

Original article

Prevalence of Dental Caries and Oral Health Practices Among Preschool Children: School Screening Programs in Benghazi City, Libya**Hawwa Beaayou¹ , Khawlah Shawash² , Fatimah Aebeedah² , Mahmoud Elsharif² **¹*Department of Dental Public Health and Preventive Dentistry, Faculty of Dentistry, University of Benghazi, Libya*²*General Dental Practitioner, Balagrae University, Faculty of Dentistry, Benghazi, Libya***Corresponding author** Khawlaalshawish@gmail.com**Abstract**

Dental caries is a common chronic disease in children, with significant effects on oral health, nutrition, and overall quality of life. Despite being preventable, untreated caries in preschool-aged children remains a global and regional public health concern, particularly in developing countries. Therefore, this study aims to assess the prevalence of dental caries and oral health practices among preschool children in Benghazi City, Libya, and to provide baseline data for school-based oral health screening and preventive programs. A descriptive cross-sectional study was conducted among 350 preschool children aged 3–5 years, recruited from five administrative areas in Benghazi. Data collection included a validated questionnaire addressing sociodemographic information, oral hygiene behaviors, dietary habits, and dental visits. Clinical examinations were conducted using the WHO criteria to assess the DMFT index. Statistical analysis was performed using SPSS version 28. Chi-square, t-test, Mann-Whitney, and Kruskal-Wallis tests were used. A p-value ≤ 0.05 was considered statistically significant. The mean dmft score was 1.91 ± 2.55 , with 56.9% of children experiencing dental caries and 43.1% being caries-free. Oral health practices showed that 83.7% of children brushed under parental supervision; however, only 53.8% brushed twice daily. Additionally, 74.9% reported daily consumption of sugary foods. Significant associations were found between DMFT scores and tooth brushing frequency, while no significant differences were observed with sociodemographic variables. The prevalence of dental caries among preschool children was high. Whereas oral health practices, especially tooth brushing frequency and sugar intake, were significantly linked to caries experience. Targeted preventive programs and parental education are urgently recommended to improve oral health in this vulnerable population.

Keywords: Dental Caries, Preschool Children, Oral Health Practices, and DMFT Index.**Introduction**

Dental caries is the most common chronic disease affecting children, significantly impacting individuals, families, and society [1]. Despite being largely preventable, over 530 million children globally suffer from dental caries in their primary teeth, with a majority of the decayed teeth remaining untreated [2]. The American Academy of Pediatric Dentistry defines "early childhood caries" (ECC) as the presence of one or more decayed (either non-cavitated or cavitated lesions), missing (due to caries), or filled surfaces in the primary teeth of a child under the age of 6 years [3]. Recently, a systematic review indicated that the global combined prevalence of ECC is 48%, based on various studies that utilized WHO criteria for determining ECC prevalence [4-5]. Moreover, untreated ECC not only severely impacts children's oral health but also their overall well-being. It can result in localized pain, infections, early loss of primary teeth, malocclusion, as well as eating and speech disorders, potentially leading to developmental delays [6-8]. Additionally, the emergence and progression of ECC stem from a long-term imbalance of numerous risk and protective factors, including sociological, biological, and environmental influences, along with a wide array of oral health-related behaviors. It is widely acknowledged that lower socio-economic status, inadequate parental education, poor oral hygiene practices, bottle feeding, and nighttime consumption of sugary foods are significant risk factors for caries [10-12].

The World Health Organization (WHO) has explicitly recommended conducting such investigations [13]. An increasing number of studies worldwide have illustrated a direct correlation between various behavioral, social, economic, and clinical factors and dental caries. Among these factors, research has demonstrated that children's tooth brushing and oral hygiene behaviors are linked to their experience with dental caries [14-17]. In addition, ECC is common between children and continues to be a major public health issue [18]. It negatively impacts children's quality of life by causing pain, early tooth loss, and malnourishment, and it also affects overall growth [19]. Also, children with poor oral health are more likely to have limited activity days than other children [13].

