

Prevalence of Dental Caries in Children Visiting a Dental College and Hospital in the United Arab Emirates: A Cross-sectional Study

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ABSTRACT

Aim: The purpose of this study was to examine the prevalence of dental caries in school children visiting a dental college and hospital and investigate the associated risk factors.

Materials and methods: Eighty children were recruited in this study between the ages of 6–12 years. The caries prevalence of decayed, missing, filled teeth (DMFT) was recorded using an evaluation form. A structured questionnaire was used to understand the associated risk factors.

Results: The caries prevalence in the population was found to be at 91.25%. There was a strong negative correlation between age and dental caries and the results were statistically significant with p -value being less than 0.0001. The duration of bottle and breastfeeding, frequency of teeth brushing, adult supervision during brushing, consumption frequency of sweets, and the frequency or timing of children's dental visits were found to be positively associated with dental caries and these results were statistically significant with p -value being less than 0.05.

Conclusion: A high prevalence of dental caries was observed among the population visiting the dental college and hospital. Encouraging dental health education, including promoting the significance of good oral hygiene practices, is crucial.

Clinical significance: The study emphasizes the rising prevalence of dental caries and underscores the need for dental health education and the promotion of good oral hygiene practices to prevent complications and reduce their prevalence.

Keywords: Dental caries, Oral hygiene, Prevalence, School children.

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INTRODUCTION

The World Health Organization (WHO) has very well recognized that oral health is an integral component in determining overall health and quality of life.¹ Dental caries (cavities on teeth) have been recognized as a profound public health concern globally, owing to its increased prevalence and the impact that it has like on the psychological and social health of the sufferers. The WHO mentions that at least 60–90% of school-going children throughout the world have experienced dental caries at one or the other time, with increased prevalence reported in Asian and Latin American countries.² The prevalence of dental caries differs in different parts of the world and has shown a declining trend in the developed and the industrialized world when compared to the developing countries.³ In the United Arab Emirates (UAE) which is a union of seven self-governing states, few studies have been done on the prevalence of dental caries. The population of the UAE is about 9.36 million (11.5% Emirati and 89.5% expatriates, coming from over 200 nationalities).⁴ It has almost 35% of the population between the ages of 0 and 14 years. The volume of the expat population is higher in this country when compared to the local population.⁴ This multicultural environment is challenging for epidemiologists to report the true prevalence rates of dental caries in the country. The WHO had recommended a preventive program for UAE in 1995–96 owing to an alarming increase in the prevalence of dental caries to 70–95% as reported in a previous study.⁵ This program included oral health education in schools and also preventive treatment offered for free.⁵ It needs to be understood that dental caries is

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preventable by simple and cost-effective interventions at both an individual and community level.^{6,7}

The RAK College of Dental Sciences (RAKCODS) is located in Ras Al-Khaimah (RAK), which is a northern emirate of UAE, with a population of almost 1.9 million, which is around 8–10% of the country's population.⁶ The RAKCODS offers free dental treatment to its patients and therefore a lot of the expat population visits the organization for dental treatment. The RAKCODS also runs a screening center as a part of its community engagement services

wherein all the school-going children who visit are screened for oral hygiene practices and dental caries prevalence. This study was undertaken to understand the prevalence of dental caries in school-going children of expatriate parents visiting the RAKCODS pediatric clinics for screening as a part of the community services. This study also tried to understand associating factors like oral hygiene practice and awareness of the attending children and their parents. The information generated as a result of this study can help us understand the prevalence rate of dental caries and the associated factors within the expatriate population visiting the clinics.

MATERIALS AND METHODS

Study Design and Setting

This was a cross-sectional study conducted at the RAKCODS, RAK Medical and Health Sciences University (RAKMHSU), Ras Al-Khaimah, UAE. The objective of the study was to understand the prevalence of dental caries and other associated factors related to oral hygiene maintenance and awareness of the expatriate parents visiting the RAKCODS.

