

Dental caries prevalence in 6-7 year-old schoolchildren in Riyadh region: A comparative study with the 1987 Oral Health Survey of Saudi Arabia Phase I

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تهدف هذه الدراسة إلى تحديد مدى وشدة انتشار النخر السني بين الأطفال في سن 6-7 سنوات من طلاب وطالبات مدارس المرحلة الابتدائية في منطقة الرياض في المملكة العربية السعودية، وذلك بعد مرور أربعة عشر عاما على إجراء المرحلة الأولى للمسح الصحي في المملكة. ستمائة واثنين طالبا وطالبة من الصف الأول للمرحلة الابتدائية تم اختيارهم عشوائيا من ثمانية عشرة مدرسة في منطقة الرياض. تم فحص جميع الأطفال للتحقق من وجود النخر السني باستخدام مقاييس منظمة الصحة العالمية. أوضحت النتائج أن 5.6% من إجمالي العينة كانت خالية من النخر السني، وأن متوسط معيار نخر وفقد وحشو الأسنان لإجمالي العينة بلغ 7.34 ± 0.2 . لقد كان المعيار بالنسبة للطلاب أكبر بشكل ملحوظ منه لدى الطالبات ($P < 0.0001$)، كما أظهر أطفال المناطق الريفية (6.28) معيارا أقل مقارنة بالمناطق الحضرية (7.69) ($P < 0.0001$)، بينما أبدى الأطفال السعوديون (7.56) معيار أعلى من غير السعوديين (6.53) ($P = 0.010$)، كما أظهر أطفال المدارس الخاصة معيارا أقل مقارنة بأطفال المدارس العامة ($P = 0.012$). خلاصة الدراسة تشير بأن هناك ازدياد ملحوظ في انتشار النخر بين أطفال المرحلة الابتدائية في منطقة الرياض بعد مرور 14 عاما على المرحلة الأولى للمسح الصحي في المملكة.

Objectives: To determine the magnitude and severity of dental caries prevalence in 6-7 year-old schoolchildren in Riyadh, Saudi Arabia, fourteen years after the conduct of the Oral Health Survey of Saudi Arabia Phase I. Materials and Methods: Six hundred and two elementary school first graders 6-7 year-old children were randomly selected using stratified cluster random sampling from 18 schools in Riyadh region, Saudi Arabia. All the children were examined for caries using World Health Organization oral health survey criteria. Results: Of the total sample, only 5.6% were free of caries. The mean dmft index of the total sample was 7.34 ± 0.02 . The mean dmft for boys (8.13) was significantly higher than the one for girls (6.48) ($P < 0.0001$). The rural children demonstrated a significantly lower dmft (6.28) than the urban (7.69) ($P < 0.0001$), and the Saudi schoolchildren showed significantly higher dmft index (7.56) than the non-Saudis (6.53) ($P = 0.010$). The children of private school had a lower dmft, which was significantly different from those in public schools ($P = 0.012$). Conclusions: The caries prevalence has increased significantly in elementary schoolchildren of Riyadh region 14 years after the conduct of Oral Health Survey of Saudi Arabia Phase I.

Introduction

Dental caries is considered as one of the most prevalent infectious diseases in the world. Several studies have been conducted in different parts of the world to determine the prevalence of dental caries among children of different age groups.¹⁻⁶ A number of reports of such studies have been published for different cities of Saudi Arabia such as Mecca,⁷⁻⁹ Almadina,¹⁰ Riyadh,¹¹⁻¹⁹ Jeddah,^{8,9,20-22} Rabagh,^{8,9} Al-Khobar,²³ Al-Ahsa²⁴ and Giza.²⁵ Nationwide studies were also conducted²⁶⁻²⁷ and special groups such as Bedouins were also studied.²⁸

The first report on dental caries prevalence in elementary schoolchildren in Riyadh region was available in 1986 and published in 1988 by Al-Sekait and Al-Nasser.¹² They reported that the mean decayed, missing and filled teeth (dmft) index for the primary teeth was slightly less than 0.8 for the 6 year-old children, rose until 8 years of age where it reached the highest at slightly more than 1.0.

