

# PREVALENCE, SEVERITY AND PATTERN OF DENTAL CARIES AMONG FEMALE SCHOOLCHILDREN IN EASTERN PROVINCE

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## ABSTRACT

*The objective of this study was to evaluate the caries prevalence, severity and pattern in female schoolchildren in Dhahran and Al-Khobar (Eastern Province, Saudi Arabia). The study included 472 female schoolchildren from public schools and 667 female schoolchildren from private schools in Dhahran and Al-Khobar. All the participating students were clinically examined for dental caries, filled and missing teeth. The total number of female students examined in the study was 895; 472 from public schools and 423 from private schools. The overall caries prevalence was 80.73 % with a mean DMFT score of  $4.4 \pm 3.9$ . For public schools, the caries prevalence was 93.05% with a mean DMFT score of  $7.87 \pm 3.77$ , while for private schools, the prevalence of dental caries was 68.39% with a mean DMFT score of  $2.31 \pm 2.62$ . The results showed that prevalence of dental caries was 87.5%, 92.6% and 99.4% respectively in grade I, VII and X female schoolchildren from public schools. The mean caries scores were  $5.94 \pm 4.14$ ,  $4.39 \pm 2.83$  and  $9.13 \pm 4.34$  respectively in grade I, VII and X public female schoolchildren. In private schools, the prevalence of dental caries was 62.3% for grade I, 70.27% for grade VII and 72.62% for grade X schoolchildren. The mean caries scores were  $2.26 \pm 2.78$ ,  $2.12 \pm 2.39$ , and  $2.54 \pm 2.69$  respectively. The prevalence and severity of dental caries was found to be higher in public schools as compared to the private schools. It can be concluded that caries prevalence and severity were very high among female schoolchildren in Dhahran and Al-Khobar regions. The overall caries experience was higher in schoolchildren from public schools as compared to the private schools.*

**Key Words:** Caries, prevalence, severity, DMFT/dmft scores

## INTRODUCTION

Dental caries is a multi-factorial disease that results in demineralization of hard dental tissues by acids produced from fermentation of carbohydrates by cariogenic bacteria. The disease results in pain, infection and consequently loss of the effected tooth if remain untreated.<sup>1</sup> Epidemiological evidence indicates that dental caries is a common and expensive to treat chronic disease among children especially in the third world countries.<sup>2</sup> Based on the DMFT/dmft index, caries severity can be classified as very low (0.0 -1.1), low (1.2- 2.6), moderate (2.7- 4.4), high (4.5 - 6.5), and very high (> 6.6).<sup>3</sup> Nutritional transition with easy access to refined carbohydrates, low use of fluoridated

toothpastes, irregular tooth brushing habits and low educational and socioeconomic status have led to high prevalence of dental caries in developing countries.<sup>4</sup>

Due to high prevalence and serious health consequences of dental caries, its prevention has long been considered as an important task for health care professionals. Thus, a global goal was set in 1981 by WHO, saying that by the year 2000, 50% of children aged 5-6 years would be caries free; and for the children of age 12 years, the mean DMFT/dmft score would be < 3, while 86% of 18 years old would keep all their teeth.<sup>5</sup> In spite of improvement of dental health in general population, these targets were not achieved.<sup>6</sup> In 2003, non-numerical goals were determined by WHO permitting each country to plan its own targets according to its current disease prevalence and severity. These targets aimed to be achieved by the year 2020.<sup>7,8,9</sup>

As regard to Kingdom of Saudi Arabia (KSA), there is a lack of representative data on the prevalence of dental caries among Saudi Arabian population. In first National survey report, Al-Shammery (1999)<sup>10</sup> reported a caries prevalence of 74% and 67% and a mean DMFT/dmft of 2.69 and 2.65 in Urban and Rural areas respectively. A more recent nationwide study was conducted by Al-Dosari et al (2010)<sup>11</sup> in 11 Saudi Arabian regions to correlate fluoride levels in drinking water with caries prevalence among three different

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**Received for Publication:** March 26, 2018

**Resived:** May 08, 2018

**Approved:** June 03, 2018

age groups of schoolchildren. The study showed an inverse relationship between fluoride exposure and caries experience. They reported a 59% - 80% caries prevalence with mean DMFT scores up to 4.08 in the studied groups.<sup>11</sup> Al Agili (2013)<sup>12</sup> in her systematic review of population based studies of dental caries prevalence in Saudi Arabia concluded that the average national prevalence of dental caries was approximately 70% in children's permanent teeth with average DMFT scores of 3.5.