Sample Size Calculation

Children who visited the RAKCODS pediatric clinics for their screening as a part of the community services and dental treatment were recruited after obtaining consent from the parents and assent from the children. We expected 5–6 new patients per week during our clinic hours within the mentioned age group. We were planning to conduct this research for 5 months, so we expected 80–100 patients during this period. With a margin of error of 10% and a confidence level of 90%, the number of our sample would have been 60. The sample size was calculated using the Raosoft sample size calculator. However, finally, 80 children participated in the study. The final sample size of 80 children allows the statistical power of the research to be increased.

Study Duration

The study was conducted during the academic year of 2022–2023 and lasted for 5 months from Nov 2022 after receiving approvals from the institutional review board, including data collection and reporting.

Study Group and Selection Criteria

All the 80 children recruited were part of the study and there was no control group in this study.

Inclusion Criteria

The study included children and parents who participated in the community program and underwent dental checkups, with inclusion being contingent upon obtaining consent and assent. The children recruited for the study were in the age range of 6–12 years. Those children who were born and raised in UAE were recruited for the study.

Exclusion Criteria

Children whose parents did not provide consent or had any medical condition were not included in the study so as to prevent any bias in the findings of the study.

Method of Data Collection

The basic demographic data were recorded and then the oral hygiene evaluation sheet was used to evaluate and record the

findings including decayed, missing, filled teeth (DMFT) status of the child. For data collection, a pre-structured questionnaire was employed, which focused on gathering sociodemographic information and assessing oral hygiene habits. The questionnaire covered a wide range of factors pertaining to oral health, including brushing habits, dietary choices, socioeconomic status, parents' educational background, and the frequency of dental visits. The inclusion of these factors aimed to obtain a holistic understanding of participants' oral care practices and their potential influence on dental health. The dental examination was done before the children were subjected to dental treatment within the clinics if they needed any beyond the screening as a part of the community engagement. The principal investigator had trained all the coinvestigators on the method of recording the data and also the dental examination of children. The data within the clinics was recorded by one and the other was trained to do the intraoral examination so as to prevent any bias in the recordings. The population was divided into two age groups 6–8 and 9–12 years to understand if there is any difference in the prevalence of dental caries or DMFT status between the age groups. For ease of understanding the severity of dental caries was classified as low if the DMFT = 0, moderate; if the DMFT \geq 4, severe; and if the DMFT \geq 7. All the data once recorded were then subjected to statistical analysis.

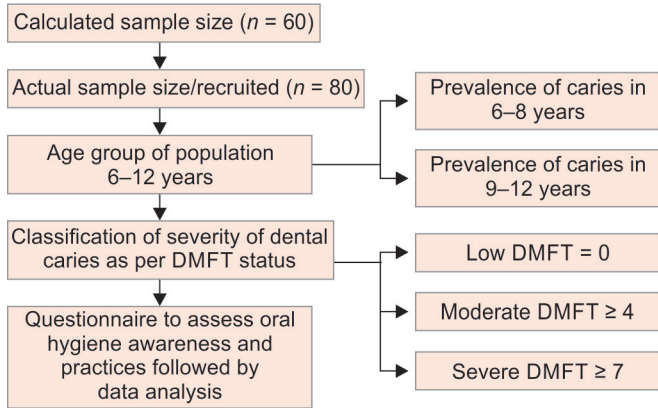
Outcome Analysis

The outcome analysis of the study will involve several key aspects. First, the prevalence of dental caries will be determined by calculating the overall occurrence of DMFT among the recruited children using the DMFT indices. Additionally, a comparison will be made between the two age groups (6–8 and 9–12 years) to assess if there are any significant differences in dental caries prevalence. Furthermore, the severity of dental caries will be classified into categories such as low, moderate, and severe based on the recorded DMFT scores. The analysis will also focus on identifying factors associated with dental caries, utilizing statistical techniques like chi-square tests and binary logistic regression to explore relationships with oral hygiene practices, dietary choices, socioeconomic status, parental education, and dental visit frequency. Lastly, the questionnaire responses related to oral hygiene practices and awareness were examined to understand patterns and correlations among the studied population. This comprehensive outcome analysis provided insights into the prevalence, severity, associated factors, and oral hygiene practices of dental caries among the participants. Overall, the outcome analysis would focus on determining the prevalence and severity of dental caries, exploring differences between age groups, investigating factors associated with dental caries, and understanding oral hygiene practices and awareness among the participants.