Over the past few decades, preschoolers in affluent nations have seen a decrease in the prevalence of dental caries over the last few decades. The incidence is still very high among preschoolers in developing countries, [22-21] despite recent evidence suggesting that this decline has halted in some developed countries [22-24]. However, better health education initiatives should be established if the burden of causes contributing to dental caries is reduced, as it is one of the avoidable diseases. [25-26]. The identification of high-risk groups refocuses oral health services on oral health promotion and encourages community knowledge and participation in preventative initiatives [27-28].

Currently, information regarding the prevalence of dental caries in Libyan preschoolers is lacking, especially in the research area. Therefore, the current study's goal is to assess the prevalence of dental caries and oral health practices among preschoolers. This information serves as a foundation for school screening programs and the development of oral health programs for this target population.

Methods

Sample design and sample selection

The study was a descriptive and cross-sectional design. Children with deciduous dentition in preschool (aged three to five) were chosen for the study; there were 350 total participants. A multi-stage sampling approach was applied. In the first stage, five administrative areas (Benghazi Center, Al-Berka, West Benghazi, Al-Salawi, and Sedi-khalifa) were selected for the private schools. In the second stage, private preschools within each area were randomly selected.

Eligibility criteria

The study employed specific inclusion and exclusion criteria to ensure the reliability and relevance of the dental assessments conducted. Eligible participants were children between the ages of three and five years at the time of examination. These children exhibited predominantly deciduous dentition, characterized by the absence of permanent first molars or limited eruption patterns consistent with their age. Participation required informed consent from a parent or legal guardian, and children were expected to demonstrate the ability to sit for a brief dental examination and cooperate adequately to allow for visual and tactile assessment. Conversely, children were excluded from the study if they presented with systemic medical conditions or syndromes known to affect tooth development or behavioral cooperation, such as severe developmental disorders, which could introduce bias into the caries assessment. Additionally, children who had received comprehensive dental treatment under general anesthesia within the preceding six months were excluded to prevent misclassification of caries status. The study also excluded children whose dental development included mixed or permanent dentition beyond what is typical for their age group, such as extensive eruption of permanent teeth.

Questionnaire development and distribution

A questionnaire was used to collect the data. To make sure the questionnaires were valid, reliable, and clear, a pilot study was conducted. Before beginning the study, ethical approvals were obtained from the ethical committee in the dental college with approval number 1401. The questionnaire addressed the following topics in the first section: socio-demographic information such as age and gender of children, and parents' occupational status. It also included questions regarding the oral health-care practices, such as the use of tooth brushing, dietary habits (the frequency of sweets intake). It also asked about their dental visit, for example: the last time of visit, frequency, and barriers to dental visits.

The universal DMFT index was used to perform a diagnostic examination for dental caries in the second section. All teeth were examined for the existence of caries using the WHO criteria. Using both tactile and visual criteria, the teeth were rated as either filled, decaying, or sound [1,8,10,11,15,16]. Three examiners conducted the examination. Before the study started, the head examiner was contrasted with a gold standard examiner. Twenty children were reexamined two weeks later to confirm the initial diagnosis. Consequently, using the "Kappa" test to measure agreement, results for intra- and inter-examiner percent agreement were 93% and 90%, respectively.

Statistical analysis

Each questionnaire received an individual identification number to permit checking for any inconsistent responses. All questionnaires were collected, and the data were entered into the Microsoft Office Excel 2021 database and checked for entry errors. The uncompleted questionnaires were excluded. Data entry was followed by coding, analysis, and tabulation. The results were statistically analyzed using SPSS 's statistical software for social science, version 28 (Chicago, IL, USA). Both qualitative and quantitative variables' descriptive statistics were shown as percentages. Chi-square and the T-test were used to compare the data. A p-value of 0.5 or less was considered to be the threshold for significance.

Results

The distribution of preschoolers' sociodemographic information is displayed in Table 1. According to the findings, the age group of 5 years had the highest proportion (56.9%), followed by the age group of 4 years (35.8%), and the age group of 3 years (7.3%) had the lowest percentage. In contrast, there are 170 males at a rate of 47.9% and 185 females at a rate of 52.1% in the gender variable. The employment variable was used to categorize mothers and fathers, and the table shows that 62% of mothers and 94.1% of fathers were employed. Table 2 shows the minimum and maximum values of the DMFT variable, with a mean of 1.91 and a standard deviation of 2.55. However, 43.1% of children have caries-free (score equal to zero), while 56.9% of them have caries experience (ranging between 1 and 14).