A comprehensive study of oral diseases and habits of the people living in the Riyadh region of Saudi Arabia, known as the Oral Health Survey Phase I (OHS1), and design-matched with the International Collaborative Study I, was conducted in 1987, and the results published in 1990¹³ and 1991¹⁴, respectively. The results of this survey showed that in the 6 years-old group, 22.3% were free of caries in their primary teeth with mean dmft of 4.14 for boys and 3.43 for girls.

Subsequent studies^{15,17,19} showed a continuous increase in the dmft index for the elementary schoolchildren of Riyadh. However, two of these studies^{15,19} were done on samples of boys only and the third one¹⁷ did not use the World Health Organization (WHO) oral health survey²⁹ criteria.

The positive association between dental caries and *mutans streptococci* (MS) level has been reported in Saudi Arabian children¹⁷ in accordance with what had been observed in many other populations.³⁰ It is interesting to note that in 1977, MS and caries prevalence were lower in Saudi Arabian young adult naval recruits compared with a similar group in United States of America.³¹

Since the Saudi Arabian Oral Health Survey Phase I was conducted, a little over 14 years ago in 1987, significant changes have occurred in the

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general life style and specifically in eating habits of young Saudis, especially in the Riyadh region, the capital and the largest urban metropolis of Saudi Arabia. Therefore, there seemed to be a need to conduct another study as a follow-up on the 1987 study and observe the possible effects of these changes on caries prevalence and treatment needs. Hence, a study was conducted in the Riyadh region among students in the first grade of elementary school (6-7 year-old) and first grade of intermediate school (12-14 year-old) for caries status and treatment needs in 2002. The purpose of this paper was to report an aspect of the study which was the prevalence of dental caries in elementary school first graders children in Riyadh, Saudi Arabia, 14 years after the conduct of the Oral Health Survey of Saudi Arabia Phase I.

Materials and Methods

The study was conducted in 2002 in Riyadh region, an administrative unit situated in the central part of Saudi Arabia with a population of 22.63% of the total population of the country. A random sample of 602 elementary school first graders from urban and rural areas of the Riyadh region was examined. In year 2000, the number of elementary schools in this region was 531 for boys and 533 for girls, with total number of students attending these schools standing at 191,938 and 192,886 respectively. To determine the sample size for this study, the foregoing student populations and standard deviation of dmft reported by Al-Shammery *et al.*¹⁴ in OHS1 were used. The sample size obtained was 571 students with a 95% confidence interval, an 80% power of the test and maximum error of 0.5 in dmft. These samples were further divided among public schools of five locations (north, south, east, west and central) of the urban area, private schools and rural schools, according to the proportions of students in these types of schools. Eighteen schools were randomly selected using stratified random sampling. Two schools (one boys', one girls') from each of the five urban locations, two private schools (one boys', one girls'), and 6 rural schools (3 boys', 3 girls') were randomly selected from the lists of schools obtained from Ministry of Education and Presidency of Girls' Education. The stratification was done using locations and type of schools. Selected schools were informed before the visit of examiners.

The required numbers of students were examined from the selected schools by trained examiners. Two examiners (one male and one

female) were trained and calibrated by a senior faculty member of College of Dentistry, King Saud University. The same senior faculty member served as one of the reference examiners in the OHS of Saudi Arabia.

The WHO criteria²⁹ were utilized for diagnosis of the dental caries status and assessment of treatment needs. Each child was examined while seated on a portable chair. Natural light and disposable mirror were used for the examination. The probe was used sparingly on doubtful surfaces. In case of any doubt the tooth was marked sound. No radiographs were taken.

Statistical Package for Social Sciences (SPSS, Windows version 10) was utilized to generate descriptive statistics and inferential tests. The 't' test and analysis of variance (ANOVA) were used to find out the statistical significance of mean differences between genders (male/female), areas (urban/rural), nationalities (Saudi/non-Saudi) and urban areas (north, south, east, west and central). The significance level was set at 0.05.