Statistical Analysis

The data collected in this study were analyzed using the statistical package for the social sciences (SPSS), version 29.0 (IBM Corporation Armonk, New York, USA). To investigate the relationship between DMFT and age, a Chi-Squared test was performed. The strength of this association was quantified using Cramer's V coefficient, which measures the strength and direction of the relationship. Additionally, Spearman's correlation coefficient was employed to assess the correlation between age and DMFT. To further explore the relationship between dental caries and the independent variables, binary logistic regression analysis was conducted. This analysis aimed to understand how dental caries are influenced by

Flowchart 1: Flowchart to understand the methodology



Through binary logistic regression analysis on the entire sample of 80 children, several significant findings were revealed. First, there was a slightly higher occurrence of dental caries (DMFT) in children whose parents were employed (48.75%) compared to those whose parents were unemployed (42.50%). However, this difference was not statistically significant (OR 0.7, 95% confidence interval [CI]: 0.4–1.3, $p = 0.04$). Regarding infant feeding habits, children who were bottle-fed for a prolonged period (more than 6–12 months) had a significantly higher incidence of dental decay (DMFT) at 65% compared to those bottle-fed for a shorter duration (<6 months) with an incidence of 26.25% (odds ratio [OR]: 2.3, 95% CI: 1.1–2.7, $p = 0.03$). Similarly, children who were breastfed for a prolonged duration had a higher DMFT prevalence at 61.25% compared to those breastfed for less than 6 months, with a prevalence of 24% (OR: 1.8, 95% CI: 1.3–2.5, $p = 0.01$).

Table 1: Dental caries prevalence severity and age groups

Age (years)	DMFT				Total	Test statistics (p-value)	Cramer's V
	High	Low	Moderate	None			
6–8	13 27.08%	2 4.17%	30 62.50%	3 6.25%	48 100.00%	47.22 ($p < 0.0001$)	0.7962
9–12	0 0.00%	23 71.88%	5 15.63%	4 12.50%	32 100.00%		
Total	13 16.25%	25 31.25%	35 43.75%	7 8.75%	80 100.00%		

the various factors under investigation. A $p < 0.05$ was considered statistically significant, indicating a strong likelihood that the observed results were not due to chance. This significance level helped determine the meaningfulness and validity of the findings in relation to the research objectives (Flowchart 1).

RESULTS

In this study, a total of 80 children visiting RAKCODS pediatric clinics for screening as a part of community engagement and dental treatment were evaluated. The gender distribution showed that 31 girls (38.75%) and 49 boys (61.25%) participated. The age range of the children was between 6 and 12 years, with a mean age of 8.23 ± 1.5 years. The oral examination was conducted as part of their initial dental check-up, and the DMFT status was recorded.

The study found a high prevalence of dental caries, with 73 out of the examined children (91.25%) having dental caries. The mean DMFT score, which represents the decayed, missing, and filled teeth in both primary and permanent dentition, was calculated as 4.075 ± 2.4 .

When analyzing the prevalence of dental caries in different age groups, it was found to be 93.75% in children aged 6–8 years and 87.5% in those aged 9–12 years. Comparing the severity of dental caries between these two age groups, it was observed that children aged 6–8 years had a higher number of severe dental caries compared to those aged 9–12 years. This difference in severity was found to be statistically significant, with $p < 0.0001$ and a strong association indicated by Cramer's V coefficient of 0.762, highlighting the relationship between age and dental caries. Furthermore, the Spearman's rank correlation analysis revealed a strong negative correlation ($-0.5419, p < 0.0001$) between age and DMFT score. As age increased, the DMFT score decreased, suggesting a trend of improving oral health with advancing age (Table 1; Fig. 1).