In Eastern Province, a study in Al-Khobar showed a caries prevalence of 87.5% with a mean DMFT/dmft scores ranging from 0.78 in 6-7 years old to 4.59 in 16-17 years old schoolchildren.<sup>13</sup> Khan et al (2001)<sup>14</sup> reported a caries prevalence of about 83% with a mean DMFT of 4.45 in Al-Hassa. Another study in Al-Hassa reported a caries prevalence of 69% among 10-14 years old boys in public primary schools.<sup>15</sup> A study in Dammam by Farooqi et al. (2015)<sup>16</sup> reported a caries prevalence of 78% among 6-9 years children with a mean dmft score of 3.66, while in 10 - 12 years old children, the caries prevalence was 68% with a mean DMFT score of 1.94.

Thus, the aim of the present study was to determine the prevalence, severity and pattern of dental caries among female schoolchildren in grades I, VII and X from both public and private schools in Al-Dhahran and Al-Khobar areas.

## METHODOLOGY

### Research process

The study was conducted between June 2014 and June 2016. The study population consisted of female schoolchildren in the first primary, first intermediate and first secondary years of public and private schools in Dhahran and Al-Khobar regions in the Eastern Province of Kingdom of Saudi Arabia. An ethical approval was obtained from Medical Ethics Research Committee in King Abdul-Aziz Airbase Hospital (KAAB), and followed a participatory action research framework as proposed by Cornwell & Jewkes (1995).<sup>17</sup> List of schools including the numbers of children in the 1<sup>st</sup> primary, 1<sup>st</sup> intermediate and 1<sup>st</sup> secondary school years were provided by the regional educational authority in the area. Prior to the survey, using the school's usual means of communication, a written consent was taken from the children's parents or guardians after explaining the nature and purpose of the study. After careful medical history taking, only Saudi children free of systematic disease and with positive formal consents were selected for the study. Children were not examined if they were absent or refused examination on the survey day. A cross-sectional random samples were taken from the female students of grades I, VII and X according to the number of students registered in each grade as well as the number of students presents at examination session with their consents signed. Based on these criteria the total number of the selected female students was 895.

### Data collection

All the selected children were examined by a female

specialist in Dental public health and three female dental therapists. An initial training and calibration exercises were conducted to provide a practical experience in the study methodology and coding system for the dental examiners prior to the main survey. The training included a half day seminar to review the nature of epidemiological surveys, dental examination and record keeping, as well as familiarization of the clinical criteria and numeric codes to be used. During a second half-day session, clinical examination was completed for 10 children who were not included in the final samples to minimize the inter- and the intra-examiner variations. The results of examination of the test sample were reviewed by a senior reference consultant from KAAB Hospital using the test-retest methodology according to Rugg- Gunn and Holloway (1974).<sup>18</sup> The calibration revealed a very high degree of agreement (.95 and .96) for inter-examiner and intra-examiner reliability using Kappa scores (WHO, 2013).<sup>19</sup>

### Clinical examination

The selected schools were visited on scheduled dates and children were examined under day light with the children sitting upright and the examiner seated in front of them. One of the team member was strategically seated to record clearly what was found by the examiner. For every child, an individual set of disposable plane mouth mirror and sickle probe with 0.5 mm diameter and clean rubber gloves were used. The WHO (2013)<sup>19</sup> criteria were used for the diagnosis of dental caries. No radiographs or fiber-optic trans-illumination were used. The data collected was recorded on a standardized form that also included the child's name (serial number), date of birth, gender, place of residence, and name of the examiner, as well as date and time of the dental examination.<sup>19</sup>

### Data Analyses

Data were analyzed using statistical package for social sciences version #21 (SPSS, IBM, Chicago, USA). Descriptive statistics were generated. Chi square test was used to determine significant association between groups. T-test was used to examine if there was any significant difference between the means of the two groups. ANOVA tests was used to determine any significant difference between the means of more than two groups (comparison between grade I, VII and X).

