Internet]. 2011;12(3):167–70. Available from: http://www.embase.com/search/results?subaction=viewrecord&from=export&id=L560007100\nhttp://elvis.ubvu.vu.nl:9003/vulink?sid=EMBASE&issn=1591996X&id=doi:&atitle=Dental+health+education+programme+for+6-year-olds:+a+cluster+randomised+controlled+trial.&sti

103. Clerehugh V. GUIDELINES FOR PERIODONTAL SCREENING AND MANAGEMENT OF CHILDREN AND ADOLESCENTS UNDER 18 YEARS OF AGE Guidelines produced in conjunction with the British Society of Periodontology and British Society of Paediatric Dentistry. 2012;1–25.

104. Cogulu D, Ersin NK, Uzel A, Eronat N, Aksit S. A long-term effect of caries-related factors in initially caries-free children. Int J Paediatr Dent. 2008;18(5):361–7.

105. Tiwari T, Albino J, Batliner TS. Challenges Faced in Engaging American Indian Mothers in an Early Childhood Caries Preventive Trial. 2015;2015.

106. Bedolla CK, Cheng C, Posada R. The Impact of Socioeconomic Status and How It Affects Parental Influence Over Children ' s Oral Health : Parents with Children Under the Age of 12. 2004;

107. Wondwossen F, Åstrøm a. N, Bjorvatn K, Bårdsen a. Sociodemographic and behavioural correlates of severe dental fluorosis. Int J Paediatr Dent. 2006;16(2):95–103.

108. Ferreira SH, Béria JU, Kramer PF, Feldens EG, Feldens CA. Dental caries in 0- to 5-year-old Brazilian children: Prevalence, severity, and associated factors. Int J Paediatr Dent. 2007;17(4):289–96.

109. Priyadarshini H, Puranik M, Nagaratnamma T, Hiremath S, Rudresh S. Prevalence of early childhood caries among preschool children of low socioeconomic status in Bangalore city, India. J Int Soc Prev Community Dent. 2011;1(1):27.

110. Saldunaite K, Bendoraitiene E, Slabsinskiene E, Vasiliauskiene I, Andruskeviciene V, Zubiene J. The role of parental education and socioeconomic status in dental caries prevention among Lithuanian children. Department of Preventative and Pediatric Dentistry, Medical Academy, Lithuanian University of Health Sciences, Kaunas, Lithuanian [internet]. 2015;50(6):156–61.

111. Kagihara L, Niederhauser V, Stark M. Assessment, management, and prevention of early childhood caries. Journal Of The American Academy Of Nurse Practitioners.2014;21(1):1-10.

112. Chi D, Masterson E, Carle A, Mancl L, Coldwell. S. Socioeconomic Status, Food Security, and Dental Caries in US Children: Mediation Analyses of Data From the National Health and Nutrition Examination Survey, 2007-2008. American Journal Of Public Health[serial online]. May 2014;104(5):860-864.

113. Schroth RJ, Cheba V. Determining the Prevalence and Risk Factors for Early Childhood Caries in A Community Dental Health Clinic. Pediatri Dent 2007; 29 (5): 387-396.

114. Al-Hosani E, Rugg-Gunn A. Combination of low parental educational attaintment and high parental income related to high caries experience in pre-school children in Abu Dhabi. Community Dent Oral Epidemiol 1998; 26: 31-36.

115. Reisine S, Tellez M, Willem J, Sohn W, Relationship IA. Relationship between caregiver's and child's caries prevalence among disadvantaged African Americans. Community Dent Oral Epidemiol. 2008;36(1):191–200.

116. 24/01/01. 15.Gould M. Snapshot survey reveals huge task of improving ethnic health. HSJOnLine. No Title.

117. 10.Watson MR, Horowitz AM, Garcia I, Canto MT. Caries conditions among 2-5-year-old immigrant Latino children related to parents' oral health knowledge opinions and practices. CDOE 1999; 27: 8–15. No Title.

