

National Survey of the Oral Health Status of School Children in Dubai, UAE

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Abstract

Objective: The aim of this survey was to determine the caries prevalence and dmft/DMFT of school children in Dubai.

Method: A multistage cluster sampling was used to select children in three age groups 5 - 6 years, 12 - 15 years and 15 - 17 years old, who were enrolled in public and private schools. Oral screening for dmft/DMFT was conducted by examiners using WHO criteria and dental mobile vans.

Results: The total number of children sampled was 5617, of whom 1317 were group one (5 - 7 years), 2237 group two (12 - 14 years) and 2063 group three (15 - 17 years).

The prevalence of caries (defined as dmft > 0) in the three groups was 65.1%, 59.2% and 65.9%, respectively. Mean dmft/DMFT scores in the three groups were 3.87, 1.83 and 2.70, respectively ($P < 0.05$). Caries free children were the highest among the second group with 58.4%.

Conclusion: Caries prevalence in school children in Dubai is high. A well structured plan for a prevention program is required.

Keywords: Caries Prevalence; dmft; Mobile Vans; Oral Health; School Children

Abbreviations

DMFT: Decayed, missing, filled, teeth; WHO: World Health Organization; KHDA: Knowledge and Human Development Authority

Introduction

There is a growing interest in the dental problems of public health concern worldwide. The World Health Organization (WHO) considers caries, periodontal diseases, loss of teeth, oral cancers, and trauma as major causes of health burdens [1, 2]. Of note, dental cavities can be found in 60 - 90% of children of school-going age [3]. Not only is there an alarmingly high prevalence of dental disorders worldwide, but there is also sufficient evidence to suggest that the benefits of the current interventions aimed at reducing this burden are not reaching the populations at risk [4]. There may be several reasons for the rising trends in the dental diseases, including the use of bottled water, dietary changes, and immigration [4]. These problems are particularly apparent in the developing countries [2].

In similarity with the global trend, surveys in the United Arab Emirates (UAE) [5,6], which is a developing country, have also revealed a startlingly high prevalence of various dental diseases. Surveys have revealed that 83% of children aged 5 years are affected by caries; and 52% have 4 or more decayed, missing or filled teeth (dmft). In a study conducted in Abu Dhabi, an Emirate within the UAE, the mean dmft score was recorded at 8.4, 8.6, and 5.7 for children aged 5 years in various regions of the Emirate [7]. Data from these studies highly suggest that there is an urgent need for action to counter the wide spread dental diseases in the UAE.

The WHO has suggested a number of cost-effective and holistic interventions to counter the increasing prevalence of dental diseases [8]. As a pre-requisite for designing any effective intervention, it is paramount that robust data must be available regarding the prevalence of the dental diseases. This survey concentrates on the Emirate of Dubai – another one of the Emirates within the UAE. There is a growing number of families moving to live in the Emirate of Dubai. The Dubai statistics center has noted an increase of 3% in the population in the age range of 5 - 9 years, a similar increase in the population between 10 - 14 years old, and around 2% in the population between 15 - 19 years old within the past eight years [9]. Immigration is known to be one of the factors contributing to the increasing prevalence of dental diseases worldwide [4], so it becomes particularly important to focus on Dubai.

The objective of this study is to determine the prevalence of decayed, missing and filled deciduous and permanent teeth (dmft/DMFT) among preschool and school-going children aged 5, 12, and 15 years, with consideration to important socio-behavioral risk factors such as age, gender, and demographics of the city of Dubai. Data will subsequently be useful for the purpose of surveillance of changing trends and patterns of disease, prevalence and degree of dental fluorosis, and designing effective interventions to reduce the prevalence of dental diseases. This study provides an overarching picture of oral health among school-going children in Dubai, and uses dental health statistics collected during the 2013 school year to identify the dental care needs of the children. This will help in identifying the community requirements across Dubai, and improving programme planning and evaluation. As a result, health promotion activities and clinical interventions can be utilized to affect behavior change and improve oral health for all.

