



## Prevalence of Dental Caries Among Libyan Children Aged from 6-12 in Derna City and Peripheral Area.

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**Abstract:** This study aimed to assess the DMFT/dmft index among school-aged children who are in the mixed dentition period. **Material and Methods:** A total of 300 children, aged between 6 and 12 years, were randomly selected through school visits. Each participant underwent an intraoral examination conducted by dental hygienists, with emphasis on recording the DMFT/dmft index, which reflects the number of decayed, missing, or filled teeth due to dental caries. Their oral health status and required treatments were documented. **Result:** The prevalence of dental caries varied from 17% to 59% among the children for DMFT and dmft indices, respectively. Of the 300 children, 129 (43%) were boys and 171 (57%) were girls, with an average age of  $8.45 \pm 1.94$  years. The mean DMFT index was  $0.45 \pm 1.08$ , suggesting a low rate of dental caries, while the dmft index averaged  $7.39 \pm 6.11$ , indicating a high occurrence of dental caries. **Conclusion:** Dental caries in children with mixed dentition ranged widely from very low to extremely high, with higher prevalence observed in those aged between 9 and 12 years.

**Keywords:** Dental Caries, DMFT Index, Mixed Dentition, School-Aged Children, Prevalence.

### Introduction:

Primary teeth are vital for children's capabilities to eat, speak, maintain their appearance, and ensure there is enough space for the proper emergence of permanent teeth (Setty et al., 2016). Oral health is crucial for overall wellness (Weintraub et al., 2022). Despite improvements in dental care, dental caries continues to be one of the most prevalent health issues worldwide (Shoae et al., 2022). Its early onset is typically associated with high sugar intake and the presence of cariogenic bacteria (Alvarez et al., 1998). Dental pain or swelling caused by caries in both primary and permanent teeth can adversely impact children's daily activities, such as speaking and eating, as well as their appearance (Setty et al., 2016). In addition to harming the teeth, dental caries can result in more serious oral and systemic health problems (Ripa et al., 1988). The occurrence of dental caries varies across factors like age, gender, socio-economic background, ethnicity, geographical location, eating habits, and oral hygiene practices (Rizwan et al., 2009). Factors such as inadequate oral hygiene due to a carefree attitude in children, emotional stress, frequent consumption of sugary and sticky foods, and changes during the mixed dentition phase heighten the risk of caries (Ahmad et al., 2022). Effectively addressing this issue necessitates both awareness and appropriate treatment methods. Research worldwide has continually shown differences in caries prevalence among various populations (Al-banyan et al., 2000; Al-hebshi et al., 2015; Alhammad et al., 2010; Alkarimi et al., 2014; Alshehhi et al., 2020; Farooqi et al., 2015; Farsi et al., 2008 & Orfali et al., 2008). However, not all children are equally susceptible to dental caries (Kuriakose et al., 1999; Mahejabeen et al., 2006; Pandit et al., 2000; Petersen et al., 1988 & Ramos et al., 1996). Maintaining good oral health enables individuals to live without pain or discomfort, thus affecting communication, nutrition, and social interaction. Oral health encompasses the well-being of the craniofacial structures, teeth, gums, and adjacent tissues (John et al., 2020). In Libya, studies on the prevalence of dental caries are scarce, but there is evidence pointing to a growing trend in both the frequency and severity over time (Saravanan et al., 2008). Preventive measures are viewed as effective; however, the lack of comprehensive data hinders strategic initiatives.

The mixed dentition stage presents specific challenges due to factors related to diet, tooth eruption patterns, and inadequate oral hygiene practices. Nevertheless, this period is critical for the correct development of occlusion and for protecting the first permanent molars from decay (Saravanan et al., 2005). The primary factor contributing to increasing caries rates in developing countries is a greater focus on treatment rather than prevention within healthcare systems. Several risk factors, including diet, brushing habits, age, and ethnicity, contribute to the development of caries, with regular sugar consumption being particularly significant. Annually, poor oral health results in over 49 million school hours lost globally, underscoring the importance of regular dental check-ups (Schroth et al., 2007). This study was thus designed to assess the DMFT/dmft indices among children with mixed dentition to inform future preventative strategies.