118. Jorysz S. Leeds Children and Young People: Oral Health Promotion Health Needs Assessment 2014. 2014;(October):1–148. Available from: http://observatory.leeds.gov.uk/resource/view?resourceId=4128

119. Al-Omiri MK, Al-Wahadni AM, Saeed KN. Oral health attitudes, knowledge, and behavior among school children in North Jordan. J Dent Educ. 2006;70(2):179–87.

120. Arrow P, Raheb J, Miller M. Brief oral health promotion intervention among parents of young children to reduce early childhood dental decay. BMC Public Health. 2013;13(1):1-9.

121. Wagner Y, Heinrich-Weltzien R. Pediatricians' oral health recommendations for 0- to 3-year-old children: results of a survey in Thuringia, Germany. BMC Oral Health [Internet]. 2014;14:44. Available from: http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=4021417&tool=pmcentrez&rendertype=abstract

122. PREVENTION OF EARLY CHILDHOOD CARIES THROUGH TRAINING IN PARENTAL TOOTHBRUSHING AND FLUORIDE VARNISH APPLICATION. 2013;

123. Sdcep. Prevention and Management of Dental Caries in Children Guidance in Brief. Heal (San Fr. 2010;(April).

124. Sdcep. Prevention and Management of Dental Caries in Children. Scottish Dent Clin Eff Program [Internet]. 2010;(April). Available from: www.sdcep.org.uk/index.aspx?o=2866?

125. Scottish Intercollegiate Guidelines Network (SIGN). SIGN 138 • Dental interventions to prevent caries in children. 2014;(March). Available from: http://www.sign.ac.uk

126. H. Nazzal , M. S. Duggal , M. B. Kowash , J. Kang KJT. Comparison of residual salivary fluoride retention using amine fluoride toothpastes in caries-free and caries-prone children. Eur Arch Paediatr Dent.

127. American Academy of Pediatrics: A Pediatric Guide to Children's Oral Health. Elk Grove Village: American Academy of Pediatrics; 2009.

128. Bottenberg P, Van Melckebeke L, Louckx F, Vandenplas Y: Knowledge of paediatricians about children's oral health – results of a survey. Acta Paediatr 2008, 97:959–963.

129. Chestnutt, IG, Schafer, F, Jacobsen, APM, et al. No Title.

130. Board HR. Strategies To Prevent Dental Caries in Strategies To Prevent. 2009;

131. Subramaniam P, Prashanth P. Prevalence of early childhood caries in 8-48 month old preschool chil- dren of Bangalore city, South India. Contemp Clin Dent 2012; 3:15–21.

132. Ismail AI. Determinants of Health in Children and the Problem of Early Childhood Caries. Pediatr Dent. 2003;25(4):328–33.

133. Committee O, Council R. Guideline on fluoride therapy. Pediatr Dent [Internet]. 2008;35(5):E165–8. Available from: http://www.ncbi.nlm.nih.gov/pubmed/24290545

134. American Academy of Pediatric Dentistry: Guideline on fluoride therapy. Internet 2015. http://www.aapd.org/media/Policies_Guidelines/G_fluoridetherapy.pdf.

135. Rozier RG, Adair S, Graham F et al. E clin-, Dietary ical recommendations on the prescription of, Scientific fluoride supplements for caries prevention: A report of the ADAC on, 2010;141(12):1480-9. AJADA. No Title.

136. Twetman S. Prevention of early childhood caries – a review of literature published 1998–2007. Eur Arch Paediatr Dent 2008;9:12–8.

137. Kowash MB, Pinfield A, Smith J CM. Effectiveness on oral health of a long-term health education programme for mothers with young children. Br Dent J. 188:201–4.

