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Deciduous and permanent dental caries status among primary schoolchildren of Libya: A cross-sectional study

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Abstract

Aim: to assess prevalence and severity of dental caries (DMFT for permanent dentition and dmft for primary dentition) among Libyan children.

Methods: A cross-sectional observational study including a random sample of 372 children was conducted in Benghazi. Experience of dental caries was assessed by decayed, missing, and filled teeth DMFT and dmft indices using WHO criteria of diagnosing dental caries. The data were entered and managed by using SPSS software version 25. Descriptive analysis of the data including frequencies, percentages and means of school-children's decayed, missing and filled components was performed.

Results: Overall dental caries prevalence was 86.6%. The mean DMFT and dmft indices were 0.86 and 2.78 for all 372 subjects amongst which major contributor was decayed component. Considering only subjects with caries experience (322), mean DMFT and dmft indices were 1.00 and 3.21, respectively. Higher prevalence of dmft scores was observed than DMFT scores in all subjects and in subjects with caries experience. For all subjects DMFT, the Decay index was 89.5%, Missing index was 3.5% and Care index was 6.7%. For all subjects dmft, the Decay index was 89.9%, Missing index was 7.9% and Care index was 2.1%. *Conclusions:* Caries prevalence was high considering the World Health Organization future oral health goals. Although the prevalence in the study sample is high, Care index is unacceptably low. The findings stress on the need to treat the children at the initial stages of caries development with preventive approaches. Providing and implementing preventive and educational programs for controlling dental caries are necessary.

Keywords: Dental caries; Children; DMFT; Dmft

1. Introduction

Dental caries is a common, chronic disease of childhood. It is a multifactorial condition influenced by the interaction of chemical, biological, and behavioral factors. Caries is the most public dental diseases affecting a large number of children and adults. It continues to be the main dental health problem in many countries since it involves most of the population. Despite dental caries is a preventable chronic disease, until now it still remains prevalent in children. According to the World Health Organization, dental caries is the fourth most expensive chronic disease group to treat [1]. The World Health Organization (WHO) lists dental caries as the third most common chronic, non-infectious disease after cancer and cardiovascular disease. Dental caries, therefore, places a major financial burden on both individuals and health care systems [1]. It is the most common of loss of teeth in children and adults. Decayed or missing teeth

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have great effect on children's routine lives as they suffering pain, distress, reduced self-esteem and could also result in the reduction of the affected individual's quality of life because of its impact on functions such as eating, talking, swallowing, and aesthetics also causing restricting in children activity [2]. Significant proportions of children and adults are affected by caries in developing countries. Dental caries continues to be a major public health problem in schoolchildren and main cause of tooth mortality and dental emergency [3]. In many developing countries, dental caries is increasing over time, especially since the relatively current economic growth and easy accessibility of sugar, which has led to increased intake of sugared foods and drinks and lack of knowledge and awareness about dental health practices has also contributed to the increase in prevalence of dental caries [4-7]. Consequently, dental health is an essential part of the person's general health.

There has been a reduction in caries experience in children from in developed countries, and an increase in several developing countries [8]. The explanation for this improvement is complex but include lowering in frequent sugary diet intake, improved oral hygiene practice, the use of fluoridated toothpaste, with increase in dental health awareness, knowledge and attitudes of children and parents. The WHO global goal for the year 2020 is for a mean DMFT of not more than 1.5 for children [8]. Countries with mean scores above a DMFT of 1.5 have failed to meet the World Health Organization (WHO) global goal for the year 2020 for children [8]. Dental caries is preventable, but it remains to be a main public health concern. It is still a major dental health disease in Libya and only few published studies related to dental caries have been published. Those studies available show that dental caries is still a major dental health problem for children. Besides, in Libya, children do not benefit from preventive oral health programmes and the prevalence of dental caries is expected to increase in the future. Although dental caries experience has been widely studied, little has been done concerning mixed dentition. In the present study, the objective was to undertake a dental examination of 8-10 year-old Libyan children in order to assess the prevalence (%) and severity of dental caries of primary and permanent dentition (dmft and DMFT) because children who have caries in their primary teeth likely to develop additional dental caries in late ages and are more expected to experience caries in their permanent dentition. This study was also undertaken to help focus the attention of the Libyan government for future planning and monitoring of dental services in Benghazi.