Results

In the calibration of the examiners, a very high degree of agreement (above 92%) for both male and female examiners with the reference examiner was observed, using the Kappa Method.

Of the six hundred and two schoolchildren of the first grades of elementary schools 6-7 years were examined for the dental caries, the male/female distribution was 52% to 48%. Only 5.6% of the total sample was free of caries indicating that prevalence of caries was 94.4%, with a mean dmft index of 7.34 (± 4.02). The "d", "m" and "f" components of the dmft were 6.18 (± 3.73), 0.88 (± 0.96) and 0.27 (± 0.85) respectively, representing that decay component was the major constituent of the dmft index (Table 1).

Table 1 showed the mean dmft for boys 8.13 (± 3.61) which was significantly higher than the one for girls 6.48 (± 4.27) with $P < 0.0001$.

The rural children demonstrated a significantly lower dmft 6.28 (± 3.79) compared to urban children 7.69 (± 4.04) with $P < 0.0001$, and the Saudi schoolchildren showed significantly higher dmft 7.56 (± 3.99) than non-Saudis 6.53 (± 4.07) with $P = 0.010$ as shown in Tables 2 and 3.

The children in private school had a lower dmft, which was significantly different from that of children in public schools ($P = 0.012$) as shown in Table 4.

Table 5 lists the mean dmft of elementary schools children from public schools in different regions in urban Riyadh. When the dmft for

different regions were compared, the northern region of Riyadh had the lowest value, while the west had the highest ($P=0.002$) as shown in Table 5.

Table 1. Caries experience by gender

	Boys			Girls			P-Value	Total		
	n	\bar{x}	SD	n	\bar{x}	SD		n	\bar{x}	SD
Decay (d)	313	6.91	3.33	289	5.39	3.97	<0.0001	602	6.18	3.73
Missing (m)	313	1.02	0.98	289	0.74	0.91	<0.0001	602	0.88	0.96
Filled (f)	313	0.20	0.63	289	0.35	1.02	0.027	602	0.27	0.85
dmft	313	8.13	3.61	289	6.48	4.27	<0.0001	602	7.34	4.02

Table 2. Caries experience in urban and rural schoolchildren

SD	Urban			Rural			P-Value	Total		
	n	\bar{x}	SD	n	\bar{x}	SD		n	\bar{x}	SD
Decay (d)	451	6.50	3.80	151	5.23	3.34	<0.0001	602	6.18	3.73
Missing (m)	451	0.90	0.90	151	0.84	1.11	0.528	602	0.88	0.96
Filled (f)	451	0.29	0.90	151	0.21	0.67	0.310	602	0.27	0.85

Table 3. Caries experience of Saudi and non-Saudi schoolchildren

	Saudi			Non-Saudi			P-Value	Total		
	n	\bar{x}	SD	n	\bar{x}	SD		n	\bar{x}	SD
Decay (d)	472	6.35	3.77	130	5.58	3.51	0.39	602	6.18	3.73
Missing (m)	472	0.90	0.93	130	0.83	1.06	0.477	602	0.88	0.96
Filled (f)	472	0.32	0.92	130	0.12	0.42	<0.0001	602	0.27	0.85
dmft	472	7.56	3.99	130	6.53	4.07	0.010	602	7.34	4.02

Table 4. Caries experience of schoolchildren in public and private schools

SD	Public			Private			P-Value	Total		
	n	\bar{x}	SD	n	\bar{x}	SD		n	\bar{x}	SD
Decay (d)	367	6.78	3.84	84	5.26	3.39	0.001	451	6.50	3.80
Missing (m)	367	0.92	0.83	84	0.82	1.16	0.485	451	0.90	0.90
Filled (f)	367	0.22	0.69	84	0.61	1.46	0.020	451	0.29	0.90