Materials and Methods

Study Design

In 2013, the Dubai Health Authority (DHA) employed a multistage cluster technique from the representative schools in Dubai to produce a sample of Preschool and school-going children aged 5 - 7 years, 12 - 14 years, and 15 - 17 years (Grades KG1 and Grade1; Grade 7 and 8; Grade 10 and 11, respectively). Cluster sampling is a useful technique that allows the researchers to randomly select a sample of subjects from each pre-defined unit of area; thereby avoiding the need for sampling the entire population of interest, which may be expensive and unnecessary [10]. Sampling for this study was conducted according to a three-stage cluster technique. The first stage involved geocoding the map of Dubai – the locations of all the schools in Dubai were marked on the map. In the second stage, the map was used to identify the main areas of Dubai, which were Deira, Bur Dubai, and other areas as Lusaily and Hatta (now on mentioned as “others”). This produced a map showing all the schools within the three main areas of Dubai. To select the clusters to be included in the study, the third stage identified those that represented both the governmental and private schools; and thereafter chose only those schools that represented the three age groups and both genders. Speaking in terms of the variables that may affect the oral health status of children, there are no known differences between the three main areas of Dubai.

According to the previous National Survey conducted in the UAE during the years 2001 - 2002 [6], the prevalence of dental caries among the children aged 5, 12, and 15 years was 89%, 48%, and 65%, respectively. Using this prevalence, with a desired precision of 2% and 95% confidence limit, the minimum sample size for the age groups was calculated to be 1317, 2237, and 2063 respectively; thereby giving a sample size of 5617. These were calculated using the computer program EPI- info version 6.04. Guidelines by the WHO for conducting oral health surveys suggest that the number of subjects in each age group or other unit of analysis (e.g. gender) should at least be 50 [11]. The list of students enrolled at each school was obtained from the school register list. Every tenth student on the school register list was chosen for oral examination and inclusion in this study.

Necessary approvals were obtained from the Ethical Committee and the other relevant authorities. These included the school administrations through the school regulatory body (Knowledge and Human Development Authority -KHDA), which is responsible for overseeing the private schools in Dubai, and the Ministry of Education (Dubai Educational Zone), which is concerned with regulating the governmental schools. Written informed consent was obtained from each child's parents or guardians for the oral examination and data collection.

Standardization of examiners

Three dentists and three dental hygienists conducted the examination. To ensure appropriate examination skills and uniformity between the examiners, training sessions were conducted at the beginning of the school year, and a follow-up session before the start of the programme. The training sessions included thorough teaching regarding the examination of deciduous and permanent teeth, and infection control practices. Each examiner re-examined a 10% sample of children in order to assess the examiner reproducibility; this was expressed as the reliability coefficient for the dmft index [11], which was calculated for each examiner. Similar reliability coefficients were also calculated for all other clinical features as well.

Examination of children

The children were examined in a supine position on a dental chair in mobile dental units. All examinations were carried out under the dental chair light (led) and standard infection control procedures were used. Hand washing and appropriate use of gloves was regularly employed, and all disposable instruments were discarded after every examination, as is the standard practice. No special cleaning of the teeth was done before the examination. A plane mouth mirror (number 4) and a blunt explorer (0.5 mm diameter tip) were used during the examination. The examination was principally visual. The explorer was used for removal of plaque and debris, and as a diagnostic aid for proximal and fissure sites. Dental caries was diagnosed using the WHO criteria, whereas teeth were recorded as decayed if found in the cavitation stage (detectable softened floor, undermined enamel, or softened wall) [10]. Sticky fissures or pre-cavitation lesions were recorded as sound [11].

Fluorosis was measured based on the Dean's classification system. This system categorizes the level of fluorosis into six, ranging from normal to severe. An individual's fluorosis score is based on the most severe form of fluorosis found on two or more teeth [12]. Bleeding on probing was also recorded by noting whether bleeding was seen on gentle probing with no more than 20 gm pressure. All sextants were measured as well. Bleeding was recorded as present when it was apparent immediately after the removal of the probe [11]. Pocketing and presence of calculus was not examined for this survey.

Data handling

The modified WHO form was used to document the variables (figure one). The data on the DMFT/dmft were recorded on the form for decayed, missing, and filled teeth. The degree of fluorosis and bleeding on probing was reported on a Microsoft Excel 2007 spreadsheet. The recorded data was checked for completion and then entered into the SPSS, version 16 for statistical analysis.