2. Materials and methods

Ethic approval and permissions to conduct the study in Benghazi were secured from both the research ethical committee of Benghazi University and the Ministry of Education. Informed written consents were also received from the parents in order to recruit their children in the present study. The schools were notified of the scheduled visit, and the children, parents and the teachers were informed of the visit by the school authorities. This cross-sectional observational study was conducted in public schools. The final sample was 372 8-10 year-old schoolchildren of both genders resident in Benghazi, studying at elementary public schools which had pupils of both genders. Clinical dental examinations of participant subjects were conducted in the schools with the child seated in an ordinary classroom-type chair and using artificial lighting and a plane mouth mirror. The presence of dental caries was assessed by visual examination. Radiographs were not taken. Prevalence of dental caries (%) and severity (mean DMFT/dmft ±SD) were measured. Dental examination was performed in accordance with World Health Organization (WHO) recommendations. The DMFT/dmft indices and WHO diagnostic criteria [9] were used. Data collection forms for recording dental caries were based on the indices recommended by the World Health Organization [9]. The prevalence of dental caries was assessed in accordance with the World Health Organization criteria using the DMFT (Decayed, Missing and Filled teeth) index for the permanent teeth and dmft (decayed, missing and filled teeth) index for primary teeth [9], while the M/m component of the DMFT/dmft was defined as all teeth lost as a result of dental caries. The sample size was calculated at 5.5% margin of error, a 95% confidence interval (CI), and an estimated concordance of 50%. The minimal sample size to satisfy those parameters was estimated at 314 schoolchildren, but the sample size was increased to allow for attrition. To ensure the reproducibility of the application of diagnostic criteria for dental caries and to provide data for intra examiner reproducibility, 20 subjects were randomly re-examined. The results of the dental examination were analyzed for intra-examiner agreement and reproducibility by Cohen's Kappa [9]. The data were analyzed using the Statistical Program for Social Sciences-SPSS version 25 through frequency and percent, graph Bar chart, Chi-squared test, and Cochran test. Prevalence of dental caries was calculated as the number and proportion of subjects with caries experience. Severity of dental caries was assessed using DMFT and dmft indices. DMFT and dmft indices were calculated for all subjects and for subjects with caries experience. Besides, for DMFT index, the Decay Index (DT/DMFT×100%), the Missing Index (MT/DMFT×100%) and the Care Index (FT/DMFT×100%) were calculated for all subjects and with subjects with caries experiences. Also, for the dmft index, the Decay Index (dt/dmft×100%), the Missing Index (mt/dmft×100%) and the Care Index (ft/dmft×100%) were calculated for all subjects and with subjects with caries experiences.

3. Results

From those children providing written consents, 372 Libyan schoolchildren were randomly selected and included in the study. Out of the total 372 children participating in this study, 198 (53.2%) were male and 174 (46.8%) were female. The levels of intra-examiner agreements in the assessment of dental caries (using repeat examinations on 20 children) as measured by Cohen's Kappa [9] statistics for DMFT and dmft indices were ranging from 0.82 to 1.00. This indicated an excellent level of agreement [9]. Of the whole sample (n=372), three hundred and twenty tow subjects (86.6 %) had experience of dental caries and less than quarter, 50 (13.4%), were caries free (Table 1). Dental caries was more prevalent amongst boys (87.9%) than girls (85%) but this difference was not statistically significant as seen in table 2.

Table 1 The number (N) and proportion (%) of all subjects with or without dental caries experience

Experience of dental caries			
Yes		**No**	
No. of subjects N	%	No of subjects N	%
322	86.6%	50	13.4%

Table 2 Number (N) and proportion (%) of subjects with or without dental caries experience by gender

Experience of dental caries											
Boys						**Girls**					
Yes		**No**		**Total**		**Yes**		**No**		**Total**	
N	%	N	%	N	%	N	%	N	%	N	%
174	87.9%	24	12.1%	198	100%	148	85.1%	26	14.9%	174	100%

Table 3 Mean, standard deviations (SD) of Decayed, Missing and Filled (DMFT) index for all subjects

