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## Prevalence and pattern of dental caries in primary molars among Libyan school children in Benghazi

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### Abstract

**Aims:** To assess prevalence and severity of dental caries in primary teeth among Libyan school children in Benghazi.

**Study design:** Cross sectional observational study.

**Material and Methods:** A total of 236 school children, aged 8-9 years were selected for a dental examination. The oral health was measured using World Health Organization (WHO) diagnostic criteria for dental caries: decayed, missing and filled tooth, dmft index for primary dentition.

**Results:** The overall caries prevalence was 83.5% (mean dmft 3.3) with the highest caries prevalence recorded among 8 year-old children (45.3%, mean dmft 3.53). Mean decayed, missing and filled teeth (dmft) was 2.91, 0.31, 0.09 respectively. Second primary molars had higher dmft than the first (mean dmft 1.72, 1.33 respectively) and the difference was statistically significant  $p=0.001$ . The mean dmft of mandibular primary molars was higher than that of maxillary ones (mean dmft 1.67, 1.38) and the differences was statistically significant  $p=0.01$ .

**Conclusion:** While the prevalence of dental caries in primary teeth was found to be high, the treated and filled teeth are very low. The most commonly affected teeth were second primary molars, especially in the mandible. Dental caries occurred most often in the mandible. This study provided us with the baseline data for prevalence of dental caries. Providing oral health education and preventive programs would assist in improving the oral health condition of school children.

**Keywords:** Caries, prevalence, dmft index, children, Libya

### Introduction

Dental caries is a major common health issue that affects most children regardless of age, sex, race and socioeconomic level. It is considered one of the main reasons for tooth loss during childhood. It is a multifactorial disease that can involve both primary and permanent teeth [1]. The challenge to control or eradicate dental caries has been on for a long time, and this goal can be reached by increasing people awareness about the importance of maintaining a good level of oral hygiene through organizing effective oral health care programmes [2]. The prevalence of dental caries has currently risen due to an increase in the consumption of cariogenic food, lack of oral health awareness programs, and the paucity of prevention strategies [3]. There is a recent trend of increasing levels of dental caries in most of the developing countries. The percentage is estimated to be higher in developing countries compared to their developed counterparts [4, 5]. In Egypt, for example, about 74% of children had caries in a sample of 369 children and adolescence aged 3-18 years [6]. The percent found in Saudi Arabia was 78% in a sample of 397 children aged 6-9 year-old [7]. In Gulf Cooperation Council was 96% in KSA, in Oman was 84.5%, and in Qatar was 89.2% [8]. In the UAE most of the studies were performed on preschool children aged 2-5 years and the percentage ranged from 41.5 to 99.4% [7, 8]. During the Syrian crisis the prevalence of dental caries was about 79% of the sample which included 1500 children aged 8-12 years [9]. The percentage was very low in Nigeria (13.1%) in a large sample of public-school children between the age of 5 and 16 years. In this Nigerian study, children aged 5-10 years had higher caries prevalence (14.8%) than those aged 11-16 years (10.6%), and the higher percent was recorded in 8 year-old children [10].

In studies performed in both India and Pakistan founded that the prevalence of dental caries in children of primary school between the age of 6 and 12 years was about 78.9% and 74.9% respectively [11, 12]. The percentage was about 61.9% in Libya in 1993-1994 while in 2011 it was 57.8% [13, 14].

Although dental caries can have a destructive impact on both dentitions, caries in deciduous teeth may harm the growth of permanent teeth and the surrounding mucosa, thereby causing negative influence on the children's growth and development (WHO, 2003) [15]. According to a systematic review about the prevalence of caries in Arab League countries, it was found that the incidence of dental caries is higher in primary teeth compared to the permanent ones [16]. The prevalence of dental caries in primary dentitions varies considerably according to several factors including age, sex, dietary habits, socioeconomic status, and the most vulnerable sites or teeth to this lesion [17]. A typical pattern of dental caries in deciduous teeth has been reported by many studies, where mandibular molars scored as the most susceptible teeth to dental caries followed by maxillary molars [18-21]. The mandibular second molars have higher caries incidence than first molars, and it was found that it may have a pronounced affect the development of caries and cavity formation in the adjacent permanent first molars [22-24].

In Benghazi city, Libya, few studies have been performed to verify the experience and pattern of dental caries in deciduous teeth especially during the mixed dentition stage. These studies which were founded, most of them concentrated on the same age group, 12 years, and few studies were conducted on different age groups. Moreover, most of these studies were concentrated of dental caries in the permanent teeth. Information on dental caries experience is very important to evaluate the oral health status of Libyan children and to design their treatment needs, thus appropriate caries prevention programs could be planned. Therefore, this study was conducted to explore the prevalence and pattern of dental caries in deciduous molars of Libyan primary school children aged 8 and 9 years living in Benghazi city.