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## Materials and Methods

This cross-sectional study was conducted over a period of three months, from February to May 2025, and included 300 students from a public primary school in Derna City. The participants were aged between 6 and 12 years. The study was ethically approved by the Ethics Committee at the College of Medical Technology in Derna, Libya, and prior consent was secured from teachers, parents, and school administrators.

Dental assessments were carried out using basic implements such as tongue depressors, dental probes, and simple mouth mirrors, with students seated on basic wooden chairs. All evaluations adhered to the World Health Organization (WHO) guidelines and were conducted in natural daylight with the aid of torches. The DMFT/dmft index was employed to document the occurrence of decayed, missing (due to caries), or filled teeth, which served as an indicator of oral health.

Copies of the examination outcomes were provided to parents to inform them of their children's dental treatment requirements. In accordance with WHO standards, the DMFT/dmft scores were classified as follows:

- Extremely low: 0.0–1.1
- Low: 1.2–2.6
- Moderate: 2.7–4.4
- High: 4.5–6.5
- Very high: >6.6

Both male and female children in the mixed dentition stage were included in the sample. Data were collected through a structured form that gathered demographic information such as age, gender, education level, birthplace, residence, and oral hygiene practices, alongside findings from clinical evaluations and interviews.

### Data Analysis:

The gathered data were analyzed utilizing SPSS software, version 26. Descriptive statistics including frequencies and percentages were employed to summarize the characteristics of the sample. All statistical tests were executed with a significance threshold established at  $p \leq 0.05$ .

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## Results

### Demographic Characteristics:

As outlined in Table 1, three hundred (300) children were examined using the WHO dental caries screening questionnaire to assess DMFT and dmft indices. The study sample included 171 girls (57%) and 129 boys (43%), randomly selected. The children ranged in age from 6 to 12 years, with an average age of  $8.45 \pm 1.94$  years. The most represented age group was 6–8 years (56%,  $n=168$ ), followed by 9–11 years (31%,  $n=93$ ). Regarding residence, 108 children (36%) lived within Derna City, while 192 (64%) were from surrounding areas. The highest proportion of students (27%) were in the first and third grades.

In terms of oral hygiene practices, 75% of the children reported using a toothbrush, while 25% were not use a toothbrush at all. Among those who brushed their teeth, 39% did so once daily, 29% twice, and 7% three times. Only 36% reported brushing before bed. As for sugar intake before bedtime, 17% said they consumed candy at night, while 83% did not. The total prevalence of dental caries ranged between 17% and 59% for DMFT and dmft indices, respectively. Pit and fissure caries were the most commonly observed form of tooth decay in both primary

and permanent teeth. In permanent teeth, 17% were decayed, 5% were missing due to dental caries, and 1% were filled. Among primary teeth, 59% had decay, 69% were missing for dental caries reason, and 2% were filled. The overall DMFT index was  $0.45 \pm 1.08$ , indicating an extremely low prevalence, while the dmft index was  $7.39 \pm 6.11$ , suggesting a very high rate of caries.

**Table 1. Demographic data**

| Variables  | N (%)           |
|--|-----------------|
| <b>Age group</b>                                   |                 |
| 6-8  | 168(56%)        |
| 9-11   | 93(31%)         |
| 12   | 39(13%)         |
| <b>Sex</b>   |                 |
| Male   | 129(43%)        |
| female   | 171(57%)        |
| <b>Educational level</b>                           |                 |
| First grade  | 81(27%)         |
| Second grade                                       | 60(20%)         |
| Third grade  | 81(27%)         |
| Fourth grade                                       | 18(6%)          |
| Fifth grade  | 21(7%)          |
| Six grade  | 39(13%)         |
| <b>Residency</b>                                   |                 |
| Derna city   | 108(36%)        |
| Outside city                                       | 192(64%)        |
| <b>Did you use of tooth brush?</b>                 |                 |
| Yes  | 225(75%)        |
| No   | 75(25%)         |
| <b>How often did you use of tooth brush daily?</b> |                 |
| none   | 75(25%)         |
| Once a day   | 117(39%)        |
| Twice a day  | 87(29%)         |
| Three time a day                                   | 21(7%)          |
| <b>Did you use tooth brush before sleep?</b>       |                 |
| Yes  | 108(36%)        |
| No   | 192(64%)        |
| <b>DMFT</b>  | $0.45 \pm 1.08$ |
| Decay  | 51(17%)         |
| Missing  | 15(5%)          |
| Filling  | 3(1%)           |
| <b>Dmft</b>  | $7.39 \pm 6.11$ |
| Decay  | 59(59%)         |
| Missing  | 69(69%)         |
| Filling  | 2(2%)           |
| <b>Did you eat candy before sleep?</b>             |                 |
| Yes  | 51(17%)         |
| No   | 249(83%)        |