Table 5. Caries experience in schoolchildren in different districts of Riyadh

	<i>n</i>	Decay (d) $\bar{x} \pm SD$	Missing (m) $\bar{x} \pm SD$	Filled (f) $\bar{x} \pm SD$	dmft $\bar{x}^* \pm SD$
North	61	5.30 \pm 3.93	0.61 \pm 0.69	0.48 \pm 0.92	6.38 \pm 4.32 ^a
South	72	7.25 \pm 3.91	0.90 \pm 0.56	0.07 \pm 0.59	8.22 \pm 4.07 ^{ab}
East	103	6.86 \pm 3.77	0.88 \pm 0.82	0.27 \pm 0.78	8.02 \pm 3.99 ^{ab}
West	65	7.78 \pm 3.95	1.03 \pm 0.61	0.26 \pm 0.64	9.08 \pm 3.98 ^b
Central	66	6.55 \pm 3.30	1.15 1.24	0.03 \pm 0.17	7.73 \pm 3.98 ^{ab}
Total	367	6.78 \pm 3.84	0.92 \pm 0.83	0.22 \pm 0.69	7.92 \pm 4.12

* Different alphabets mean statistical significance

Discussion

The comprehensive results of the first phase of the national survey of oral health status (OHS1), conducted in 1987, were published in 1991.¹⁴ The present study investigated the magnitude and severity of dental caries prevalence in 6-7 year-old schoolchildren in Riyadh, Saudi Arabia, fourteen years after the conduct of the OHS1. The results of OHS1, Al-Shammery *et al.*^{13,14} showed that in the 6 years-old group, 22.3% were free of caries, whereas the present study indicated that only 5.6% of the total sample were free of caries.

The OHS1 showed that the mean dmft for 6 year-old Riyadh children was 4.14 for boys and 3.43 for girls. The present study found that the mean of dmft for the same age group was 8.13 for boys and 6.48 for girls (Table 1), which represents a more than doubling magnitude compared to the OHS1.

The mean dmft of the total sample in this study (7.34 \pm 4.02) was the highest among all previous studies conducted in a similar population in Riyadh.^{12-15,17,19} These studies showed a continuous increase in the dmft index since the first study in 1986 up to the present one. Figure 1 is a chart of the caries experience obtained from these studies. It shows the severe increase of caries prevalence in this decade compared to the last. Furthermore, the mean dmft of the total sample reported in the present study was also higher than those of other cities in the kingdom^{8-10,20-23,26} as well as other countries^{1-3,5} for the same age group.

In this study the decay was the major component (84%) of the dmft index (Table 1). This is in concordance with OHS1^{13,14} and other studies

conducted in a similar population in Riyadh^{12,15,19} and other cities in the kingdom.^{9,10,20,21,23,26} This indicates the large number of active caries and the high level of treatment need.

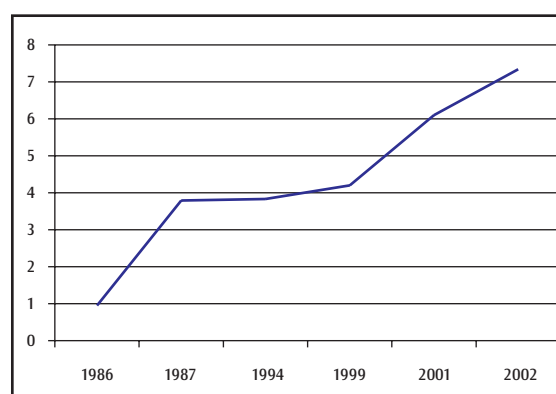


Fig.1. Progressive increase in dmft from 1986 to 2002 as reported in 6-8 year-old Riyadh schoolchildren (Obtained from different studies).

The severe increase in caries prevalence can be related to changes in the lifestyles (increase accessibility and more frequent use of sweetened snacks and drinks) and poor oral hygiene practices among these schoolchildren. It may also be partly related to the lack of dental health knowledge and access to professional dental care. Al Ghanim *et al.*³² studied a sample of 446 Saudi pre-school children in Riyadh to evaluate the significance of different variables in assessing the level of caries. They developed a caries prediction model that identified five significant risk factors for high caries experience namely: debris index, use of

sweetened milk in bottle, frequency of consumption of soft drinks, frequency of intake of sweets and child's age at the first dental visit. Wyne and Khan³³ evaluated the dietary habits of 4-6 years old children in Riyadh through a self-administered questionnaire completed by the parents. They reported that 88.2% of the total sample were given sweetened snacks, 75% were using canned soft drinks and packed fruit juices and 41.2% were not brushing their teeth. Al-Tamimi and Petersen¹⁰ confirmed the association between dental caries experience of elementary schoolchildren of Al-Madina and consumption of sweets.

