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Original Research Article

Dental caries prevalence and contributing factors in Southern Libya: a cross-sectional study

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ABSTRACT

Background: Dental caries is the most prevalent chronic disease among children and adults worldwide. It is still a major public health challenge, affecting over 2 billion people globally. The prevalence of dental caries in Libya exceeds 75%.
Methods: This cross-sectional study design was conducted at the faculty of dentistry, Sebha University, and included 627 participants. Data was collected within a period of 8 months between July 2024 and May 2025. Dental caries was assessed by decayed, missing, filling teeth (DMFT) for permanent teeth and dmft for deciduous teeth), and oral hygiene status was measured by the oral hygiene index (OHI).
Result: A total of 627 participants were recruited at a mean age of 32.95 (SD=14); 63.2% were female and 36.8% were male. The prevalence of dental caries in this study was exceptionally high; most of the participants 98.4% experienced dental caries at a median of 8.00 (0.00-30.00). The difference in DMFT between age groups was statistically significant (p=0.000). The OHI difference between genders was statistically significant (p=0.006). OHI was at a good level in the primary and tertiary education levels (median=1.30 and 1.40, respectively), whereas it was at a fair level in secondary education (median=2.16).
Conclusions: The prevalence of dental caries was high in the study population. The old age group experienced more dental caries compared with other age groups. Sociodemographic factors, such as gender and educational level, play a critical role in shaping oral health behaviours.

Keywords: Dental caries, Sebha city, Decayed, missing, filled primary teeth, Oral hygiene index

INTRODUCTION

Dental caries is the most prevalent chronic disease among children and adults worldwide. It is still a major public health challenge, affecting over 2 billion people globally.[1] The prevalence of dental caries in Libya has been reported in several studies on different age groups, for example, a study conducted in Tripoli in 2023 that revealed that children aged 6-7 and 11-12 years had dental caries in their primary teeth (78%) with a mean DMFT of 3.7, while dental caries in their permanent teeth was 48.2% with a mean DMFT of 1.7.[2] Although the study included a large sample size, the result cannot be extrapolated to entire Libya population because they were restricted to Tripoli and based on availability rather than random selection. Furthermore, the study included only children without referring to prevalence of adults. Moreover, oral hygiene, which is considered one of the most important determinants of dental caries, was not measured. A recent systematic review and meta-analysis demonstrated a relatively higher frequency of dental caries (64.7%) among children aged 5-15 years. Even with the large number of studies and sample size (17 studies, 7000 participants), there was considerably high heterogeneity (I^2>99%), indicating substantial variability in the included studies. Furthermore, large number of

these studies were carried out in Benghazi; thus, their results cannot be generalized for the entire country.[3] Another study assessed the prevalence of dental caries, showing a high prevalence of the disease (86.6%); however, it had small sample size and focused only on a specific population (Benghazi).[4] The presented studies had several limitations, including a restricted geographic area, which means that a national survey is necessary to accurately report the overall prevalence at the national level. Nonetheless, multiple studies in different geographic areas are a useful tool for estimating the prevalence of dental caries all over the country (Libya). Another limitation of the aforementioned studies is that, despite its importance, oral hygiene status was not measured. Although oral hygiene alone is not enough for caries prevention, it has critical role in controlling dental caries incidence.[5-7] Additionally, education level strongly influences oral hygiene practice. It plays a significant role in determining oral hygiene skills and maintenance among different age groups.[8,9] Furthermore, children whose parents possess a high level of education demonstrate regular toothbrushing and better oral hygiene routines.[10,11]

Understanding the national prevalence of dental caries along with oral hygiene status and its determinants, such as education level, providing a clear perspective about the oral health behaviors and unmet needs of community. Providing this information to stakeholders and decision-makers allows them to enhance oral health practices by prioritizing preventive education, making evidence-based interventions, and allocating resources or implementing oral health policies.

Therefore, the study aimed to measure the prevalence of dental caries in Sebha City, Libya, and the oral hygiene status, taking the education level into account.