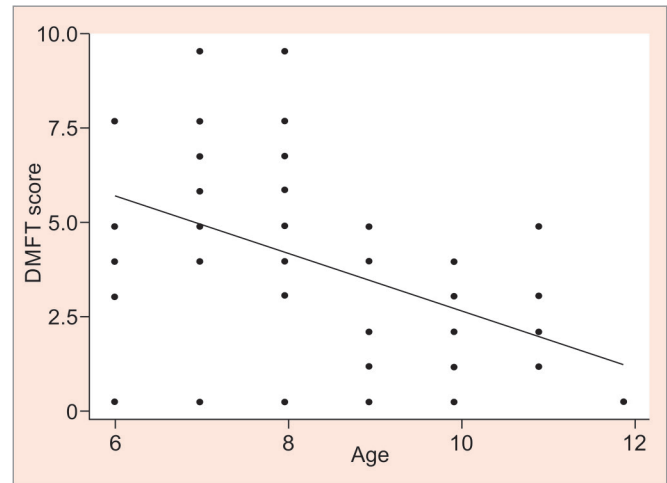


Fig. 1: The Spearman's rank correlation between age and DMFT score is -0.5419 ($p < 0.0001$). There is a strong negative correlation between age and DMFT score. As the age advances, the DMFT score decreases. The scatter plot gives the visualization of the relationship

The study also found that children who brushed their teeth only once a day had a significantly higher prevalence of DMFT at 63.75% compared to those who brushed at least twice a day, with a prevalence of 27.5% (OR: 2.1, 95% CI: 1.2–3.6, $p = 0.04$). Notably, children who received adult supervision while brushing exhibited a lower incidence of DMFT, with a prevalence of 29%, compared to children who lacked adult supervision, with a prevalence of 45% (OR: 3.2, 95% CI: 1.3–7.4, $p = 0.02$). In terms of sweet consumption, children who consumed chocolates or candies on a daily basis had a significantly higher incidence of DMFT compared to those who

Table 2: Dental caries and associated risk factors including diet and oral hygiene practices using binary logistic regression analysis

Variables	Dental caries		95% CI	p-value
	Yes n (%)	Odds ratio		
<i>Parental occupation</i>				
Yes (Employed)	39 (48.75)	0.7	0.4–1.3	0.4
No (Unemployed)	34 (42.50)			
<i>History and duration of prolonged bottle feeding (>6–12 months)</i>				
Yes	52 (65)	2.3	1.1–2.7	0.03
No	21 (26.25)			
<i>History and duration of breast feeding (>6–12 months)</i>				
Yes	49 (61.25)	1.8	1.3–2.5	0.01
No	24 (30)			
<i>Frequency of teeth brushing</i>				
Once a day	51 (63.75)	2.1	1.2–3.6	0.04
Twice a day	22 (27.5)			
<i>Adult supervision of brushing</i>				
Yes	29 (36.25)	3.2	1.3–7.4	0.02
No	44 (55)			
<i>Frequency of consumption of sweets</i>				
Daily	49 (61.25)	2.7	1.6–4.2	0.01
Once or twice a week	34 (42.50)			
<i>How often do you visit a dentist</i>				
Frequently	22 (27.5)	1.8	1.1–2.8	0.03
Only when there is a need	51 (63.75)			

consumed chocolates once or twice a week at most (OR: 2.7, 95% CI: 1.6–4.2, $p = 0.01$). Finally, children whose parents only took them to the dentist, when necessary, typically due to pain, had a higher prevalence of DMFT at 63.75% compared to children who had regular checkups, with a prevalence of 22% (OR: 1.8, 95% CI: 1.1–2.8, $p = 0.03$). These findings emphasize the impact of various factors such as feeding practices, oral hygiene habits, sweet consumption, and dental visit frequency on the prevalence of dental caries among children (Table 2).