Results and Discussion

Group one (5 - 7 years)

Demographics of the sample population

The sample population consists of 1317 children. Of these, 16% were enrolled in government schools, and 84% in private schools. In terms of the three areas of Dubai, 54.6% were from Deira, 41.5% from Bur Dubai, and 3.9% from the other areas (Lusaily and Hatta) (Table 1).

| Socio-demographic characteristics | Group 1 (n = 1217) | % | Group 2 (n = 2237) | % | Group 3 (n = 2063) | % |
|-----------------------------------|-----------------------|------|-----------------------|------|-----------------------|------|
| Area | | | | | | |
| Deira | 664 | 54.6 | 1045 | 46.7 | 1243 | 60.3 |
| Bur Dubai | 505 | 41.5 | 1099 | 49.1 | 686 | 33.3 |
| Others | 48 | 3.9 | 93 | 4.2 | 134 | 6.5 |
| Type of School | | | | | | |
| Government | 195 | 16.0 | 562 | 25.1 | 640 | 31.0 |
| Private | 1022 | 84.0 | 1675 | 74.9 | 1423 | 69.0 |
| Gender | | | | | | |
| Male | 527 | 43.3 | 1087 | 48.6 | 689 | 33.4 |
| Female | 690 | 56.7 | 1150 | 51.4 | 1374 | 66.6 |

Table 1: Distribution of school students involved in the study according to background characteristics, Dubai, 2013.

Dental Caries

In this analysis, the severity of dental caries in deciduous teeth was measured by the prevalence of caries experience, no obvious decay rate and the cumulative index of dmft, where the index components were decayed (d), missing (m), and filled (f) teeth.

Twelve of the students in this group had more than three missing teeth; whereas 3% had more than 5 filled teeth. In the age group of 5-7 years, 60.3% of the students were diagnosed with decay; 7.5% with missing teeth; and 21.6% with fillings. The mean dmft was 3.87 (Table 2).

| Health status of teeth | No | % | Prevalence of caries experience (% affected) |
|--------------------------------|-------------|------|---|
| Number of decayed teeth | | | |
| 0 | 483 | 39.7 | 60.3 |
| < 5 | 384 | 31.6 | |
| 5- | 239 | 19.6 | |
| 10+ | 111 | 9.1 | |
| - X ±SE | 3.18 ± 0.11 | | |
| Number of missed teeth | | | |
| 0 | 1126 | 92.5 | 7.5 |
| 1 | 63 | 5.2 | |
| 2 | 16 | 1.3 | |
| 3+ | 12 | 1.0 | |
| - X ±SE | 0.12 ± 0.02 | | |
| Number of filled teeth | | | |

| | | | |
|------------------|-------------|------|------|
| 0 | 954 | 78.4 | 21.6 |
| 1- | 159 | 13.1 | |
| 3- | 67 | 5.5 | |
| 5+ | 37 | 3.0 | |
| - | | | |
| X ±SE | 0.58 ± 0.04 | | |
| DMF index | | | |
| 0 | 425 | 34.9 | 65.1 |
| 1- | 220 | 18.1 | |
| 3- | 139 | 11.4 | |
| 5- | 110 | 9.0 | |
| 7- | 114 | 9.4 | |
| 9- | 83 | 6.8 | |
| 11- | 126 | 10.4 | |
| - | | | |
| X ±SE | 3.87 ± 0.13 | | |

Table 2: Distribution of Group 1 (5 - 6 years) according to health status of teeth as indicated by oral health examination, Dubai 2013.

Untreated Caries

Slightly more than 60% of the children screened had untreated caries in this age group. When stratified by the number of teeth involved, 9.1% had a dmft > 10. The results were further analyzed based on the demographics and gender. The results show that the areas of Lusaily and Hatta had the highest percentage of untreated caries. A comparison between government and private schools revealed that 58.3% of the students in government schools had 4 or more decayed teeth without treatment; whereas this percentage was 50.8% in private schools. There was no significant difference between male and female students (Figure 1).

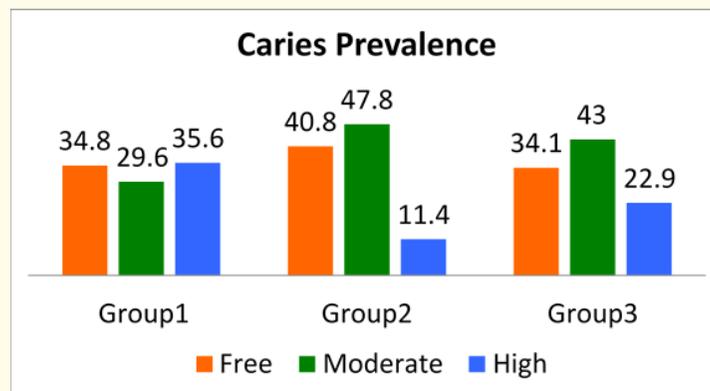


Figure 1: Distribution of caries prevalence among the schoolchildren Dubai, 2013.