138. Lara Mayze AM. A Preventative Approach to Oral Health for Children in a Regional/Rural Community in South-West Victoria, Australia. Dentistry [Internet]. 2015;05(07). Available from: http://www.omicsonline.org/open-access/a-preventative-approach-to-oral-health-for-children-in-a-regionalrural-community-in-southwest-victoria-australia-2161-1122-1000313.php?aid=55156

139. Belinda V, Melara a, Saez S, Bellet L, Salone LR, Vann WF, et al. Effectiveness of an oral health program for mothers and their infants. Int J Paediatr Dent [Internet]. 2014;144(2):1–6. Available from: http://www.ncbi.nlm.nih.gov/pubmed/24393627\nhttp://www.gacetadental.com/wp-content/uploads/OLD/pdf/221_CIENCIA_Lactancia_materna.pdf\nhttp://cataleg.ub.edu/record=b1660429~S1*spi\nhttp://cataleg.ub.edu/record=b1751366~S1*spi\nhttp://jada.ada.org/content/

140. Vargas CM, Monajemy N, Khurana P, Tinanoff N: Oral health status of preschool children attending Head Start in Maryland, 2000. Pediatr Dent 2002, 24:257-63.

141. Pullen H, Sitorius M a, Electra D. Need for Primary Care Providers to Carry out Annual Oral Cancer Examinations. 2015;2(2).

142. No Title. Tala HAssignment Rep oral Heal United Arab Emirates, 29 December 1995–12 January 1996 WHO Reg Off East Mediterr Rep number 171,1996.

143. Students. AO health program for RAK, Http://www.albayan.ae/across-theuae/ A 23 F 2009., 1st 1233756456644-2009-02-23-1.408484 (accessed, 2013). D. No Title.

144. Pine CM, Adair PM, Burnside G, Nicoll AD, Gillett A, Aida Borges-Yáñez S et al. Barriers to the treatment of childhood caries perceived by dentists working in different countries. Community Dent Heal. 2004;21(1 SUPPL.

145. Holst D. Causes and prevention of dental caries: a perspective on cases and incidence. Oral Health Prev Dent. 2005;3(1):9–14.

146. Oredugba F, Agbaje M, Ayedun O, Onajole A. Assessment of Mothers ' Oral Health Knowledge : Towards Oral Health Promotion for Infants and Children. 2014;(April):908–15.

147. Nelson JD. By Word of Mouth : A Qualitative Approach to Understanding the Integration of Preventive Dental Health in Primary Care Settings by. 2015;

148. Kamil MA, El-ameen NM, Madkhaly SH, Alshamarry TH, Hakami RU, Nassir EM. Knowledge and attitude of Saudi mothers towards health of primary teeth. 2015;7(July):107–12.

149. S. K, S. S. Oral health knowledge, attitude and practices of parents attending Prince of Songkla University dental hospital. Int J Heal Promot Educ [Internet]. 2007;45(4):111–3. Available from: http://www.embase.com/search/results?subaction=viewrecord&from=export&id=L350200327

150. Jain R, Oswal K, Chitguppi R. Knowledge, attitude and practices of mothers toward their children′s oral health: A questionnaire survey among subpopulation in Mumbai (India). J Dent Res Sci Dev [Internet]. 2014;1(2):40. Available from: http://www.iadrsd.org/wp-content/journal/JDRSD_4_14R11.pdf

151. Parental Attitudes and Tooth Brushing Habits in Preschool Children in Mangalore , Karnataka : A Cross-sectional Study. :156–60.

152. Mohebbi SZ, Virtanen JI, Murtomaa H, Vahid-Golpayegani M, Vehkalahti MM. Mothers as facilitators of oral hygiene in early childhood. Int J Paediatr Dent. 2008;18(1):48–55.

153. Franzman MR, Levy SM, Warren JJ, Broffitt B. Ages 6 to 60 Months. :87–92.

154. Olak J. DENTAL HEALTH IN PRESCHOOL AND SCHOOLCHILDREN IN RELATION TO DENTAL FEAR AND FEAR-RELATED FACTORS , AND THE OUTCOME OF A CARIES PREVENTION by. 2013.

155. Fleming P. Timetable for oral prevention in childhood—a current opinion. Prog Orthod [Internet]. Progress in Orthodontics; 2015;16(1):27. Available from: http://www.progressinorthodontics.com/content/16/1/27

156. Committee O, Council R. Policy on Dietary Recommendations for Infants , Children , and Adolescents. 2007;(6):39–40.

157. Armitage GC. Periodontal diseases of children and adolescents. CDA J. 1986;14(12):57–61.

158. Group O. Treatment of Plaque-induced Gingivitis , Chronic Periodontitis , and Other Clinical Conditions. 2004;(6):366–75.