## Material and Methods

A cross sectional study using a stratified random sample was conducted in period from January to April 2019 to evaluate the dental health of 8 and 9 year-old school children. The participants were selected from a population of 20,817 Libyan schoolchildren, in the age range of 8-9 years, who were enrolled at 102 public primary schools in the city of Benghazi from November 2018 to June 2019. Only children with no systemic and/or mental developmental disorders participated in this study.

The sample size was calculated at 6.5% margin of error, a 95% confidence interval (CI) and an estimated concordance of 50%. The minimal sample size to meet the required parameters was estimated at 225 participants. The sample was increased by 20% to compensate for lower participation, giving a total of 270 schoolchildren.

Benghazi city is divided into 4 educational offices: Centre of Benghazi (20 schools with 3535 children aged 8-9 years old); Alsalawi (15 schools with 3939 children aged 8-9 years old); Sedi Khalifa (7 schools with 1519 children aged 8-9 years old); and Alberka (60 schools with 11824 children aged 8-9 years old). The sample was divided as follow: 17% of the sample was from three schools from Centre of Benghazi, 19% from three schools from Alsalawi, 7% from one school of Sedi Khalifa and 57% from 9 schools of Alberka. In the first stage the school in each educational office of Benghazi city

and the classes in each school were chosen by simple random sampling technique, maintaining equal numbers of the target age groups. In the second stage, the students in each class were selected by cluster sampling (i.e. all student in the class were selected) in such a way that numbers of boys and girls of each age group remained equal. After the selection of the sample, 270 consent forms were sent to their parents, and only those whose parents agreed were included in the current study.

## Clinical examination

The clinical examinations were performed by three experienced dentists, who were calibrated before the examinations started. The inter/intra-examiner reliability tests showed good Cohen's Kappa statistics ranging from 0.82 to 1.00. The clinical dental examination was conducted during daytime hours in a private room at each school. In order to reduce the risk of cross-infection, a disposable diagnostic kit was used for each child, and the examiner used disposable masks and gloves. Participants were examined for dental caries, using the decayed, missing and filled teeth (dmft), according to the WHO Oral Health Survey Basic Methods. Information about the child's age and sex was also recorded.

## Ethical approval

The study received ethical approval from both the research ethical committee of Benghazi University and the Ministry of Education. Permission to conduct the study was also gained from each head of school, and the parents signed informed consent forms.

## Statistical analyses

The collected data were analyzed using SPSS for Windows, version 23.0 (SPSS Inc., Chicago, USA). After the generation of descriptive statistics, a paired sample t-test was used to localize the statistical differences between the sex, age, type of the arch and type of teeth of all children, the p value was set at 0.05. Pearson's correlation coefficient test was used to pinpoint the relationship between the various variables measured.

## Results

Of the 270 consent forms that were sent to the parents, 24 were not returned and 10 students were absent on the day scheduled for clinical examination, two of them were from the same school and the others were from different schools. Therefore, the final sample comprised 236 students (87%). The sample distribution was presented in table 1. There were slightly more females than males, and more children aged 8 years than 9 years. The prevalence of dental caries of the whole sample was 83.5% (mean dmft 3.3). The highest caries prevalence rate was among participants aged 8 years compared to those aged 9 years. With percent 45.3% and 38.1% respectively (mean dmft 3.53, and 3.07). However, the difference between the two age groups was not statistically significant  $p = 0.152$ . There are no differences in the prevalence of caries between male and female students (mean dmft 3.31, and 3.32 respectively). Females and 9 years aged children were having more caries free teeth than males and 8 years children see figure 1.

**Table 1:** Distribution of patients according to sex and age.

Sex	8 years	9 years	total
Male	52 (46.4%)	60 (53.6%)	112 (47.5%)
Femal	71 (57.3%)	53 (42.7%)	124 (52.5%)
Total	123 (52.1%)	113 (47.9%)	236 (100%)