METHODS

This cross-sectional study design was conducted at the Faculty of Dentistry, Sebha University, and included 627 participants. Data were collected within 8 months from July 2024 to May 2025. Demographic data includes age, gender, living location, and educational level for every single participant. Dental caries was assessed by DMFT for permanent teeth and DMFT for deciduous teeth), and oral hygiene status was measured by the OHI. The clinical examination was performed by well-trained examiners who underwent data collection training and calibration to maintain the measurements' validity. The dental examination was carried out on a dental chair. A standard dental explorer was used to evaluate dental caries and a WHO probe to assess debris and calculus for measuring OHI. Before recruitment, all participants were asked to provide voluntary informed consent prior to their inclusion.

The study protocol was approved by the department ethical committee, faculty of dentistry, Sebha University on 7th of April 2024 (Approval No: 3/2024), according to Helsinki declaration of ethical standards. The informed consent was obtained from all the participants by filling out the informed consent form before enrolment.

Statistical analysis was performed using the statistical package for the social sciences (SPSS version 22). A descriptive analysis was performed for all demographic data; counts and percentages were reported for qualitative data. Quantitative data were assessed for normality, and then mean and standard deviation were used for normally distributed data such as age, whereas median with min and max were used for not normally distributed data. The DMFT differences between age groups, OHI, and educational levels were assessed by comparing medians (min-max). Mann-Whitney U and Kruskal-Wallis were used to compare medians between these variables. The assessment of the statistical significance at the alpha level (p=0.05).

RESULTS

Demographics

A total of 627 participants were recruited at a mean age of 32.95 (SD=14); 63.2% were female and 36.8% were male. Most participants were aged 19-35 years (42.1%) and 36-55 years (33.7%). The distribution of the level of education was as follows: most participants were at the primary level (53.7%); followed by secondary level (30.6%), and the tertiary level (15.6%) (Table 1 and Figure 1).

Table 1: Demographic data.

Characteristics	N	Mean (SD)	Median (min-max)	Percentages
Age (in years)	627	32.95 (14)	----------	
Gender	231 Male			36.8
	396 Female			63.2
Educational level	337 Primary			53.7
	192 Secondary			30.6
	97 Tertiary			15.6
DMFT	627	----------	8 (0-30)	
OHI	627	----------	1.4 (0-6)	

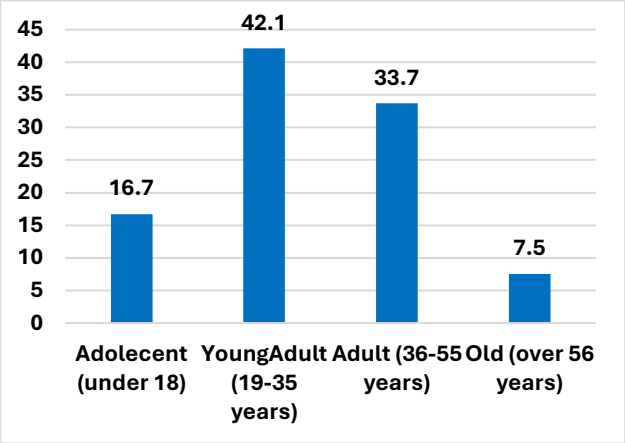

Figure 1: Age groups.

The prevalence of dental caries in this study was exceptionally high; nearly all the participants (98.4%) experienced dental caries at a median of 8.00 (0.00-30.0) (Figure 2).

The difference in DMFT between age groups was statistically significant (p=0.000). The DMFT score tends to increase with age from 5.00 in adolescents to 12 in older age group (Table 2).

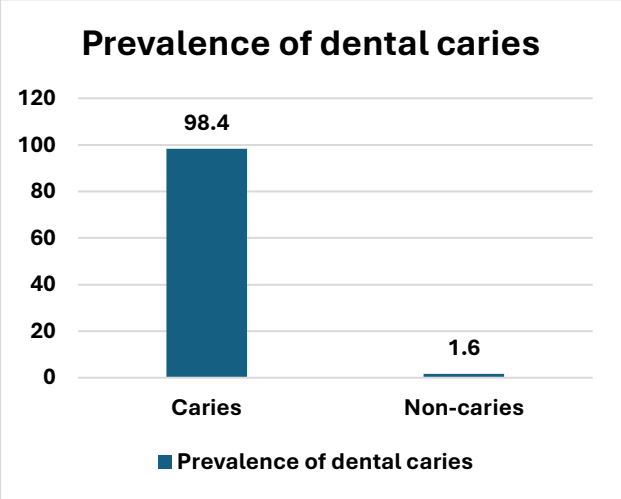

Figure 2: Prevalence of dental caries.