## RESULTS

A total of 895 female schoolchildren were examined; 472 from public schools and 423 from private schools. For public schools; 136 students were taken from grade I, 168 from grade VII and 168 from grade X. For private schools, 91 students were taken from grade I, 148 from grade VII and 84 from grade X.

The overall caries prevalence was 80.73 % with mean caries score of  $4.4 \pm 3.9$ . For public schools, the caries prevalence was 93.05 % with mean caries score of  $7.87 \pm 3.77$ , while for private schools, the caries prevalence 68.39 % with mean caries score of  $2.31 \pm 2.62$ . Table #1 presents the prevalence of caries in terms of

school type and grades. The caries prevalence was high in female schoolchildren from public schools compared with those in private schools across all the grades.

Table #2 shows the caries experience and pattern in the study group according to grade and type of school. The DMFT/dmft values in grade I students for public schools and private school female students were  $5.94 \pm 4.14$  and  $2.26 \pm 2.78$  respectively. As shown in the table, the most affected teeth in both public and

private schools were the lower molars with the DMFT/dmft scores 4.39- 9.13 for public schools and 2.12- 2.54 for private schools.

Table #3 presents the comparison of sound teeth, decayed teeth and DMFT/dmft scores in relation to grades of the female students and the type of the school. A highly significant ( $P < .001$ ) difference was found between public and private schools.

TABLE 1: PREVALENCE OF DENTAL CARIES IN FEMALE SCHOOLCHILDREN IN TERMS OF SCHOOL TYPE AND GRADES

School Grade	Public school			Private school		
	Grade I	Grade VII	Grade X	Grade I	Grade VII	Grad X
Student (N)	136	168	168	191	148	84
Caries Free (%)	17 (12.5)	13 (7.74)	1 (0.6)	72 (37.7)	44 (29.73)	23 (27.38)
Caries Positive (%)	119 (87.5)	155 (92.26)	167 (99.4)	119 (62.3)	104 (70.27)	61 (72.62)

TABLE 2: DESCRIPTION OF CARIES EXPERIENCE AND PATTERN ACCORDING TO GRADE AND SCHOOL TYPE

Grade	School	Stu- dents(n)	Decayed Teeth (Mean $\pm$ )	Missing Teeth (Mean $\pm$ )	Filled Teeth (Mean $\pm$ )	DMFT/ dmft (mean $\pm$ )	Most Affected Teeth (%)
I	Public	136	5.37 $\pm$ 3.8	0.23 $\pm$ 1.28	0.33 $\pm$ 0.93	5.94 $\pm$ 4.14	LR+ LL primary 2nd molar (20.03%)
I	Private	191	1.92 $\pm$ 2.6	0.047 $\pm$ 0.29	0.29 $\pm$ 0.83	2.26 $\pm$ 2.78	LR+LL primary 1st molar (23.43%)
VII	Public	168	3.63 $\pm$ 2.77	0.02 $\pm$ 0.15	0.73 $\pm$ 1.25	4.39 $\pm$ 2.83	LR+LL 1st molar (32.30%)
VII	Private	148	1.49 $\pm$ 2.15	0.006 $\pm$ 0.08	0.56 $\pm$ 1.18	2.128 $\pm$ 2.39	LR+LL 1st molar (34.08%)
X	Public	168	7.13 $\pm$ 4.7	0.19 $\pm$ 0.53	1.64 $\pm$ 2.32	9.13 $\pm$ 4.34	LR+LL 2nd molar (17.18%)
X	Private	84	1.42 $\pm$ 2.1	0.04 $\pm$ 0.3	1 $\pm$ 1.68	2.54 $\pm$ 2.69	LR+ LL 1st molar (25%)

LR ( lower right), LL ( lower left)

TABLE 3: STATISTICAL COMPARISON OF SOUND, DECAYED AND DMFT/DMFT SCORES IN RELATION TO GRADES OF THE STUDENTS AND SCHOOL TYPE

