

Prevalence of Dental Caries, Severity, and Pattern in Age 6 to 7-Year-old Children in a Selected Community in Saudi Arabia

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Abstract

Aims: The aim of this study was to determine the prevalence, severity, and pattern of dental caries in 6 to 7-year-old children in military primary schools in Jeddah city, Saudi Arabia.

Methods and Materials: A random sample of 300 children (6 to 7-year-olds) was drawn from six schools of military dependents. Clinical examinations were carried out under standardized conditions by two trained and calibrated examiners (MAM) and (YR). Caries were diagnosed using the British Association for the Study of Community Dentistry (BASCD) criteria.

Results: Caries were diagnosed in 288 (96%) of the children, and only 4% were clinically caries free. Mean decayed, missing, and filled teeth (dmft) for the 300 children was 8.06 (+ 4.04) per child and mean decayed, missing, and filled surfaces (dmfs) was 23.18 (+ 15.64). The teeth most affected by caries were mandibular primary second molars (83.35%), and the least affected were mandibular primary central incisors (1.15%).

Conclusions: The level of caries was higher than seen in children of equivalent age in other studies. The level of caries is expected to increase in permanent dentition. The above findings stress the need for an effective program of oral prevention in these children, such as a school dental health education program for children and their parents in order to improve their oral health status.

Keywords: Dental health survey, children, dental caries, caries pattern

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Introduction

Many developed countries have shown a marked decrease in the prevalence of dental caries in children over the past decades. However, in many other developing countries caries prevalence has increased.^{1,2,3,4}

Previous studies carried out in Saudi Arabia have shown a high prevalence of caries in both preschool^{5,6,7} and school-aged children.^{8,9,10}

In one study in Riyadh city the decayed, missing and filled teeth (dmft) of 6-year-old children was 4.14 for boys and 3.43 for girls, and 22.3% of the children were free of caries in their primary teeth.¹¹ Fourteen years later, a subsequent study showed a higher level of disease. The dmft was 8.13 for boys and 6.48 for girls, and only 5.6% of the children were free of caries.¹⁰

In the city of Jeddah dmft values have ranged from 2.9 to 6.3 per child, and caries prevalence has ranged from 70% to 76% in 6-year-old children.^{8,12}

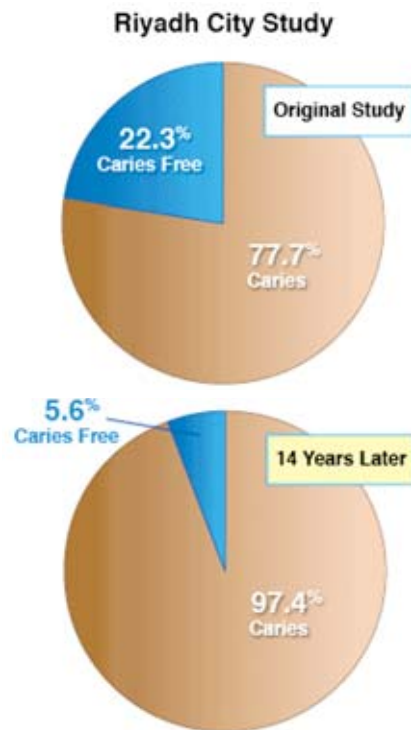
Caries in permanent teeth has also been shown to increase markedly with age. In one study a DMFT of 2.6 was reported for 8-year-old children compared to 0.9 per child for 6-year-olds in the same investigation.¹³

There are seventeen Military Hospitals in the kingdom of Saudi Arabia. These hospitals provide health services free-of-charge for their own military personnel and their dependants. The major cities in the kingdom are Riyadh, Jeddah, and Dhahran. In Jeddah, which is the second largest city in Saudi Arabia, there is one main hospital with several polyclinics located around the city.

The aim of this study was to determine the prevalence, severity, and pattern of caries in 6 to 7-year-old children in military primary schools in Jeddah city to show the extent of the disease in this community.