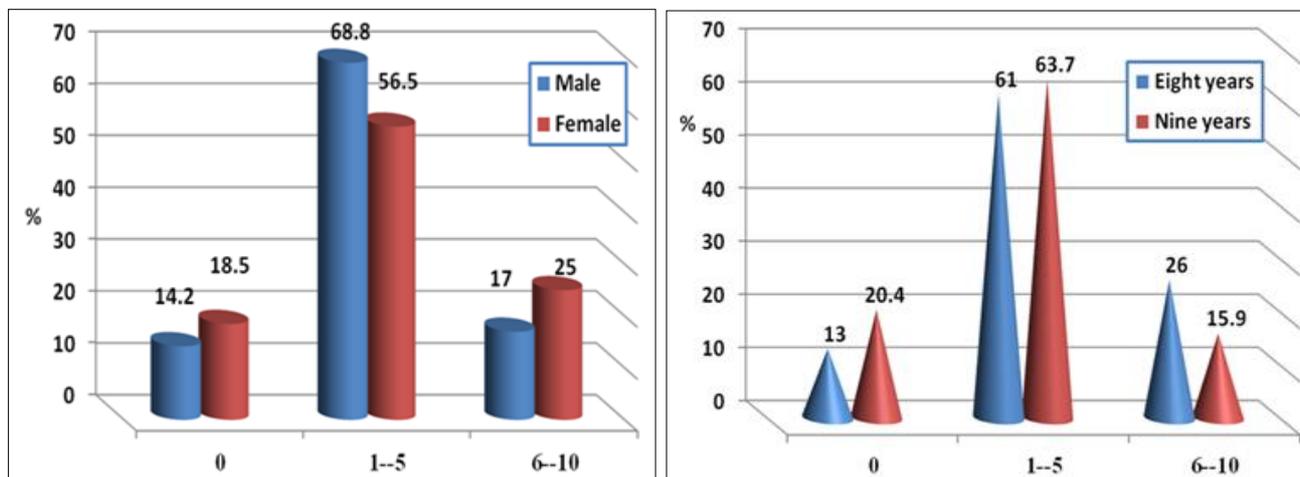


Fig 1: Distribution of patients according to age, sex and dmft

The total dmft score ranged from 1-10 with mean of 3.31. The sample was organized into three groups, group one who has dmft = 0, group two with dmft = 1-5, and group three with dmft = 6-10. Most of children fell in the second group (62.3%). Only one participant had total dmft equal to ten with nine decayed teeth, six children with total dmft equal to eight, three of them had eight decayed teeth, and three children had total dmft equal to nine one of them has nine decayed teeth. On assessing the dmft separately of the whole sample, decayed teeth represent 88.3% (mean 2.91), missing teeth 9.1% (mean 0.31), and filled teeth represent only 2.6% (mean 0.09). Age wise, 8 years children had higher dmft than 9 years children for both first and second molar (mean dmft 1.52, 1.85), but the difference was only significant in case of deciduous first molar  $p= 0.01$ . In addition, there were no significant differences in the caries prevalence of the first and second molars between males and females of both age groups  $p > 0.01$ . Concerning the caries pattern, the deciduous second molar had higher dmft than the first (mean dmft 1.72, 1.33 respectively) and the difference was statistically significant  $p$

= 0.001. Regarding each arch the dmft was higher in deciduous second molar than first molar in both arches (mean dmft 0.82, 0.55 in maxilla) (mean 0.88, 0.78 in mandible), however the differences as only significant in maxilla  $p = 0.001$ . In addition, the mean dmft of mandibular deciduous molars was higher than that of maxillary ones (mean dmft 1.67, 1.38) and the differences was statistically significant  $p=0.01$ .

Pearson's correlation coefficient was used to assess the correlation between the dmft of the first and second molars. The results showed positive correlation between the total dmft and the dmft of deciduous first molars as well as of the deciduous second molars. In addition, positive correlation found between dmft of deciduous maxillary molars and mandibular ones ( $r= 0.39, p= 0.01$ ). Positive correlation was found between upper- lower first molars as well as the upper - lower second molars. Table 2 shows the results of the Pearson correlation test of all the variables tested.

Table 2: results of the Pearson correlation test

Variables	r - value	P - value
dmft D and dmft E	0.472	0.01
dmft T & dmft D	0.822	0.01
dmft T & dmft E	0.828	0.01
dmft (D5 + D6) & dmft (E5+6)	0.374	0.01
dmft (D7 + D8) & dmft (E7 + E8)	0.383	0.01
dmft (D5+D6) + dmft (E5+E6) & dmft (D7+D8) + dmft (E7+E8)	0.399	0.01

**Discussion**

Despite dental caries experience has been extensively studied, little has been done relating mixed dentition period. Dental caries is considered a major public health problem in underdeveloped or developing countries. Therefore, the present study investigated the prevalence and pattern of dental caries in the stage of mixed dentition in school children of Benghazi. The prevalence of caries-free children in our study was 16.5% which is slightly more than that presented in similar studies describing the oral health status of children in the Islamic Republic of Iran which was 11.5%, and 10.0% in 1999 and 2009 respectively [25]. The mean dmft of the present study of the whole sample was 3.3 which is coincide with other Arab countries such as Kuwait where mean dmft was 3.25 [26], but it is higher than that reported in Jordan for children aged 8-12 year (mean dmft 2.05) [27] and higher than that found in Italian study (1.84) [22]. On the other hand, the value reported for dmft rate was lower compared with that

reported in Saudia Arabia for similar age groups in 2008, 2011 and 2015 [28, 29, 7]. Also, lower than overall mean dmft that published on Khan *et al.* review study on the prevalence of dental caries in the Arab League which was 4.34 in deciduous teeth [30]. And lower than that found in Saudi Arabian studies (4,71, 6,09) [31] and found in Syrian study (4.25) [9].