No. of subjects	**DMFT index**	**Decayed D**		**Missing M**		**Filled F**	
372	mean	mean	SD	mean	SD	Mean	SD
	0.86	0.77	1.17	0.03	0.26	0.06	0.28

Table 4 Mean, (SD) of Decayed, Missing and Filled (DMFT) index with caries experience

No. of subjects	**DMFT index**	**Decayed D**		**Missing M**		**Filled F**	
322	mean	mean	SD	mean	SD	Mean	SD
	1.00	0.89	1.22	0.04	0.28	0.07	0.30

Table 5 Mean, standard deviations (SD) of decayed, missing and filled (dmft) index for all subjects

No. of subjects	dmft index	decayed d		missing m		filled f	
372	mean	mean	SD	mean	SD	Mean	SD
	2.78	2.5	2.18	0.22	0.57	0.06	0.32

Table 6 Mean, (SD) of decayed, missing and filled (dmft) index with caries experience

No. of subjects	dmft index	decayed d		missing m		filled f	
322	mean	mean	SD	mean	SD	Mean	SD
	3.21	2.89	2.09	0.25	0.60	0.07	0.34

Table 7 Median, interquartile range (IQR) dmft for all subjects and for subjects with caries experience

	All subjects	Subjects with dental caries experience
	dmft	Dmft
Median	2.00	3.00
IQR	4.00	4.00

Table 8 Mean DMFT, Decay, Missing and Care Indices for all subjects and with subjects with caries experiences

Index	Mean	Decay index %	Missing index %	Care index %
DMFT for all subjects	0.86	89.5	3.5	6.7
DMFT for subjects with caries experience	1.00	89.0	4.0	7.0

Table 9 Mean dmft, Decay, Missing and Care Indices for all subjects and with subjects with caries experiences

Index	Mean	Decay index %	Missing index %	Care index %
dmft for all subjects	2.78	89.9	7.9	2.1
dmft for subjects with caries experience	3.21	90.0	7.7	2.1

For all subjects (n= 372), the mean for the DMFT index was 0.86, and for subjects with caries experience (n= 322) was 1.0. The mean and standard deviation for the decayed component of DMFT for subjects with caries experience were 0.89 (SD± 1.22). The D (decayed) component comprised the greatest proportion of the caries experience seen (Tables 3, 4). For all subjects (n= 372), the mean for the dmft index was 2.78, and for subjects with caries experience (n= 322), was 3.21 (Tables 5, 6). Suitable measures of central tendency and dispersion were calculated using median and interquartile range for all subjects and for subjects with caries experience (Table 7). For DMFT index, the Decay Indices for all subjects and for subjects with caries experience were 89.5% and 89.0% respectively. The Missing Indices for all subjects and subjects with caries experience were 3.5% and 4.0% respectively. The Care Indices for all subjects and

subjects with caries experience were 6.7% and 7.0% respectively (Table 8). For dmft index, the Decay Indices for all subjects and subjects with caries experience were 89.9% and 90.0% respectively. The Missing Indices for all subjects and subjects with caries experience were 7.9% and 7.7% respectively. The Care Indices for all subjects and subjects with caries experience were 2.1% and 2.1% respectively (Table 9).

4. Discussion

Dental caries could badly affect children's dental health, quality of life, and happiness. This study has provided valuable data about the prevalence and severity of dental caries in 8-10 year-old Libyan schoolchildren in Benghazi. The study results contribute to the overall picture of Libyan schoolchildren's oral health. Although it seems that there has been a significant reduction in dental caries globally in the last 40 years, the study sample of Libyan children in Benghazi had high prevalence and DMFT/dmft values. Unfortunately, dental caries showed to be a major health issue in Libyan children requiring immediate attention. In the present study the overall prevalence of dental caries among study population was higher than expected; over three quarters of the subjects (86.6%) had experience of dental caries. This figure was far from the goal of a no-caries rate of 50% in children established for 2020 by WHO [8]. The prevalence of dental caries among Libyan schoolchildren is on the increase. Our data (86.6%) was higher than that found in previous studies conducted on Libyan children, 42.22%, 63.5%, 50%, 58%, 57.8%, 77.72% 49.0%, 55.8%, 74.7% [3,10-17], respectively. Moreover, our data was higher than figures reported in more recent Libyan studies 45%, 71%, 78% [18-20], respectively. Therefore, the trend of dental caries in Libya has shown noticeable increase since the previous studies conducted in 1991 (42.22%) [3] to the figure in 2021 (78%) [20] up to our data in the present study (86.6%). Furthermore, comparing our data with those reported in other countries, shows that the prevalence found in this study was higher than that in the UK (32.7%) [21], India (10%) [22], Italy (43.1%) [23], Brazil (78%) [7], Philippines (74.9%) [6], Karachi (69.6%) [24], Egypt (74%) [25], and in Syria (79.1%) [26], but lower than the figures found in Saudi Arabia studies (87.9%, 92.3%) [5], and found in Mexico (94.7%) [27].