Methods and Materials

The sample was drawn from 6 to 7-year-old children attending military primary schools in Jeddah, the West Province of Saudi Arabia. Six primary schools for military dependants are present in Jeddah city; three schools for girls and



three for boys. Each school had around 80 to 100 children attending the first grade during the year 2002-2003. The study included a total of 300 children (150 boys and 150 girls) randomly selected from all the schools. Sampling was performed to provide a sample large enough to be representative of children of this age in this population.

Letters were sent to the parents requesting consent to their child being examined in schools. All children in selected schools were eligible to take part. All children selected participated in the clinical examination.

Clinical Examination

Children were examined by two examiners, one examiner for the girls schools (MAM) and the second (YR) for the boys schools, in a classroom at the school under standardized lighting conditions using a Daray light (Daray Lighting Ltd, Woodville, Derbyshire, UK). Each child was examined supine with the examiner seated behind and data recorded by a trained assistant.



Diagnosis was visual with a plane mouth mirror used to assist visibility and cotton rolls were employed to remove any plaque or debris, where necessary. All teeth and surfaces were examined for caries using the British Association for the Study of Community Dentistry (BASCD) criteria and scoring system.¹⁴

Training and calibration exercises were conducted prior to the study. Duplicate examinations of a total of 20 children by two examiners (MAM, YR), gave an inter-examiner kappa value for surfaces diagnosed as carious of 0.89. Repeat examinations of 20 children were made during the study to check intra-examiner reproducibility of caries. Results yielded a kappa value of 0.97 (MAM) and 0.95 (YR) for surfaces diagnosed as carious.

Data Analysis

All data were entered into an SPSS program. Both descriptive and analytic approaches were used in the data analysis. Kappa statistic was used to describe the extent of agreement between the two examiners. The association between prevalence of caries and gender was tested using the Chi square test. The t-test was used to test the mean dmft and decayed, missing, and filled surfaces (dmfs) difference between groups. A p-value of less than 0.05 was considered statistically significant.

Results

A total of 300 children aged 6 to 7-year-old were included in the study, 150 were boys and 150 were girls.

Prevalence of Caries

Of the 300 children examined, 288 (96%) had caries, and only 4% of the children were clinically caries free. Of those children diagnosed with caries, 146 (50.7%) were male and 142 (49.3%) were female. There was no statistical significant difference in the prevalence of caries between male and female children ($P = 0.239$) (Table 1).

The total mean dmft for the 300 children was 8.06 (+ 4.04) per child, and the mean dmfs was 23.18 (+ 15.64) per child. These results showed a statistically significant difference in dmft and dmfs. Caries experience was made up largely of decayed teeth. Decayed teeth made up an average of 6.92 (+ 3.94) teeth per child, 85% of the total dmft, and 18.93 (+14.16) surfaces per child, 81% of the average. Mean mt was 0.34 (+ 0.92) per child and ft was 0.79 (+ 1.47). Using the two-sample t-test, there was no statistical significant difference in the mean dmft and gender ($P = 0.171$) or the mean dmfs and gender ($P = 0.143$) (Tables 2 and 3).

The mean DMFT for permanent teeth was 0.41 (+ 0.86). Similarly, the difference in the mean for DMFT and gender was not statistically significant ($P = 0.348$) (Table 4).

Pattern of Caries

Further analyses were carried out to determine the pattern of caries in these children. Combined data for pattern of caries are presented; there was no significant difference between males and females.

Table 1. Prevalence of caries, mean dmft, and dmfs in relation to gender.

| Gender | No. of children | Number (%) of children | | | |
|--------|-----------------|---------------------------|----------------------|--------------------|----------------------|
| | | Children with caries free | Children with caries | dmft (\pm)SD | dmfs (\pm) SD |
| Male | 150 | 4 (3%) | 146 (97%) | 8.38 (\pm 4.11) | 24.50 (\pm 15.86) |
| Female | 150 | 8 (5%) | 142 (95%) | 7.74 (\pm 3.96) | 21.85 (\pm 15.36) |
| Total | 300 | 12 (4%) | 288 (96%) | 8.06 (\pm 4.04) | 23.18 (\pm 15.64) |

*No significant difference in the prevalence of caries and gender $P = 0.239$

Table 2. Mean dmft values and its components in relation to gender for primary teeth.