The relationship between demographics and DMFT/dmft scores indicated significant differences among various age groups, as shown in Table 2, via one-way ANOVA (DMFT:  $F=148.57$ ,  $p=0.000$ ; dmft:  $F=21.14$ ,  $p=0.000$ ). Post-hoc Tukey tests revealed that dmft scores were notably higher in children aged 9–11, whereas the highest DMFT scores were observed in 12-year-olds ( $p=0.000$  for both). An analysis based on gender, using the T-test, indicated that girls had higher average DMFT and dmft scores in comparison to boys ( $p=0.012$  and  $p=0.018$ , respectively). The level of education also showed a significant correlation with DMFT/dmft scores ( $p=0.000$ ). For DMFT, the most substantial differences were observed in children in grades four, five, and six ( $p=0.011$ ,  $0.002$ , and  $0.000$ ), while, in terms of dmft,

the most significant differences appeared in grades two through five ( $p=0.005$  to  $0.048$ ). Children residing in Derna City displayed significantly elevated DMFT and dmft scores compared to their counterparts living outside the city ( $p=0.000$  for both).

Regarding oral hygiene practices, using a toothbrush did not significantly influence dmft scores ( $p=0.333$ ), but it did have a considerable impact on DMFT scores ( $p=0.000$ ). One-way ANOVA results demonstrated that the frequency of brushing positively affected both DMFT and dmft scores (DMFT:  $F=4.64$ ,  $p=0.003$ ; dmft:  $F=6.74$ ,  $p=0.000$ ). Children who brushed their teeth before bedtime exhibited significantly lower dmft scores ( $p=0.000$ ), whereas consuming candy before going to sleep showed no significant effect on either DMFT or dmft scores ( $p=0.06$  and  $0.581$ , respectively).

**Table 2. Relationship between demographic variables and Mean DMFT/dmft.**

| Variables  | Mean DMFT  | p-value  | Mean dmft  | p-value  |
|--|------------|----------|------------|----------|
| <b>Age group</b>                                   |            | 0.000**  |            | 0.000**  |
| 6-8  | 0.035±1.86 | 0.000*** | 5.85±4.37  | 0.000*** |
| 9-11   | 0.38±0.70  | 0.000*** | 10.58±5.90 |          |
| 12   | 2.38±1.80  | 0.000*** | 6.30±9.26  |          |
| <b>Sex</b>   |            | 0.012*   |            | 0.018*   |
| Male   | 0.27±0.79  |          | 6.47±4.72  |          |
| female   | 0.57±1.24  |          | 8.07±6.86  |          |
| <b>Educational level</b>                           |            | 0.000**  |            | 0.000**  |
| First grade  | 0.000      |          | 3.84±3.60  | 0.005*** |
| Second grade                                       | 0.15±0.36  |          | 7.2±3.93   | 0.000*** |
| Third grade  | 0.07±0.26  |          | 9.96±4.51  | 0.000*** |
| Fourth grade                                       | 0.66±0.97  | 0.011*** | 13.83±5.12 | 0.048*** |
| Fifth grade  | 0.71±0.90  | 0.002*** | 7.71±8.42  |          |
| Six grade  | 2.38±1.80  | 0.000*** | 6.30±9.26  |          |
| <b>Residency</b>                                   |            | 0.000**  |            | 0.000**  |
| Derna city   | 0.88±1.45  |          | 9.25±7.39  |          |
| Outside city                                       | 0.203±0.69 |          | 6.33±4.91  |          |
| <b>Did you use of tooth brush?</b>                 |            | 0.000**  |            | 0.333**  |
| Yes  | 0.54±1.20  |          | 7.56±6.45  |          |
| No   | 0.16±0.46  |          | 6.88±4.85  |          |
| <b>How often did you use of tooth brush daily?</b> |            | 0.003**  |            | 0.000**  |
| none   | 0.16±0.46  |          | 6.88±4.85  | 0.026    |
| Once a day   | 0.56±1.19  |          | 5.86±5.58  |          |
| Twice a day  | 0.65±1.32  |          | 9.51±6.82  | 0.000*** |
| Three time a day                                   | 0.000      | 0.018*** | 8.71±7.07  |          |
| <b>Did you use tooth brush before sleep?</b>       |            | 0.134*   |            | 0.000*   |
| Yes  |            |          |            |          |
| No   | 0.58±1.23  |          | 10.13±6.32 |          |
|  | 0.37±0.97  |          | 5.82±5.37  |          |
| <b>Did you eat candy before sleep?</b>             |            | 0.06*    |            | 0.581*   |
| Yes  |            |          |            |          |
| No   | 0.82±1.66  |          | 7.82±6.03  |          |
|  | 0.37±0.90  |          | 7.30±6.11  |          |