The results of this study revealed that for all subjects, the mean for the DMFT index was 0.86, and for subjects with caries experience was 1.0. These figures met with the oral health goals for the "year 2020 WHO health 21 policy" no more than a DMFT of 1.5 should be observed for children [8]. Almost Similar results found in a study in Tripoli by Kabar et al [17] reported mean DMFT 0.88. On the other hand, In the present study the mean DMFT was not in accordance with the findings of other Libyan studies and lower than that reported that mean DMFT 1.68 for all subjects and 2.90 for subjects with caries experience [13], 1.58 [3], 1.17 [10], 1.63 [11], 1.56 [14], 1.80 [18], 1.7 [20], but our data was higher than the mean DMFT (0.271) reported in another Libyan study [15]. Anyway, the DMFT in the present study was much lower than the mean DMFT reported by studies conducted in other developing countries, in Saudi Arabia (5.06), the Philippines (3.68), Brazil (3.95), Egypt (1.04), Oman (3.23), Kuwait (2.6), and Saudi Arabia (2.5), [5-7,25,28-30] respectively. In the present study, despite the fact dental caries prevalence in Libyan children was high; the mean DMFT was low compared with other developing countries. High levels of caries are usually associated to high treatment needs and the high level of untreated caries is a cause for concern. Untreated caries lesions, the d-component, conquered the DMFT and dmft indices among the schoolchildren representative a high rate of unmet treatment needs. These results agreements with that of other previous studies conducted among children, showing highly unmet treatment needs [4,5,28].

In the present study, Decay Index was the highest proportion of the DMFT index, representing 89.5% for all subjects and 89.0% for subjects with caries experience. Our data was higher than other Libyan studies 84.8% [3], 77.0% [11], 49.0% [15], 64.6% [17], 43.6% [20]. But, lower than previous Libyan studies reported that Decay indices were 95.2% of the DMFT for all subjects and 95.9% for subjects with caries experience [13], also, lower than 90.6% [10], and lower than 92.6% [18]. When comparing the Decay index reported in the present study (89.5) found that higher than figures were observed in Iraq (54.8%) [31], Iran (58.7%) [32], India (73%) [22], but similar results with that found in Romania (89%) [33]. The reason may be in Libya dental services within the school dental services are not able to offer all the dental treatment needed by children [11]. Also, lack of dental awareness and unhealthy dietary habits may have worsened the situation with poor oral hygiene combined with less exposure to fluoride due to increase using of drinking bottled water [6,15,34,35].

In the present study, the Care index which reproduces the restorative care of those who have suffered dental caries was 6.7%. When compared this figure with previous Libyan studies found that higher than that reported 1.9% [3], 5.0% [10], 1.0% [11] and 1.8% [13], but was less than 10.0% [20]. Furthermore, when compared our data with findings of other countries was much less than that found in India (13%) [22], in Iran (37.9%) [32] in the UK (42%) [21], and in Syria (8.86%) [26]. This low figure (6.7%) in the present study may be due to the lack of awareness and knowledge regarding the necessity and importance of treating children's teeth due to their erroneous belief that children's teeth are replaceable and not important may have contributed to this pattern of caries experience [36]. Also, it may be due

to lack of preventive and treatment services and most oral health services in Libya provide symptomatic treatment rather than restoration and prevention [11]. In the present study the high level of untreated caries is a cause for concern, representing a high unmet treatment need. It is alarming that schoolchildren are found to be at greatest need of dental services and health education.