| | Decayed | Missing | Filled | Mean dmft (\pm) SD |
|--------|--------------------|--------------------|--------------------|------------------------|
| Male | 7.49 (\pm 3.96) | 0.32 (\pm 0.69) | 0.57 (\pm 1.31) | 8.38 (\pm 4.11) |
| Female | 6.36 (\pm 3.85) | 0.37 (\pm 1.11) | 1.01 (\pm 1.58) | 7.74 (\pm 3.96) |
| Total | 6.92 (\pm 3.94) | 0.34 (\pm 0.92) | 0.79 (\pm 1.47) | 8.06 (\pm 4.04) |

*No significant difference in dmft and gender P = 0.171

Table 3. Mean dmfs values and its components in relation to gender for primary teeth.

| | Decayed | Missing | Filled | Mean dmfs (\pm) SD |
|--------|----------------------|-------------|-------------|------------------------|
| Male | 21.13 (\pm 14.56) | 1.59 (3.41) | 1.78 (4.13) | 24.50 (\pm 15.86) |
| Female | 16.73 (\pm 13.44) | 1.78 (5.23) | 3.35 (5.85) | 21.85 (\pm 15.36) |
| Total | 18.93 (14.16) | 1.68 (4.41) | 2.56 (5.12) | 23.18 (\pm 15.64) |

*No significant difference in dmfs and gender P =0.143

Table 4. Mean DMFT values and its components in relation to gender for permanent teeth.

| | Decayed | Missing | Filled | Mean DMFT (\pm) SD |
|--------|--------------------|--------------------|--------------------|------------------------|
| Male | 0.45 (\pm 0.86) | 0.00 (\pm 0.00) | 0.03 (\pm 0.02) | 0.46 (\pm 0.86) |
| Female | 0.35(\pm 0.80) | 0.00 (\pm 0.00) | 0.02 (\pm 0.02) | 0.37 (\pm 0.85) |
| Total | 0.40 (\pm 0.83) | 0.00 (\pm 0.00) | 0.02 (\pm 0.18) | 0.41 (\pm 0.86) |

*No significant difference in DMFT and gender P = 0.348

Table 5. Caries prevalence by individual primary teeth.

| Tooth | Maxillary | | Mandibular | |
|-----------------|-----------|----------|------------|----------|
| | Right (%) | Left (%) | Right (%) | Left (%) |
| Central incisor | 35.3 | 35.0 | 1.0 | 1.3 |
| Lateral incisor | 29.3 | 35.0 | 5.0 | 4.3 |
| Canine | 18.0 | 21.3 | 19.3 | 16.0 |
| First molar | 61.7 | 61.0 | 76.7 | 77.7 |
| Second molar | 70.7 | 72.0 | 82.7 | 84.0 |

The teeth most affected by caries were mandibular primary second molars, and the least affected were mandibular primary central incisors (Table 5). The caries prevalence was generally higher in the mandibular primary teeth than the same teeth in the maxilla. Among the mandibular teeth, caries prevalence was highest in primary second molars (83.35%), followed by primary first molars (77.2%), and primary canines (17.65%). The least affected mandibular teeth were primary central incisors (1.15%).

Among the maxillary teeth, the prevalence was highest in primary second molars (71.35%), followed by primary first molars (61.35%), primary central incisors (35.15%), and primary lateral incisors (32.15%). The least affected maxillary teeth were primary canines (19.65%).

Discussion

The aim of the study was to determine the prevalence, severity, and patterns of caries in 6 to 7-year-old children in military primary schools in Jeddah city and show the extent of the disease in this community in order to determine the treatment needs and preventive efforts required to improve the oral health of the children in this population. The study was a part of an oral health promotion program in these schools to promote oral health in this selected group of children. Recent studies carried out in Saudi Arabia have demonstrated caries represents a particular problem amongst children in this country.^{8,9,10,11,15}



Caries prevalence and dmft scores were found to be very high among this group of children. Ninety-six percent of the children had clinical caries with an average of eight teeth per child affected with caries. There was no significant

difference between caries prevalence and dmft in relation to gender. The decay component was the major part of dmft scores, which indicates a high percentage of untreated caries and a high treatment need for these children. Previous studies in Saudi children have also reported decay as the major component of dmft scores.^{6,8,11,12,15,16}