Group two (12 - 15 years old)**Demographics of the sample population**

The sample population of this age group was 2237, of which 562 (25.1%) children were enrolled in government schools, with the remaining 1675 (74.9%) in private schools. There was a higher number of female children in this group (51.4%) (Table 1).

Dental Caries

Of a total of 2237 students in this group, 58.4% had no obvious decay. Students screened in this age category had 41.6% teeth affected by decay. Similarly, private schools had a much higher percentage of students with no obvious decay (65%). In comparison, there were 40% students with no obvious decay in the government schools. In this group, 41.65% of the students had decay, 7% had missing teeth, and 29.4% had a filling or more. The mean DMFT was 1.83 (Table 3).

| Health status of teeth | No | % | Prevalence of caries experience (% affected) |
|--------------------------------|-------------|------|--|
| Number of decayed teeth | | | |
| 0 | 1306 | 58.4 | 41.6 |
| <5 | 818 | 36.6 | |
| 5- | 94 | 4.2 | |
| 10+ | 19 | 0.8 | |
| - X ±SE | 1.03 ± 0.04 | | |
| Number of missed teeth | | | |
| 0 | 2080 | 93.0 | 7 |
| 1 | 99 | 4.4 | |
| 2 | 36 | 1.6 | |
| 3+ | 22 | 1.0 | |
| - X ±SE | 0.12 ± 0.01 | | |
| Number of filled teeth | | | |
| 0 | 1580 | 70.6 | 29.4 |
| 1- | 444 | 19.8 | |
| 3- | 157 | 7.0 | |
| 5+ | 56 | 2.5 | |
| - X ±SE | 0.69 ± 0.03 | | |
| DMF index | | | |

| | | | |
|------------|-------------|------|------|
| 0 | 913 | 40.8 | 59.2 |
| 1- | 690 | 30.8 | |
| 3- | 378 | 16.9 | |
| 5- | 156 | 7.0 | |
| 7- | 52 | 2.3 | |
| 9- | 24 | 1.1 | |
| 11- | 24 | 1.1 | |
| - X ±SE | 1.83 ± 0.05 | | |

Table 3: Distribution of Group 2 (12 - 14 years) according to health status of teeth as indicated by oral health examination, Dubai 2013.

Untreated Caries

Around 41% of the children in this age group were affected by untreated caries. When stratified by the number of teeth involved, 36.6% had less than 5 teeth involved. Of note, the highest level of caries was found in Lusaily and Hatta with 74 students out of 93 (79.5%) screened being affected by it. In similarity with the trend in the other age groups, government school students showed a high level of untreated caries affecting around 80% of the students in this age group (Figure 1).

Dental fluorosis

Students in the area of Deira showed the highest percentage of students with “normal teeth” (93.9%). The students in Bur Dubai had 4.4% “very mild” cases and one student had a case of “severe” fluorosis. 93 children in “others” area showed some form of fluorosis. 24.7% had mild fluorosis and 2.2% had a moderate form of fluorosis.

Group three (15 - 17 years old)

Demographics of the sample population

The sample population of this age group was 2063. Of these, 689 (33.4%) were male students, whereas 1374 (66.6%) were female students. Private schools contributed 69% of the students in this age group, while the remaining 31% of the students were enrolled in government schools. In terms of geographical distribution, 6.5% were from the district of Lusaily and Hatta, 60.3% from Deira, and 33.3% from Bur-Dubai (Table 1).

Dental Caries

Of the screened students, 42.4% had decay, 15.6% had missing teeth, and 39.3% had a filling or more. The mean DMFT score was 2.70 (Table 4).