Table 1. Socio-demographic data among pre-school children

Variables		Frequency	Percentage
Age Groups	3 years	26	7.3%
	4 years	127	35.8%
	5 years	202	56.9%
Gender	Male	170	47.9%
	Female	185	52.1%
Occupation status of mother	yes	220	62.0%
	No	135	38.0%
Occupation status of father	yes	334	94.1%
	no	21	5.9%

Table 2. The descriptive statistics of the DMFT variable

Descriptive statistic				
DMFT	Lower score	Upper score	Mean	Std Dev
	0.00 (34.1%)	14.00 (56.9%)	1.91	2.55

Table 3 shows the evaluation rates of the children's oral health care practices. About 83.7% of children reported using the toothbrush under parental supervision. While the question regarding the amount of toothpaste was 40.6% of children (full brush), and 5.6% of them do not use toothpaste at all. However, concerning the frequency of tooth brushing, about 53.8% used it twice daily, and 5.4% of them used it three times. Whereas, 59.9% of participants used fluoridated toothpaste. Regarding consumption of sweet food, about 74.9% of children answered (yes), while the highest percentages (46.5% and 41.1%) were consumed twice and once daily, respectively. Whereas, 87% of children did not use a baby bottle/feeding, and 44.2% of them have a history of dental visits. About 83.7% of children were not targeted in the oral health education programme.

Table 3. Oral health care practices among preschool children

Oral health care practices questions	Variables	Frequency	Percent %
Amount of toothpaste used each time	smear	77	21.7%
	pea size	114	32.1%
	full brush	144	40.6%
	None	20	5.6%
Toothbrushes under parental supervision	Yes	297	83.7%
	No	58	16.3%
How many times a day do you brush your teeth?	Once	129	36.3%
	twice	191	53.8%
	three times	19	5.4%
	never	16	4.5%
Do you use fluoridated toothpaste?	Yes	202	56.9%
	No	153	43.1%
Consumption of sweet food	Yes	266	74.9%
	No	89	25.1%
How many times a day do you consume sugary foods and drinks?	once	146	41.1%
	twice	165	46.5%
	sometime	32	9.0%
	never	12	3.4%
Used a sweetened baby bottle \ feeding at night	Yes	46	13.0%
	No	309	87.0%
History of dental visits	Yes	157	44.2%
	No	198	55.8%
Oral health education program	Yes	58	16.3%
	No	297	83.7%

Table 4 shows the relationship between the child's age group and the oral health practices of the children. The results show that there is a statistically significant relationship between the frequency of toothbrush

use for cleaning teeth and the different age groups of children, meaning that as the child's age increases, the frequency of toothbrush use also increases, with a P-value of 0.014, which is less than the significance level of 0.05. Whereas there is no significant relationship between age groups and children's practices in the other questions.

Table 4. The significant differences between oral health care practices and children 's age groups