The prevalence estimates for caries were higher than those reported earlier in studies in different parts of Saudi Arabia^{9,11,16} as well as in the same city.^{8,12} In Jeddah city reported values for 6-year-old children have been in the region of 70-76%, and dmft scores have ranged from 2.9 to 6.3.^{8,12} The values seen are also higher than estimates for younger children in other parts of the country. Prevalence ranging from 45% to 89% and dmft values from 0.2 to 7.12^{6,15,17} have been reported in previous studies.

In the current study, although the dmft score of 8.06 is higher than earlier reported from the city of Jeddah^{8,12}, these scores were comparable to reports from the same community^{18,19} but in different parts of the country. A study in the North West Region of the country showed a dmft score of 7.66, and 7.5% of the children were caries-free.¹⁸ A second report from Riyadh Armed Forces Schools for girls, showed a dmft score of 8.1, and 3.0% of the children were caries-free.¹⁹



The data on caries pattern helps to determine the appropriate treatment planning for these children. The study showed the occurrence of caries in both anterior and posterior teeth in most of the children. The prevalence of caries in molars was mostly bilateral. The bilaterality of primary molar caries was previously reported.^{20,21} This finding suggests careful examination of the contralateral molar if the molar on one side is carious. The mandibular primary second molars had the highest caries prevalence. This finding is in contrast to previous reports for preschool children in Riyadh²² and in Tanzania²³ but correlate with the studies in Alkhubar¹⁶ and Finland.²⁴

Socio-economic status has been associated with dental caries in several studies with levels of disease being higher amongst children in the lowest classes and those whose families were especially disadvantaged.^{25,26} The trend for caries to be higher in children from lower social classes has also been seen in young children in at least three studies in Saudi Arabia.^{7,8,15} The study population were children of military personnel, therefore, due to their lower socioeconomic status, it would be expected social and economical factors may be linked to the high caries level in this group of children.

The high prevalence of caries in this selected population can also be related to poor oral hygiene practices, improper dietary habits, as well as poor dental awareness and lack of dental knowledge among those children. Additional factors such as late first dental visits for routine check-ups and starting brushing late, which is common in Saudi²⁷, may also be responsible for the high caries prevalence.

Dental care is available free-of-charge for this population; nevertheless, the level of untreated dental caries is high. This could be due to either failure to go for dental treatment or the inability to see the dentist. Regular dental visits are important to promote good oral health. Routine visits for dental check-ups are not common practice in Saudi Arabia; many children go to the dentist only when they feel pain or have a dental problem.^{12,27}

Furthermore, dentist-to-patient ratio at the military hospital in Jeddah is around 1:10000, which is relatively low to serve this community considering the rapid population expansion in this region. This in fact shows the acute shortage of dental staff in the hospital, hence, dentists are unable to cope

with the need and the high demand for dental services for this community. The best possible care to patients is difficult to achieve under the circumstances of the relatively low dentist/population ratio, high prevalence of oral disease, and high demand for dental services.

The study highlighted the extent of dental disease in this community, which reflects the high treatment needs that cannot be met by traditional ways. Reduction of high caries levels can only be achieved by a preventive and oral hygiene promotion program; therefore, there is a great need to change from restorative-oriented dental services to preventive-oriented dental services in order to improve the oral health status of this population. The need to initiate school dental health education programs for children and their parents is a must to increase the dental awareness on the importance of oral health and how to prevent oral diseases by improving oral hygiene practices and change in dietary habits.

Also, there is an increased demand to start educational programs for new and expectant mothers to increase their dental knowledge and to give advice to restrict cariogenic snacks and drinks, to start oral hygiene early, and to get dental check-ups for their children early. Furthermore, we should consider the training of dental auxiliaries such as dental therapists, dental hygienists, and dental educators to help in the prevention and control of dental caries.

Conclusion

The high prevalence of dental caries found in this group of children and the very low effective treatment requires urgent efforts to initiate planning strategies for prevention and treatment in this highly selected group of population.

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