DISCUSSION

The prevalence of dental caries in UAE children is a significant concern, and understanding the factors contributing to this problem is essential for developing targeted preventive and intervention strategies. This study was conducted in a dental college and hospital of the UAE to try to understand and possibly address the specific oral health needs and challenges faced by children in this region. According to the present study the prevalence rate of dental caries was at 91.25% with a mean age of 8.23 ± 1.5 years. Similar studies done in the country of UAE presented a prevalence rate ranging from 72–94%, though these studies are relatively old.^{8–14} In the neighboring countries of UAE where studies were done recently, also a similar trend in the prevalence of dental caries has been observed with the prevalence of dental caries ranging between 78 and 84%.^{10,11} The results of the present study indicate a high burden of dental caries in the population which is more or less similar to what is found in the rest of the middle eastern region. In this study, the average DMFT score was 4.075, which is slightly lower than the DMFT score of 5.1

reported years ago in 5-year-olds.¹² However, it is notably lower than the DMFT scores of 8.4, 8.6, and 5.7 observed among 5-year-old children in Abu Dhabi, Al-Ain, and the Western Region, respectively.¹³ Another study¹⁴ found that 4–5-year-old children in Al-Ain had an average DMFT score of 5.8. Although the present study suggests a lower DMFT score than previously reported yet the mean scores are high. Factors such as poor oral hygiene, lack of understanding toward oral hygiene awareness, and increased consumption of refined carbohydrates and junk food could be significant factors contributing to this high prevalence.^{14,15} In this study, a strong negative correlation was observed between age and dental caries, indicating that as individuals age, the prevalence of dental caries decreases. These findings challenge the common belief that dental caries primarily affect younger individuals. Previous studies have also suggested a decline in dental caries prevalence with advancing age, attributing it to various factors.^{15,16} Accumulated dental treatments and preventive measures, such as restorations and fluoride treatments received over time, contribute to a lower risk of new caries development.¹⁶ Improved oral hygiene practices and dietary modifications, including reduced consumption of sugary foods and drinks, are also considered influential factors.^{15,16} Furthermore, the increase in manual dexterity with age may facilitate better tooth-brushing and oral hygiene practices, further contributing to the decrease in dental caries prevalence as individuals grow older.¹⁷ The slightly higher occurrence of dental caries (DMFT) in children with employed parents (48.75%) compared to those with unemployed parents (42.50%) may be influenced by factors such as limited parental time for oral health supervision, inadequate guidance on oral hygiene practices, and challenges in scheduling regular dental check-up. Additionally, socioeconomic factors associated with parental employment status, including income and access to healthcare, can impact oral health outcomes.¹⁷ It is crucial to consider that the observed difference may not be statistically significant, highlighting the need for further research with larger samples to better understand the relationship between parental employment status and dental caries in children.¹⁸ The findings of the study reveal that children who were exclusively bottle-fed or breastfed for more than 6–12 months had a higher prevalence of dental caries compared to those who were breast and bottle-fed for less than 6 months. These results align with similar studies conducted elsewhere, which also demonstrated an association between prolonged bottle and breastfeeding practices and increased caries risk.¹⁸ Studies have indicated that extended exclusive feeding with either method may contribute to a higher likelihood of dental caries development.^{18–20} A review published in the Lancet suggests that inadequate oral hygiene practices following breastfeeding may be responsible for breastfeeding-related health consequences, including an increased risk of dental caries in children.²¹ This highlights the importance of promoting good oral hygiene practices, such as regular brushing and proper cleaning of gums and teeth, to mitigate the risk of dental caries associated with prolonged breastfeeding. Studies emphasize the significance of balanced feeding practices that involve shorter durations of both breast and bottle feeding.^{20,21} Promoting the timely introduction of cup feeding and implementing appropriate weaning practices can help reduce the risk of dental caries and support optimal oral health in young children.²¹ The study findings indicate that children who brushed their teeth twice daily under adult supervision had a decreased prevalence of dental caries