159. Oliveira ACB, Paiva SM, Campos MR, Czeresnia D. Factors associated with malocclusions in children and adolescents with Down syndrome. Am J Orthod Dentofac Orthop. 2008;133(4):1–8.

160. Warren JJ, Slayton RL, Bishara SE, Levy SM, Yonezu T, Kanellis MJ. Effects of nonnutritive sucking habits on occlusal characteristics in the mixed dentition. Pediatr Dent. 2005;27(6):445–50.

161. Shaughnessy T, Shire LH. Etiology of Class II malocclusions. Pediatr Dent. 1988;10(4):336–8.

162. Kowash MB. Severity of early childhood caries in preschool children attending Al-Ain Dental Centre, United Arab Emirates. Eur Arch Paediatr Dent. 2015;16(4):319–24.

163. Woodall J, Woodward J, Witty K, McCulloch S. An evaluation of a toothbrushing programme in schools. Health Educ [Internet]. 2014;114(6):414–34. Available from: http://www.emeraldinsight.com/doi/abs/10.1108/HE-12-2013-0069

164. Wulaerhan J, Abudureyimu A, Bao X-L, Zhao J. Risk determinants associated with early childhood caries in Uygur children: a preschool-based cross-sectional study. BMC Oral Health [Internet]. 2014;14(1):136. Available from: http://www.biomedcentral.com/1472-6831/14/136

165. Szatko F, Wierzbicka M, Dybizbanska E SI, And IEO health of P three‐year‐olds, Health mothers' oral health‐related knowledge. CD, 2004;21:175‐80. No Title.

166. Williams NJ, Whittle JG GAT relationship between, And socio‐demographic characteristics and dental health knowledge, 2002;193:651‐4 attitudes of parents with young children. BDJ. No Title.

167. Kim Seow W. Environmental, maternal, and child factors which contribute to early childhood caries: A unifying conceptual model. Int J Paediatr Dent. 2012;22(3):157–68.

168. M. B. Kowash. Severity of early childhood caries in preschool children attending Al-Ain Dental Centre, United Arab Emirates. Eur Arch Paediatr Dent. 16:319–324.

# Appendix

Appendix I: Ethical approval from HBMCDM Research Ethics Committee

Appendix II: Study Consent sheets to be signed by parents/legal guardians

Appendix III : The original questionnaire form

Appendix VII :  Arabic translated questionnaire form

# Appendix I

Hamdan Bin Mohammed
College of Dental Medicine
Mohammed Bin Rashid UMHS

كلية حمدان بن محمد لطب الأسنان
جامعة محمد بن راشد للعلوم الصحية

***Athanasios E. Athanasiou, D.D.S., M.S.D., Dr. Dent.***
*Acting Dean*
*Professor & Program Director in Orthodontics*
*Hamdan Bin Mohammed College of Dental Medicine*

Ref: HBMCDM/EC/2020
Date: September 10, 2015

Dr. Noura Mohamed Juma
Resident, Paediatric Dentistry Department
Hamdan Bin Mohammed College of Dental Medicine
PO Box 505097
Dubai Healthcare City
Dubai

**Title of project:** Knowledge, attitude, and practices of parents toward their children's oral health: A questionnaire survey among a subpopulation in Dubai and Northern Emirates
**Reference: EC0815-001**

Dear Dr. Noura,

Thank you for submission of your proposal for approval to the Ethics Committee.

On behalf of the Committee, I am pleased to confirm a favourable ethical opinion, effective 9th September, 2015, on the basis described in the application form.

The proposal is approved pending approval by the Institution where the research is conducted. Informed consent is required from the parents who participate in the project.