The prevalent severity of the disease points out the urgency for effective prevention programs, especially for the high-risk age groups, and systematic oral health care system. It is obvious that the present prevention and care efforts provided by the different government sectors were not enough to stabilize or reduce the prevalence and severity of the disease. There is a need for the government and private sectors, educational or health provider, to collaborate in establishing and implementing very well planned prevention programs. A prevention program that involves organized school-based dental services might be an affective approach. A dental clinic in every elementary school with part time dentist will be an ideal for implementing the prevention programs and for providing primary oral care. The proper use of fluoride where necessary (topical fluoride application, fluoride supplements. etc.) and fissure sealant should be continued however in a more efficient and planned manner. Dental health topics ought to be included in the schools curriculum starting from the first grade of elementary school along with training of schoolteachers to provide basic dental health education. The elementary schoolteachers can play an important role in building up positive health habits in their students. Reports showed that the schoolteacher in Riyadh^{19,34} and Al-Madina¹⁰ have satisfactory oral health knowledge and their attitude towards participation in oral health education was encouraging. Fluoridation of water should be considered for the whole country where applicable. Al-Khateeb *et al.*^{8,9} showed that dmft values were considerably higher in Jeddah (fluoride level less than 0.3 ppm) than in Mecca or Rabagh where higher fluoride level recorded 2.5 ppm and 0.8 ppm, respectively. Reports from different cities in the kingdom varied from very high fluoride level to very low.^{7-9,15,17,35,36}

In the present study boys showed significantly greater dmft than the girls ($P < 0.0001$), as was found with OHS1.^{13,14} It may be due to the fact that Saudi girls are more concerned about their oral health than Saudi boys which was not the case before 1986 when reports^{11,12} showed that girls were more affected than boys.

The results of the present study demonstrated that urban children had untreated carious lesions (6.50) more than the rural children (5.23; $P < 0.0001$). This follows the same pattern as OHS1,^{13,14} in which the dmft was 3.9 for urban and 3.1 for rural area ($P < 0.05$). Those differences may be due to the more rapid changes in eating habits taking place in urban areas than rural.

The breakdown between Saudi and non-Saudi showed that the dmft for the Saudi children was 7.56 (± 3.99), whereas for non-Saudi was 6.53 (± 4.07). This difference was statistically significant ($P = 0.010$). There was no significant difference between Saudi and non-Saudi children in the decay component of the dmft. This suggests that non-Saudi children follow the same eating habits and life pattern as native children.

Private schools children showed the lowest dmft compared to public schools ($P = 0.012$) as shown in Table 4. Similar differences were reported by other studies.^{8,9,19} This could be explainable by the high educational level of the parents of children in private schools and a better access to dental health services. Al-Tamimi and Petersen¹⁰ reported an association between the higher dmft index of elementary schoolchildren and lower educational level of the parents.

The dmft had the lowest values in Riyadh Northern district schools, and were significantly different from Western region schools ($P = 0.002$). This may be due to differences in socio-economic status of these areas. The close correlation between socioeconomic status and oral health in Saudi Arabia has been previously documented.^{15,22}

The present study provides important information regarding the change in magnitude and severity of dental caries prevalence in elementary schoolchildren after 14 years of the OHS1. This information may assist the planning personnel of the health department of Riyadh region to accelerate educational and preventive measures, and to determine a better estimate of manpower requirements and material needs.

Conclusion

Results of this study indicated that dental caries prevalence in elementary schoolchildren of Riyadh has increased significantly to a serious level since OHS1 conducted fourteen years ago.

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