Chi-Square Test					
Practices questions	Age	3 years No. (%)	4 years No. (%)	5 years No. (%)	P- value
Amount of toothpaste used each time	Smear	5 (1.4)	32 (9.0)	77 (21.7)	0.147
	Pea size	9 (2.5)	43 (12.1)	62 (17.5)	
	Full brush	8 (2.3)	49 (13.8)	87 (24.5)	
	None	4 (1.1)	3 (0.8)	13 (3.7)	
Toothbrushes under parental supervision	Yes	18 (5.1)	111 (31.3)	168 (47.3)	0.071
	No	8 (2.3)	16 (4.5)	34 (9.6)	
How many times a day do you brush your teeth?	Once	9 (2.5)	55 (15.5)	65 (18.3)	0.014**
	twice	13 (3.7)	64 (18.0)	114 (32.1)	
	Three times	0 (0.0)	7 (2.0)	12 (3.4)	
	Never	4 (1.1)	1 (0.3)	11 (3.1)	
Do you use fluoridated toothpaste?	Yes	16 (4.5)	73 (20.6)	113 (31.8)	0.852
	No	10 (2.8)	54 (15.2)	89 (25.1)	
Consumption of sweet food	Yes	21 (5.9)	98 (27.6)	147 (41.4)	0.519
	No	5 (1.4)	29 (8.2)	55 (15.5)	
How many times a day do you consume sugary foods and drinks?	Once	8 (2.3)	51 (14.4)	87 (24.5)	0.264
	Twice	16 (4.5)	56 (15.8)	93 (26.2)	
	Sometime	2 (0.6)	12 (3.4)	18 (5.1)	
	Never	0 (0.0)	8 (2.3)	4 (1.1)	
Used a sweetened baby bottle\ feeding at night	Yes	1 (0.3)	21 (5.9)	24 (6.8)	0.168
	No	25 (7.0)	106 (29.9)	178 (50.1)	
History of dental visits	Yes	6 (1.7)	57 (16.1)	94 (26.5)	0.075
	No	20 (5.6)	70 (19.7)	108 (30.4)	
Oral health education program	Yes	2 (0.6)	25 (7.0)	31 (8.7)	0.271
	No	24 (6.8)	102 (28.7)	171 (48.2)	

Table 5 shows the relationship between the means of dmft and demographic variables of the study. It is clear from the table that all P-values are greater than the significance level of 0.05, which means there are no statistically significant differences between them.

Table 5. The significant differences between the means of the DMFT and demographic variables

Mann-Whitney and Kruskal-Wallis Tests			
Study variables		dmft Mean $\pm$ Std. D	P- value
Gender	Male	1.76 $\pm$ 2.23	0.966
	Female	2.04 $\pm$ 2.81	
Age	3 years	2.35 $\pm$ 3.72	0.568
	4 years	2.04 $\pm$ 2.67	
	5 years	1.77 $\pm$ 2.28	
Occupation status of mother	Yes	1.77 $\pm$ 2.28	0.080
	No	2.14 $\pm$ 2.65	
Occupation status of father	Yes	1.90 $\pm$ 2.54	0.893
	No	2.10 $\pm$ 2.76	

Table 6: Shows the relationship between the means of dmft and children's oral health care practices. There are significant differences between the means of dmft and the frequency of children's toothbrush use. While, the mean value decreases when the toothbrush is used twice daily. As well as, there is a significant difference between the means of dmft and sugar consumption (the mean value increases among children who consume more sweets).

Table 6. The relationship between the means of dmft and children's oral health care practices

Mann-Whitney and Kruskal-Wallis Tests			
Study variables		dmft Mean $\pm$ Std. D	P- value
Amount of toothpaste used each time	Smear	2.04 $\pm$ 2.66	0.790
	pea size	1.91 $\pm$ 2.62	
	full brush	1.92 $\pm$ 2.53	
	None	1.35 $\pm$ 1.81	
Toothbrushes under parental supervision	Yes	1.88 $\pm$ 2.56	0.651
	No	2.07 $\pm$ 2.51	
How many times a day do you brush your teeth?	Once	1.59 $\pm$ 2.09	0.034**
	twice	1.87 $\pm$ 2.60	
	three times	3.84 $\pm$ 3.67	
	never	2.63 $\pm$ 2.85	
Do you use fluoridated toothpaste?	Yes	1.88 $\pm$ 2.58	0.729
	No	1.95 $\pm$ 2.52	
Consumption of sweet food	Yes	2.08 $\pm$ 2.65	0.011**
	No	1.39 $\pm$ 2.15	
How many times a day do you consume sugary foods and drinks?	once	1.70 $\pm$ 2.38	0.134
	twice	1.87 $\pm$ 2.33	
	sometime	3.38 $\pm$ 3.92	
	never	1.17 $\pm$ 1.75	
Used a sweetened baby bottle \ feeding at night	Yes	1.87 $\pm$ 2.90	0.679
	No	1.92 $\pm$ 2.50	
History of dental visits	Yes	2.18 $\pm$ 2.70	0.055
	No	1.70 $\pm$ 2.40	
Oral health education program	Yes	2.14 $\pm$ 2.86	0.366
	No	1.87 $\pm$ 2.49	

Figure 1 represents the levels of children's oral health practices and classification of their responses into two categories: negative practices and positive practices. It was found that 65.9% of the children have negative practices that require more parental care and correction of some incorrect behaviors, while 34.1% of the children exhibit good practices.