Yours sincerely,

Professor Athanasios E. Athanasiou
Chairman, Research &Ethics Committee

Hamdan Bin Mohammed
College of Dental Medicine
Mohammed Bin Rashid UMHS
Athanasios E. Athanasiou
DDS, MSD, Dr Dent
DHCC License Number : DS0132-12
Signature

# Appendix II

**استمارة الموافقة**

هذا البحث تقوم به د. نورة محمد جمعة – طبيب مقيم في قسم أسنان الأطفال في كلية حمدان بن محمد لطب الأسنان - دبي

موضوع البحث: استبيان لتقييم معارف,مواقف وممارسات الوالدين تجاه صحة أسنان أطفالهم.

المشاركون: من اجل التأهل للإجابة على الاستبيان , يجب ان تكون احد الوالدين أو الوصي على الطفل ,على أن يكون الطفل في مرحلة ما قبل دخول المدرسة.

نتوقع ان يشارك 750 شخص في هذه الدراسة.

الاجراء:يمكنك ملءالاستبيان عن طريق حوار مباشرمع طبيب الاسنان , الجزءالاول من الاستبيان يتكون من معلومات عامة مثل عمروجنس الطفل بالإضافة الى المستوى التعليمي للآباء و الأمهات و الوظيفة. الجزءالثاني من الاستبيان, ويتألف من 29 سؤال مقترن بالمعرفة والمواقف والممارسات تجاه الاطفال وصحة الفم. استيفاءالاستبيان يستغرق حوالى 20 الى 30 دقيقة. المشاركة في هذه الدراسة اختياري تماما, اذا كانت هناك اية اسئلة لا تريد الإجابة عنها يمكنك تركها بدون أجابه.

المخاطروالفوائد: لاتوجد مخاطر معروفة مرتبطة بهذه الدراسة. النتائج التي سيتم التوصل اليها ستلعب دورا مهما في تحديد الاهداف المناسبة التي من الممكن أن تساهم في تخطيط برامج الصحة الفموية الوقائية التي ستساعد في الحد من انتشارتسوس الاسنان في الامارات.

المشاركة اختيارية:وهذا يعنى انه يمكنك ان تقررعدم المشاركة. لك كامل حرية الانسحاب من الدراسة في أي وقت دون تحمل أي أثار مترتبة عليها.

السرية: المعلومات التي يتم الحصول عليهامن هذه الدراسة سرية, أي معلومات يمكن استخدامها للتعرف عليك او على طفلك سيتم حفظها بسرية تامة.

موافقة: لقد قرات وفهمت المعلومات المذكورة اعلاه, أوافق على المشاركة في الدراسة .في حال كانت عندي اية أسئلة يمكنني التواصل مع الباحث : د.نورة محمد جمعة على الرقم :0507765199 او عن طريق البريد الإلكتروني

Noura.mahmoud@hbmcdm.ac.ae

أو التواصل مع المشرف د.منال الحلبي – مسؤوول قسم طب أطفال الأسنان في جامعة حمدان بن محمد لطب الأسنان- دبي

Manal.elhalabi@hbmcdm.ac.ae

التوقيع:

## Appendix III

**DATA COLLECTION SHEET**

Child name: …….

Child Medical file No.: ☐☐☐☐☐☐☐☐☐☐☐☐

Gender: ☐ Male ☐ Female

Child Date of birth : d/d☐☐ m/m☐☐ y/y☐☐☐☐

Mother's age:
Educational level: ☐None ☐primary education ☐Secondary education ☐Tertiary education
Occupational Status : ☐Unemployed ☐student ☐Businesswomen ☐Professional

Father's age:
Educational level: ☐None ☐primary education ☐Secondary education ☐Tertiary education
Occupational Status: ☐Unemployed ☐student ☐Businessman ☐Professional

## Knowledge:

1-How many milk teeth does a normal child have in his mouth ?
10☐ 12☐ 20☐ 28☐ ☐I don't know

2-Does the tooth paste you are using for your child contain fluoride?
Yes☐ No☐ ☐I don't know

3-what is the role of the fluoride in the tooth paste?
Prevents tooth decay ☐ Prevents gum problems ☐ Gives freshness ☐ I don't know☐