Table 2: DMFT difference between age groups.

Age groups (in years)	Median	Minimum	Maximum
Adolescent	5.0	0.00	19.0
Young adult	8.0	0.00	30.0
Adult	10.0	1.0	28.0
Old	12.0	2.0	23.0

The DMFT difference between males and females was not statistically significant. The median DMFT among males was 8 and among females 8.5 (Figure 3).

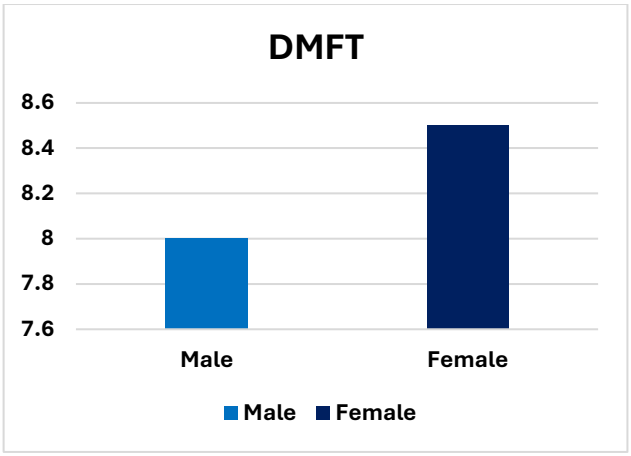

Figure 3: Difference in DMFT between genders.

The DMFT difference between education levels was not statistically significant (p>0.05). The median DMFT was 9.00 in the primary group, and 8 in the secondary and tertiary groups (Table 3).

Table 3: Difference in DMFT between genders.

Education level	Median	Minimum	Maximum
Primary	9.0000	0.00	28.00
Secondary	8.0000	0.00	21.00
Tertiary	8.0000	1.00	30.00
Total	8.0000	0.00	30.00

The OHI difference between genders was statistically significant (p=0.003). Males showed a slightly higher median compared to females (1.500 and 1.400, respectively), which suggests that OHI scores higher in males than in females (Table 4).

Table 4: OHI difference between the genders.

OHI			
Gender	**N**	**Median (max-min)**	**P value**
Male	1.500	1.5 (0.00-6.00)	0.003
Female	1.400	1.4 (0.00-6.00)	

The OHI difference between the age groups was not statistically significant (p>0.05). The old age group had the highest OHI score (median=1.600), whereas the adolescent age group had the lowest OHI score (median=1.300) (Table 5).

Table 5: OHI difference between age groups.

Age groups (in years)	Median	Minimum	Maximum
Adolescent	1.30	0.00	6.00
Young adult	1.40	0.00	5.60
Adult	1.50	0.20	6.00
Old	1.60	0.00	4.60

The OHI difference between education levels was statistically significant (p=0.00). The primary and tertiary education levels exhibited good oral hygiene levels (median=1.30 and 1.40, respectively), whereas the secondary education level revealed a fair oral hygiene level (median=2.16) (Table 6).

Table 6: OHI difference between education levels.

Education level	Median	Minimum	Maximum
Primary	1.30	0.00	4.90
Secondary	2.16	0.00	6.00
Tertiary	1.40	0.30	5.00

DISCUSSION

The primary objective of this study is to evaluate the prevalence of dental caries and provide a comprehensive view of dental caries in Sebha City and surrounding counties. The results showed a significantly high prevalence of dental caries among the participants (98.4%) with a median DMFT score of 8. Compared to previous studies conducted in Libya, this prevalence is considerably high.[2,4] The study's finding indicates that dental caries is still one of the public health concerns among the study population. This result might reflect inaccessibility to preventive measures, or poor oral health awareness, or consumption of a cariogenic diet.