Grade	School	Sound Teeth (Mean $\pm$ )	Decayed teeth (Mean $\pm$ )	DMFT/dmft (Mean $\pm$ )	P Value
Grade I	Public	13.55 $\pm$ 4.21	5.37 $\pm$ 3.88	5.94 $\pm$ 4.14	0.00
	Private	17.57 $\pm$ 2.90	1.92 $\pm$ 2.60	2.26 $\pm$ 2.78	
Grade VII	Public	23.36 $\pm$ 2.9	3.63 $\pm$ 2.77	4.39 $\pm$ 2.83	0.00
	Private	25.65 $\pm$ 2.48	1.49 $\pm$ 2.15	2.12 $\pm$ 2.39	
Grade X	Public	18.73 $\pm$ 4.32	7.13 $\pm$ 4.76	9.13 $\pm$ 4.34	0.00
	Private	24.48 $\pm$ 3.76	1.42 $\pm$ 2.10	2.54 $\pm$ 2.69	

## DISCUSSION

Previous studies in different areas of Saudi Arabia have demonstrated dental caries to be a significant problem in schoolchildren.<sup>20-25</sup> Studies regarding the dental caries prevalence among schoolchildren in Eastern Province are scarce, thus the present study was planned to determine the prevalence, severity and pattern of dental caries in public and private schools in Dhahran and Al-Khobar areas. This will help to determine the treatment needs and allows health care planners to design proper preventive programs required to improve oral health of these children. The first primary, first intermediate and first secondary school years were chosen as these ages are usually considered for global monitoring and for national and international comparisons.<sup>2</sup> Data collection was carried out by well trained and carefully calibrated team using WHO diagnostic criteria.<sup>19</sup> This was to minimize inter- and intra-examiner variations, thus increasing the data reliability and accuracy.

The present study showed that the caries prevalence and severity are still very high in female schoolchildren, especially in public schools as compared to those in developed countries.<sup>26</sup> This also indicates that the WHO goals are still unmet for children in Dhahran and Al-Khobar areas. Our results revealed high prevalence of dental caries in both public and private schools ranging from 57.38% - 99.4%, and these results are in accordance with the findings of previous studies in other areas of Saudi Arabia as well as in United Arab Emirates and Qatar.<sup>27,28,29</sup> It can be attributed to similar cultural, environmental as well as socioeconomic factors with high intake of cariogenic diet and poor oral hygiene practices.<sup>30</sup>

The results of the present study showed that the bulk of DMFT/dmft scores were mainly the decay component, which was in agreement with several other studies in the Kingdom.<sup>15,31,32,33</sup> This highlights the high treatment needs in the study population as well as the urgent need for preventive dental education programs for the children and their parents.

Dental caries has been closely associated with low socioeconomic status.<sup>21,34,35,36,37</sup> The present study confirms this finding; as the caries prevalence and severity were low in private schools where children from higher socioeconomic class mostly study. The low socioeconomic status has also been associated with poor oral hygiene, improper dietary habits as well as poor dental awareness and knowledge.<sup>38</sup>

A significant increase in caries prevalence and severity was noticed from grade I to grade VII, and X in public schools, and was in agreement with Banting (2001)<sup>39</sup> who reported that dental caries prevalence increases with age due to prolonged and continuous exposure to cariogenic factors. On the other hand, a non-significant difference was noticed across the grades in private schools, which may reflect a change in the level of knowledge and improved quality of oral hygiene practices in this population. However, it is important

to note that mean caries scores were still much higher than the WHO targets even in the private schools.

The data on caries pattern helps to determine the appropriate treatment planning and prevention in the children. The present study showed higher caries experience in molars as compared to premolars and anterior teeth in the examined children. This can be attributed to deep pits and fissures in molars and lack of oral hygiene in molar area.<sup>40</sup> These findings call for careful examination of the molars for dental caries, specific oral hygiene instructions for these areas and early placement of fissure sealants.

## CONCLUSION

- Caries prevalence and severity were very high among the female schoolchildren in Dhahran and Al-Khobar areas.
- The mean caries scores were significantly high among public schoolchildren as compared to the children from private schools.
- Molar teeth were the highest effected group as compared to premolars and anterior teeth.

## ACKNOWLEDGMENT:

The authors would like to express their appreciation to Dua'a Ashgar, Suaad Al-Qarni and Huda Al-Haw-sawi, the dental therapists in KAAB Hospital for their valuable help during the study.

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