4-What is the most common dental disease in children?
Tooth decay☐ Bleeding gums☐ Discolored tooth☐ ☐I don't know

5-Which of the following food items can lead to tooth decay?
Chocolates ☐ Bakery products ☐ Soft drinks☐ all of the above☐ ☐I don't know

6-Which of the following do you think prevents tooth decay?
Restricting sweets☐ Tooth brushing ☐ Regular dental visits☐ Fluoridated tooth paste ☐ All the above

7-what are the causes for gum disease?
Improper brushing☐ Tatar☐ all of the above☐ ☐I don't know

8-Which of the following do you think prevents the gum disease?
Regular brushing and mouth wash☐ Professional cleaning ☐ All the above☐ I don't know☐

9-Which of the following can lead to irregular teeth?
Thumb sucking /tongue/thrusting /mouth breathing ☐ Runs in family ☐ All of the above☐ I don't know☐

10-Can irregularly placed teeth be aligned in the correct position?
Yes ☐ No☐ ☐I don't know

## Attitude

1-It is necessary to take the child for regular dental visits?
Agree☐ Uncertain ☐ Disagree☐

2-Cleaning of the child teeth should be by mothers?
Agree☐ Uncertain ☐ Disagree☐

3-It is necessary to clean the child's teeth after every meal?
Agree☐ Uncertain ☐ Disagree☐

4-Good oral health is related to good general health
Agree☐ Uncertain ☐ Disagree☐

5-Healthy milk teeth are essential for children to chew the food properly
Agree☐ Uncertain ☐ Disagree☐

## Practice

1-When was your child's first dental visits?
6months after birth☐ After eruption of first milk tooth ☐ 1 year after birth ☐ not yet visited ☐

2-When do you take your child to visit the dentist?
Only during problems☐ every 6 months ☐ every year☐ not regular☐

3-When did you commence the cleaning of your child's teeth?
Soon after first milk tooth eruption ☐ After 4-6 milk teeth eruption☐ After all milk teeth eruption ☐ After birthday of the child ☐ Don't remember ☐

4-How many times do you brush your child's teeth?
Once in a day ☐ Twice in a day ☐ After every meal ☐ not regular☐

5-When do you change your child's tooth brush?
Once in 15 days☐ Once in a month☐ Every 2-3 months☐ Once the bristles fray out☐ not regular☐

6-At what time do you give the sugary food items to your child?
With meals☐ In between meals☐ Before going to bed ☐ Not regular☐

ملحق (1): صحيفة جمع بيانات

أنثى☐ ذكر☐الجنس:

تاريخ ميلاد الطفل: يوم☐☐ ☐☐شهر ☐☐☐☐سنة

عمر الأم: 50 -59☐ ☐49 – 40 ☐39 – 30 ☐ 29 – 20

50 عمر الأب: -59☐ ☐49 – 40 ☐39 – 30 ☐ 29 – 20

جامعية المستوى التعليمي (للأم):☐ تعليم ثانوي☐ تعليم أساسي☐ غير متعلّمة☐

المستوى التعليمي (للأب): جامعي☐ تعليم ثانوي☐ تعليم أساسي☐ غير متعلّم ☐

الوضع الوظيفي (للأم): موظفة☐ سيدة أعمال☐ طالبة ☐ غير موظفة☐

الوضع الوظيفي (للأب): موظف☐ رجل أعمال☐ طالب ☐ غير موظف☐

## معلومات:

**1)** كم عدد الأسنان اللبنيّة في فم طفلك؟
لا أعلم☐ ☐28 ☐20 ☐12 ☐10

**2)** هل يحتوي معجون الأسنان على عنصر الفلوريد؟
لا أعلم☐ ☐لا ☐نعم

**3)** ما هي وظيفة عنصر الفلوريد في معجون الأسنان؟
لا أعلم☐ ☐يمنح الانتعاش ☐يمنع مشكلات اللثة ☐يمنع تسوس الأسنان

**4)** ما هي مشاكل الأسنان الأكثر شيوعًا لدى الطفل؟
لا أعلم☐ ☐تغيّر لون الأسنان ☐نزيف اللثة ☐تسوس الأسنان

**5)** أيّ من العناصر الغذائية التالية يؤدّي إلى تسوّس الأسنان؟
لا أعلم☐ ☐جميع ما سبق ☐المشروبات الغازية ☐منتجات الخبز ☐الشوكولاتة