| Health status of teeth | No (n = 2063) | % | Prevalence of caries experience (% affected) |
|--------------------------------|------------------|------|---|
| Number of decayed teeth | | | |
| 0 | 1188 | 57.6 | 42.4 |
| <5 | 731 | 35.4 | |
| 5- | 128 | 6.2 | |
| 10+ | 16 | 0.8 | |
| - X ±SE | 1.15 ± 0.04 | | |
| Number of missed teeth | | | |

| | | | |
|-------------------------------|-------------|------|------|
| 0 | 1741 | 84.4 | 15.6 |
| 1 | 152 | 7.4 | |
| 2 | 78 | 3.8 | |
| 3+ | 92 | 4.5 | |
| - X ±SE | 0.33 ± 0.02 | | |
| Number of filled teeth | | | |
| 0 | 1252 | 60.7 | 39.3 |
| 1- | 425 | 20.6 | |
| 3- | 210 | 10.2 | |
| 5+ | 176 | 8.5 | |
| - X ±SE | 1.25 ± 0.05 | | |
| DMF index | | | |
| 0 | 704 | 34.1 | 65.9 |
| 1- | 543 | 26.3 | |
| 3- | 344 | 16.7 | |
| 5- | 213 | 10.3 | |
| 7- | 136 | 6.6 | |
| 9- | 60 | 2.9 | |
| 11- | 63 | 3.1 | |
| - X ±SE | 2.70 ± 0.07 | | |

Table 4: Distribution of Group 3 (15 - 17 years) according to health status of teeth as indicated by oral health examination, Dubai 2013.

Untreated Caries

Around 42.4% of the children screened in this age group were affected by untreated caries. There were 35.4% cases of caries in less than 5 teeth, and almost 1% with more than 10 teeth involved. Lusaily and Hatta had a 40.3% prevalence of untreated caries. This stood at 20% in Deira. In private schools, 240 out of 1423 (16.9%) students had caries, whereas in government schools, there were 232 (16.3%) students (Figure 1).

Bleeding on probing

Of the 2063 students in this group, 1741 were checked for their periodontal condition by applying gentle pressure to look for bleeding on probing. A large group of students refused to provide their consent for this examination, which explains the missing 15.6%. Of the 1741 students checked, 56% of the students had one or more sextants, which bled on probing, whereas 44.5% had healthy periodontal tissue.

Dental fluorosis

27.8% children living in the area of Bur Dubai had no form of fluorosis. 82.7% children from "others" area had questionable form of fluorosis.

Discussion

As per our knowledge, this is the first survey of its kind to assess the oral health conditions of a representative sample of school children in the Emirate of Dubai. The decision to survey the school students was due to the ever-increasing prevalence of caries in the school-going children. Additionally, such data is required to design any interventions aimed at lowering the prevalence of dental caries. These interventions are important not only because of a particular predisposition of children to dental diseases, but also because oral hygiene habits can be more successfully altered at a young age [13].

The survey included three age groups that were chosen because they represented the primary dentition, the mixed dentition, and the permanent dentition; thus allowing a wide overview on the trend of caries and oral health in Dubai [14]. The method of choosing the school students allowed a more collective sample of the students according to demographics, gender and type of school attended. This produced a sample which is representative of the population of children in this Emirate, and the results can, therefore, be generalized to all the schools of Dubai. Given the ease of accessing school students and their information, this survey was at an advantage – especially in terms of the response rate.

The results of this study clearly indicate that the prevalence and risk of caries is high. 60.3% of the children 5 years of age are affected; the prevalence decreases (41.6%) in the mixed dentition group (12 years), however, it rises again (42.2%) in the permanent dentition group (15 years). The lower prevalence of caries in the mixed dentition group could probably be attributed to the stage of exfoliation and replacement of carious primary teeth by the newly erupted sound permanent teeth.

Similar findings were reported by El-Nadeef, *et al.* [6] in 2009, where the prevalence of caries was recorded at 48% among 12 years old children, and at 64% among 15 years old children in the city of Dubai. There are several differences between this study and that conducted by El-Nadeef, *et al.* This study is superior to the one by El-Nadeef, *et al.* in terms of the process of screening. In this study, the students were screened in the mobile dental units with the dental chair light and accessible view of the teeth, giving a more accurate picture of the oral condition in the mouth. In contrast, oral examinations in the study by El-Nadeef, *et al.* were conducted on a flat table, under natural light. This could account for the higher prevalence of caries recorded in this study.

A comparison with the studies conducted in the other gulf countries reveals comparable results. Kuwait has a prevalence of 76% for caries in children aged 5 - 6 years. Similarly, Qatar reveals a prevalence of 70% and Saudi Arabia a prevalence of 94% for caries in children in the age group of 5 - 6 years. In the mixed dentition group, Kuwait, Qatar and Saudi Arabia show a prevalence of 73%, 50% and 93.7%, respectively [15].