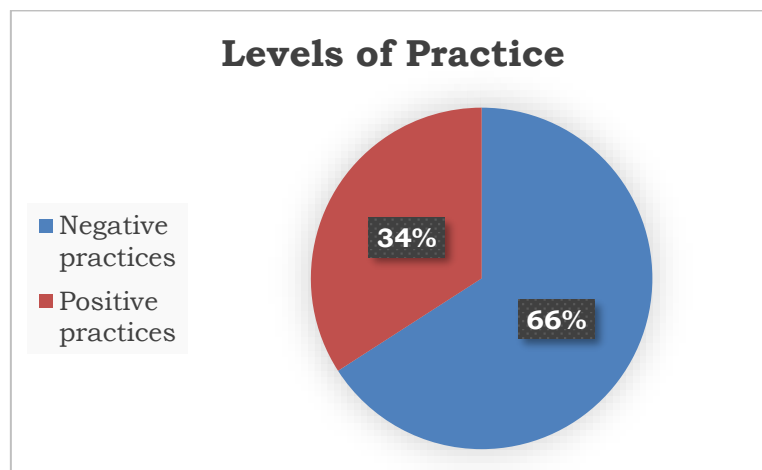


Figure 1. The levels of children's oral health practices

Discussion

This study examines the dental caries status of preschoolers in Benghazi City using a cross-sectional design. This study aims to gather data from participants in other studies who are between the ages of three and five. [1, 8, 10, 11, 15, 16]. In keeping with previous studies, a closed-ended questionnaire was also employed to evaluate the sample's oral health practices [8, 10, 11, 15, 16, 21].

The purpose of this study was to evaluate oral health habits and dental caries prevalence in preschool-aged children in Benghazi City, Libya. According to the findings, the study population's mean DMFT score and prevalence rate of dental caries are both higher than half. However, other studies showed that the rates in the United States (19%) [29] and South Africa (45%) [30] were higher than those in Italy (19%) [31] and India (50%) [32]. It could be brought on by bad oral hygiene habits, such as not cleaning your teeth or eating too many sweets each day. However, A significant gap existed between the prevalence rate of dental caries among Huizhou preschoolers and the goal set by the WHO in 2003, which was that the caries-free rate of 5-year-old children would be 50% by 2020 [1].

However, there is a significant association between the means of dmft and the frequency of children's toothbrush use and sugar consumption. In our results the rate of caries is increasing with sweet intake and who never or brushing their teeth once daily, while other researchers reported and analyzed that, sugary snacks before sleeping is a risk factor that commonly reported (31, 33- 34), Beside that, a study was conducted in China, found that, there is no a significant association between the means of dmft and the frequency of toothbrushing (1). On the other hand, there is no significant association between the means of dmft and baby bottle\ feeding at night, whereas other studies supported those children who were breastfed for a long period of time were at a higher risk of developing dental caries (1, 35). This rate may be due to a lack of awareness among the children's parents about proper oral hygiene and dietary practices. Furthermore, parents with a positive dental attitude and better dental knowledge will probably build up better oral health habits in their children and look after their children's oral health (36-37). Thus, it is of great importance to involve the parents in dental health promotion programs for preschool children.

However, this study faced some limitations due to the absence of accurate records for the actual number of preschool children in public and private schools. Therefore, we could not calculate the sample size exactly and selected a convenience sample during the period of research.

Conclusions and Recommendations

The current study concluded that a high percentage of cavities remained unrepaired and that dental caries was prevalent among preschoolers ages three to five years. Conversely, the prevalence of dental caries was linked to oral health behaviors such as children's use of toothbrushes, their habit of eating sugary snacks, and breastfeeding. Therefore, it is highly advised to start concentrating on dental caries prevention at a young age. Additionally, it's critical to implement oral health programs within this target group.

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Conflict of interest. Nil

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