**6)** أيّ مما يلي تعتقد أنّه يمنع تسوّس الأسنان؟
معاجين الأسنان ☐زيارة طبيب الأسنان بصفة دورية ☐ غسل الأسنان بالفرشاة ☐الحد من تناول الحلويات
جميع ما سبق☐ المحتوية على عنصر الفلوريد

**7)** أسباب التهاب اللثة؟
لا أعلم ☐ ☐جميع ما سبق ☐ الجير ☐عدم غسل الأسنان بالفرشاة بشكل جيّد

أيّ مما يلي تعتقد أنّه يمنع الإصابة بأمراض اللثة؟
لا أعلم☐ ☐ جميع ما سبق ☐ التنظيف في عيادة الأسنان☐انتظام غسل الأسنان بالفرشاة وغسل الفم

**8)** أيّ مما يلي يمكن أن يُسبّب عدم انتظام اصطفاف الأسنان؟
لا أعلم☐ ☐ جميع ما سبق ☐بسبب الوراثة ☐مصّ الإبهام / دسر اللسان / التنفس عن طريق الفم

## الموقف:

**1)** يُعدّ ضروريًا اصطحاب طفلك في زيارات دورية منتظمة إلى طبيب الأسنان؟
☐لا أوافق ☐غير متأكّد ☐أوافق

**2)** يجب على الأم المساعدة و الإشراف بشكل مباشر على عملية تنظيف أسنان الطفل؟
☐لا أوافق ☐غير متأكّد ☐أوافق

**3)** يعدّ ضروريًا تنظيف أسنان الطفل بعد تناول كل وجبة غذائية؟
☐لا أوافق ☐غير متأكّد ☐أوافق

**4)** ترتبط صحة الفم الجيّدة بسلامة الصحة العامة؟
☐لا أوافق ☐غير متأكّد ☐أوافق

**5)** تعدّ الأسنان اللبنيّة الصحية مهمّة للأطفال لمضغ الطعام بشكل جيّد؟
☐لا أوافق ☐غير متأكّد ☐أوافق

## ممارسة:

**1)** متى كانت أول زيارة لطفلك إلى طبيب الأسنان؟
☐لم يزره حتى الآن ☐ بعد 1 سنة من ولادته ☐بعد بروز أول سنّة لبنيّة ☐بعد 6 شهور من ولادته

**2)** متى يجب اصطحاب طفلك لزيارة طبيب الأسنان؟
☐ليس بصفة دورية ☐كل سنة ☐كل 6 أشهر ☐عند ظهور مشاكل فقط

**3)** متى بدأتي تنظيف أسنان طفلك؟
بعد بزوغ جميع ☐بعد 4-6 شهور من بزوغ الأسنان اللبنية ☐بعد فترة وجيزة من بزوغ أول الأسنان اللبنيّة
☐ لا أتذكّر ☐الأسنان اللبنيّة

**4)** كم عدد المرّات التي تفرشين فيها أسنان طفلك؟
☐ليس بشكل منتظم ☐بعد كل وجبة غذائية ☐مرتين يوميًا ☐مرة يوميًا

**5)** متى تغيّرين فرشاة أسنان طفلك؟
☐بمجرّد أن تبلى شعيرات الفرشاة ☐كل 2-3 شهور ☐مرة كل شهر ☐مرة كل 15 يوم
☐ليس بصفة منتظمة

**6)** في أي وقت تُطعمين طفلك أصناف الطعام السكريّة؟
ليس بصفة ☐قبل الخلود إلى النوم ☐فيما بين الوجبات الغذائية ☐مع الوجبات الغذائية
☐منتظمة