\*Independent samples test(T-test).

\*\*One-way ANOVA.

\*\*\*Post Hoc Tests (Tukey HSD).

## Discussion:

This research identified a significant overall prevalence of dental caries (59%) among school-aged children, aligning with the results from studies conducted by Wong et al. (2017), Gao et al. (2020), and Mohammad et al. (2012). Nonetheless, the occurrence of caries in primary teeth in our sample was found to be lower than the 78% reported in a study based in Tripoli (Alraqiq et al., 2021). Conversely, the caries rates found in our study were similar to those from other regions in Libya, such as Benghazi (63.5%) and Zawia and Zehra (55%) among children aged 6 years (Hawew et al., 1996 & Nasr et al., 2014). The prevalence of dental caries varies significantly both between and within countries, influenced by factors such as ethnicity, climate, diet, cultural practices, and socioeconomic conditions. Early visits to the dentist are crucial as they create opportunities for preventive services like fluoride treatments and sealants, while also educating both children and their guardians on oral hygiene and the necessity of regular dental visits (Dhull et al., 2024). Parents play a vital role in ensuring their children's oral health. A study from Canada indicated that children with parents who recognized the importance of permanent teeth had notably lower rates of caries. This underscores a strong connection between parental knowledge and children's oral health (Stepanets et al., 2022). In our findings, the mean number of decayed teeth was  $0.432 \pm 0.902$ . Caries experiences varied from moderate to severe among different age groups, with approximately 30% of the children exhibiting poor oral hygiene. This is consistent with research from Nepal, where 31% of children aged 9-11 had caries and 45% faced oral health challenges (Suryasa et al., 2021). Notably, our data revealed that girls exhibited a higher caries rate compared to boys, contrasting with the results of the Karachi study by Mohammad et al. (2012), which found a higher prevalence in boys. This difference in gender may reflect disparities in dietary habits and oral hygiene practices between boys and girls. While 75% of the children in our study brushed their teeth daily, 25% did not brush at all. This is in line with another study that reported 56% of children practiced regular brushing (Tewari et al., 1977). Only 17% of the children mentioned consuming sugary foods before bedtime. To effectively promote oral health, it is crucial to engage multiple sectors including public health, education, and government, as schools provide an optimal environment to instill and foster good oral hygiene practices from an early age. However, education on its own is insufficient. To facilitate behavioral change in children, it is essential to involve parents and provide consistent support to establish lasting oral hygiene habits..

## Conclusion:

Dental caries among children in the mixed dentition stage ranged from very low to extremely high, with significantly higher rates found among those aged 9 to 12 years. There is a pressing need for targeted preventive programs, which should be developed and implemented through collaboration between healthcare providers, educators, and community leaders.

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