The mean dmft of children in the age group of 5 - 7 years was recorded at 3.87. This could indicate poor practices of oral hygiene or lack of adequate supervision during the brushing of teeth. Similar to the results of this study, different surveys conducted in the Gulf region reveal the mean dmft of this age group to range from 4.4 in Kuwait to around 7.3 in Saudi Arabia [15].

In this study, Dubai was divided into three main demographic areas (Deira, Bur-Dubai, and others – Lusaily and Hatta). It is important to compare the students of different areas as it allows us to explain the differences on the basis of varying socioeconomic status and levels of exposure to different environmental elements, such as fluoride. Another area of analysis this study looked at was the type of schools (whether government or private) these students attended. This analysis was an indirect measure of the type of oral health services available to the children. Many immigrant parents do not treat their children in Dubai, and prefer to have their children treated in their home countries. This finding allows us to understand the effect of the culture of these people and health habits on the overall population.

The results of this study illustrate that dental diseases are not distributed evenly across Dubai. Although the percentage of the population in area number three (categorized as others) was the lowest, they had the highest level of caries. The concentration of high level of caries in all age groups was very obvious. The present findings could be attributed to various reasons, such as unavailability or improper utilization of dental services, lack of awareness regarding the optimal oral hygiene practices, uneven focus of interventions on the main

city areas as compared to the suburbs, exposure to fluoride supplements, and the dietary habits of these students. Recently, the availability of dental mobile units has made designing outreach programmes easier. Dental services have since become more accessible to the population and a higher response rate from the population towards dental care has been noticed.

Bur Dubai area showed the highest percentage of subjects with no obvious decay in all age groups. This multicultural area has the largest population of these age groups; in addition, the percentage of private schools in this area is also higher. There may be several explanations for this finding. It is possible that schools in this region have better health promotion activities, children have a greater interest in the preventive measures to avoid expenses of treatment, and their level of exposure to fluoride in their home countries. While there is a low prevalence of caries, a high prevalence of filled and missing teeth suggests that the majority of school children are receiving dental treatment, yet a persistent proportion of the population continues to suffer from decay.

Although the literature concentrates on adolescents and pre-adolescents, it is interesting to note the findings and compare them to the results of this study. The literature suggests that males have worse oral hygiene practices as compared to females, and require more detailed instructions on oral hygiene [16]. Social science research has also indicated that girls have better general hygiene practices as compared to boys [17].

However, in this study, there were no significant differences between the genders in caries, filled or missing teeth. This is an indication that the healthcare system and the parents are providing equal access to their sons and daughters for dental care.

The presence of bleeding on probing is a sign for high levels of plaque accumulation and poor interest in oral hygiene. Upon examination of the third group, 56% of the 15 years old students had bleeding on probing. Low interest in health habits, hormonal changes in this age group and poor dietary habits could be the possible causes of these results. In addition, this is a sign of inadequate emphasis on oral hygiene, especially during the younger years. Plaque accumulation may lead to a higher rate of caries and this is an important indicator for the future status of their oral health. Studies have also revealed that dental diseases in the primary dentition are significantly correlated with the development of caries later in the adult dentition [18].

Overall there was a greater coverage in 2013 for the Emirate of Dubai with nearly more than 4000 more students screened, as compared to the other screening programs. However, this study has some limitations as well. The differences in schools (e.g. government vs. private) in each area could skew the results for that area. Additional analyses could also be skewed due to the clustering of schools in one area more than the others. Another consideration is the definition of active decay. The definition used in this study counts only caries that have progressed into dentin, as endorsed by the WHO for epidemiological research, and may underestimate the prevalence and severity of caries [1]. Another challenge for the examiners is identifying the tooth-colored fillings that could also lead to underestimating the number of filled teeth.

Conclusion

The prevalence of caries in school children, especially the ones in the youngest age group, in Dubai is high. There are several differences of note in the three main geographical areas of Dubai. Urban and multicultural areas tend to have better oral hygiene and a lower prevalence of dental caries as opposed to the suburbs. Additionally, students in the private schools have better oral health as compared to the students in government schools. Comparing the different age groups in terms of the prevalence of caries reveals a high prevalence in the primary and permanent dentition groups, whereas a slightly lower prevalence in the mixed dentition group. In light of these findings, there is an urgent need for oral health prevention and treatment programs aimed at reducing this prevalence, especially at an early age.

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Conflict of Interest

There is no conflict of interest in this study.

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