In the present study, the Missing index was 3.5% for all subjects and 4.0% for subjects with caries experience. Similar result was found in other Libyan study reported that the Missing Index was 4.0% [10]. On the other hand, our data was far lower than that found in previous Libyan studies reported that 13.0% [3], 21.5% [11], 6.7% [20]. However, the figures in the present study were higher than that found in another Libyan study reported that the Missing index was 3.0% for all subjects and 2.4% for subjects with caries experience [13]. Our data was similar to results found in other countries, in Iran 3.4% [32], and in Iraq 3.6% [31], but, lower than found in India 7% [22] and in France 11% [37].

In this study the mean dmft index was 2.78 for all subjects. Other previous Libyan studies showed lower figures of mean dmft; 2.32 [10], 2.58 [12], 2.0 [15], 2.32 [13] and 2.72 [17]. But higher figure was found in recent studies in Libya, 3.23 [19], and 3.7 [20]. The mean dmft of the present study was in disagreement with that found in other studies conducted in other developing countries; higher than that found in Karachi (2.01) [24], in Syria (2.47) [26], in China (2.21) [38], but lower than that found in Egypt (3.23) [25], in Saudi Arabia (3.66) [39].

In the current study, as national and international trends, dental caries was more prevalent amongst boys than girls however; this difference was not statistically significant. Similar trend in a study reported that boys had higher caries experience than girls [25]. The reason may be due to girls generally paying greater attention to hygiene and aesthetics than boys. Although girls may be expected to show higher prevalence of caries experience than boys due to earlier tooth eruption and they exposed to risk factors for dental caries. But the differences in eruption times are only a few months which clinically may result in little difference. Moreover, similar results from other studies found that gender differences were not statistically significant in Libya [11,14], in Saudi Arabia [5], in India [22,40], in Tunisia [4], in China [41], and in Romania [33]. Also, a National Survey in the UK, found the same percentage of boys and girls with experience of dental caries [42].

On the other hand, other studies were not in accordance with the finding of this study reported that girls had higher caries experience than boys [7,13,14,16,30,43,44]. Unfortunately, in Libya there is increasing levels of dental caries, the reason may be due to the lack of oral health care access among schoolchildren with an increase unmet treatment needs, lifestyle changes, easy access to unhealthy foods, dietary habits and higher consumption of sugared foods and drinks particularly among children, the preventive programs are not established and inadequate access to dental care. Besides, poor oral hygiene practices and lack of appropriate dental health awareness, knowledge and supervision of parents among those children [6,35,36]. Moreover, dental services in Libya especially those within schools are not able to provide all the dental treatment needed by children [11].

The present study had some strengths and limitations. The strengths in the study, the methodology was properly prepared with international standards according to the World Health Organization (WHO). Consequently, the results may be easily compared with those obtained by other researchers. Also, the levels of intra-examiner agreements in the assessment of dental caries were included. Anyhow, as a limitation in the present study was the small sample size. In addition, the caries diagnosis was based only on clinical and not on radiographic findings.

In this study, the significant number of Libyan children in Benghazi suffered by dental caries stresses the importance of preventive approaches required to control the carious progression, before the requirement for invasive treatment to repair carious teeth.

5. Conclusion

This study suggests that considerable proportion of children had dental caries and the trend indicates an increase in dental caries, which has been steadily increasing both in prevalence and in severity over time. Also, this study displayed high unmet treatment needs. The high level of untreated caries is a cause for concern. It is essential to recognize the reasons leading to the observed trends and action be taken to inhibit dental caries. The findings of the present study would be useful for dental professionals and authorities in the planning of dental services for children. Consequently, there is a crucial need for dental health programs such as dental health educational programs for children and their parents, caries prevention programs, school oral health programs with emphasis on school based preventive and therapeutic service to meet the treatment need by children. Health programs are vital and of critical importance in order to improve the oral dental health in vulnerable populations. Further study about evaluation prevalence and severity of dental caries should be carried out. Meanwhile, other preventive measures should be implemented.

Compliance with ethical standards

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Disclosure of conflict of interest

The authors declare that they have no conflicting interests.

Statement of informed consent

Informed written consents were received from the parents in order to recruit their children in the present study.

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