Similar findings of the current study were found in anther studies that the deciduous second molars followed by first molars are the main affected teeth [22-24, 31, 32]. Also, this study confirms that the primary second molars had higher dmft than the first primary molars [22-24]. Moreover, the mandibular molars showing higher level of dental caries than their maxillary counterparts [18-21, 32, 33], and these finding is compatible with finding of our study.

Significant differences in dental caries prevalence were found according to arches and age but no significant differences in dmft were found between both genders. Regarding each arch

the dmft was higher in deciduous second molars than first molars in both arches (mean dmft 0.82, 0.55 in maxilla) (mean 0.88, 0.78 in mandible), however the differences as only significant in maxilla  $p = 0.001$ . In addition, the mean dmft of mandibular primary molars was higher than that of maxillary ones (mean dmft 1.67, 1.38) and the differences was statistically significant  $p=0.01$ . The main reason for primary second molars has more caries than the first ones maybe due to plaque retention, brushing the second primary molars is more challenging than brushing the first ones and natural cleaning is likely better on the first primary molars. Also, the tooth anatomy might be an explanation. The first primary molars erupt earlier than the second primary molars for this reason could expect that the first primary molar has more caries prevalence than second primary molars due to a longer presence in the oral cavity. But this is not supported by the studies.

The prevalence of dental caries was higher, 45.3% (mean dmft 3.53) for the 8-years-old children than 38.1% (mean dmft 3.07) for 9-years-old children. In present study it was observed that as age advances, prevalence of dental caries among children declines. These results agreed with other studies reported<sup>[10, 12]</sup>.

The present study revealed the prevalence of dental caries of the whole sample was 83.5% (mean dmft 3.3). This value is high when compared to other countries like that reported in Indian study for children aged 6-11 years (78.9%, mean dmft 2.97)<sup>[11]</sup>, in Egypt, about 74% of children had caries<sup>[6]</sup>, and higher than that found in Saudi Arabia (78%, mean dmft 3.66)<sup>[7]</sup>. Also, it was higher than that found in Karachi city 69.6% (mean dmft 3.30)<sup>[12]</sup>, in Syria 79% (mean dmft 2.47%)<sup>[9]</sup>. And much higher than finding of Nigerian study (14.8%) for children aged 5-10 years-old<sup>[10]</sup>. But, the caries prevalence of the present study is quite similar to that found 84.5% in Oman, and 89.2% in Qatar, in the UAE most of the studies were performed on preschool children aged 2-5 years and the percentage ranged from 41.5 to 99.4%, in Gulf Cooperation Council which ranged from 20.8 to 96% in KSA<sup>[8]</sup>.

Comparing caries prevalence in the current study (83.5) with Libyan previous studies showed that an increasing trend in the prevalence of dental caries. For example, studies conducted in Benghazi estimated the prevalence of dental caries among children, in 1996 showed prevalence of dental caries was 50%<sup>[34]</sup>, and was 50% in 2000<sup>[13]</sup>. Another study was undertaken in Benghazi in 2002, investigating the oral health of 685 children, it was found that more than half of these children (58%) had carious primary teeth<sup>[35]</sup> also, a study conducted in 2011 showed that caries prevalence was 57.8%<sup>[14]</sup>. More recent Libyan study reported that the prevalence of dental caries was 63.5%<sup>[36]</sup>.

Diet, tooth brushing and fluoride intakes are very important for the level of caries prevalence<sup>[37]</sup>. The World Health Organization emphasizes the need public health solutions for prevention of dental caries<sup>[38]</sup>. Therefore, farther studies to assess the prevalence of dental caries in different cities are needed promote the reduction of dental caries prevalence in Libya.

## Conclusion

The present study showed caries process in the primary dentition is considerable for the majority of children during the age period 8-9 years, and decayed component constituting the major in caries prevalence of primary teeth. This high caries level is indicating that the dental health has reached a low level. Higher caries prevalence rate was among

participants aged 8 years compared to those aged 9 years. Also found that primary second molars have more caries than the first ones, and the difference was statistically significant. Prevalence of dental caries showed to be an important health issue in the Libyan children requiring immediate attention. This finding seems to suggest regular check-ups and enhancement of preventive measure are required for the whole population. However, it becomes imperative to collect more data on prevalence of dental caries and treatment needs to provide preventive care.

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**Conflict of Interests:** Authors have no conflict of interest.

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