compared to children who brushed once a day without adult supervision. The results are similar to other studies which highlight the significant impact of adult supervision and brushing frequency on oral health outcomes in children.²² Other studies have suggested that regular brushing under adult guidance ensures thorough cleaning and reinforces proper oral hygiene habits.^{23,24} Parental involvement and supervision are crucial for establishing effective oral care routines and promoting optimal oral health.^{24,25} The authors of the present study believe that encouraging children to brush twice daily and providing guidance during brushing can contribute to reducing the risk of dental caries and maintaining good oral health in the long term. A significant association was found between the daily consumption of chocolates and candies when compared to the consumption of these twice or thrice a week. These results align with the findings of a study conducted, which demonstrated a significant association between consuming chocolates and dental caries in children attending primary schools and older children.^{26,27} The potential cariogenicity of sugar-containing chocolates and candy, influenced by factors such as consistency, duration of oral retention, and frequency of consumption, may explain this relationship.²⁸ The present study findings suggest a decreased prevalence of dental caries in children who visit dentists frequently compared to those who only seek dental care when they experience pain. Studies have consistently shown a decreased prevalence of dental caries in children who visit dentists frequently compared to those who seek dental care only when they experience pain.^{29–31} Regular dental visits play a crucial role in preventive care and early detection of dental problems, leading to improved oral health outcomes. A study found that children who visited the dentist at least once a year had a significantly lower prevalence of dental caries compared to those who visited only when they had pain.³⁰ Similarly, a study reported that children who had regular dental visits had lower rates of dental caries compared to those who visited the dentist only for emergencies.³¹ The present study has limitations, including a small sample size of 80 children, potential recall bias from self-reported data, and a narrow focus on factors influencing dental caries prevalence. Future research should involve larger and more diverse populations, utilize longitudinal studies, and incorporate objective measures like clinical examinations and laboratory tests. Exploring additional factors such as genetics, socioeconomic status, and oral microbiome composition would also be valuable in understanding dental caries occurrence. Clinicians need to be aware of the high prevalence of dental caries in children and the associated factors identified in this study. Prioritizing preventive measures and oral health promotion is crucial in clinical practice. Educating parents and caregivers about maintaining good oral hygiene practices, including regular brushing, flossing, and proper cleaning of gums and teeth, is essential. Emphasizing the importance of brushing twice a day using appropriate techniques is crucial. Clinicians should address the potential impact of prolonged bottle and breastfeeding on dental caries risk, providing guidance on feeding practices and promoting balanced approaches. Stressing the significance of regular dental visits for preventive care and early detection is vital. Educating parents about routine dental check-ups and the importance of seeking dental care beyond emergencies is necessary. Considering social and cultural factors in treatment plans and oral health education, taking into account socioeconomic status and access to care, is important for clinicians.

CONCLUSION

Among expatriates residing in Ras Al-Khaimah, a high prevalence of dental decay was observed. Interestingly, the study found a decrease in dental caries prevalence with increasing age. The employment status of parents did not show a significant association with dental caries, while factors such as the duration of bottle and breastfeeding, frequency of teeth brushing, adult supervision during brushing, consumption frequency of sweets, and the frequency or timing of children's dental visits exhibited a positive correlation with dental caries. These findings highlight the importance of educating both children and parents and implementing interventions for overall and oral health in children.

ETHICAL APPROVAL

This research was approved by the Research and Ethics Committee of the university and the RAK Research and Ethics Committee, Ministry of Health, (Approval Reference Number: MOHAP/REC/2023/13-2023-UG-D). The approval was received on 14 November 2022.

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