The DMFT score demonstrated a statistically significant upward trend across the age groups, with (p=0.00). The adolescent age group exhibited a relatively low DMFT score (median=5) compared with the old age group, which shows a substantially high score (median=12). Moghadam et al and Jordan et al was reported same findings, which indicate the DMFT score increases with age.[12,13] The findings are consistence with the cumulative pattern of the dental caries process, which is attributed to lifelong exposure to common dental risk factors. These risk factors include consumption of cariogenic carbohydrates, low health education, and limited access to dental services.[14-16] Consequently, this highlights the significance of early dental caries prevention in order to mitigate its progression in advanced age.[17-19]

On the other hand, gender did not reveal any association with DMFT, the scores were almost same between males and females (8 and 8.5, respectively). The findings of this study suggest that the participants are possibly sharing the same risk factor. On the contrary, other studies reported the high caries incidence in female compared to male, may be attributed to factors such as early teeth eruption or dietary habits.[20,21]

Even though most of the study participants had a primary level of education, no difference was found in the DMFT scores between all the education groups. This suggests that oral health knowledge and behavior are comparably limited across different educational levels in this situation. Alternatively, it may indicate that structural difficulties, such as access to dental services, may possibly have a more considerable effect than individual educational achievement. Other studies have shown contrary results, demonstrating that educational achievement does certainly affect the experience of dental caries.[21] While there is no direct correlation between educational level and dental caries, the other factors, such as dietary habits, toothbrushing frequency, and use of dental fluoride, are usually determined by an individual's educational level.[22]

The OHI in this study showed meaningful variation among certain sociodemographic factors, whereas others were relatively consistent across the groups.

The difference in OHI among the genders was statistically significant (p=0.003), which might reveal the role of gender in determining the oral hygiene practice and access to oral health care. This result supports the literature that suggests the difference between males and females in terms of pattern of behavior, oral health awareness, and seeking of dental care usually has a great impact on oral hygiene outcomes.[23,24] The nature of behavior and lifestyle habits might contribute to this difference; in other words, one gender may show persistent oral hygiene care and desire for receiving dental prevention services.[25]

In contrast, the OHI and age were not statistically different in the study population, indicating that age might not be determinant of oral hygiene. This finding may suggest that oral hygiene practice is relatively stable among age groups, and the other demographic factors might play a considerable role more than age does.

The association between OHI and educational level was a statistically significant (p=0.00). Individuals with primary and tertiary education levels revealed better oral hygiene (median OHI=1.30 and 1.40, respectively) than those with secondary education (median OHI=2.16). This pattern is somewhat unexpected because higher education is usually associated with improved health literacy and good health behaviours.[10,22,26,27] The favorable oral hygiene status observed in the primary educational group may suggest the existence of specific contextual factors influencing the study setting. Conversely, the poor oral hygiene status observed in the secondary education group might reflect a lack of the health education or insufficient reinforcement of healthy behavior during this age transitional period. This finding highlights that education level might affect oral hygiene practice but is not always associated with adequate oral health status.[28] The outcomes highlight the importance of taking gender and educational factors into account when designing oral health promotion programs. Therefore, the intervention programs should be tailored to specific educational groups to eliminate behavioural differences and enhance oral health education, which will subsequently improve overall oral hygiene outcomes.[29]

The present study has some limitations, include a single location data collection during working days, which may introduce potential selection bias. Although participants recruited were from different areas in the south of Libya, the majority were concentrated in Sebha; therefore, the result cannot be extrapolated. In addition, there are several risk factors that were not included in this study, such as diet, socioeconomic status, fluoride use, and toothbrushing frequency, which can be potential confounders.

The findings of this study highlight the necessity for the implementation of comprehensive oral health education and promotion strategies targeting every part of the population, focusing on young people. Any public health initiative should be emphasized on improving dental health access, raising awareness in the community, and encouraging a healthy diet and good oral hygiene practices. Further research is needed to explore the undiscovered contributors, such as access to fluoridated water, socioeconomic status, and frequency of dental visits, to draw a clear view and understand the reasons for the high burden of dental caries.

CONCLUSION

The prevalence of dental caries was high in the study population. The old age group experienced more dental caries than the other age groups, suggesting cumulative disease progression over time. Demographic factors, such as gender and educational level, play a critical role in shaping oral health behaviors. Preventive interventions and oral health educational programs need to be tailored towards specific age groups and lower education levels.

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