

Dental caries prevalence among 12-14 year-old schoolchildren in Riyadh: A 14 year follow-up study of the Oral Health Survey of Saudi Arabia Phase I

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هدفت هذه الدراسة إلى تقييم التغيرات الحاصلة في حدة ومدى انتشار النخر السني بين طلاب و طالبات مدارس المرحلة المتوسطة في الرياض في المملكة العربية السعودية وذلك بعد مرور أربعة عشر عاماً على إجراء المرحلة الأولى لمسح الصحة الفموية في المملكة العربية السعودية. تم اختيار مائتان وخمسة طالب و طالبة من الصف الأول للمرحلة المتوسطة عشوائياً من ستة عشر مدرسة في الرياض، وتم فحصهم للتحقق من النخر السني باستخدام معيار منظمة الصحة العالمية. أوضحت نتائج الدراسة أن 6.3% فقط من إجمالي العينة كانت أسنانهم خالية من النخر السني مما يوضح أن مدى انتشار نخر الأسنان كان 93.7%، كما كان معدل معيار نخر و فقدان وحشو الأسنان لإجمالي العينة 5.94 (± 3.95). لقد كان معدل المعيار للطلاب الذكور 7.20 (± 3.89) أكبر من الطالبات 4.66 (± 3.59) (دلالة إحصائية < 0.0001). و إن طلاب المناطق المدنية ظهر لديهم معيار 6.45 (± 3.92) أعلى من طلاب المناطق الريفية 4.61 (± 3.72) (دلالة إحصائية = 0.003). كما لم يظهر أي اختلاف جوهري بين معدل معيار نخر و فقدان وحشو الأسنان بين الطلاب السعوديين وغير السعوديين (6.09 و 5.35، بالترتيب) (دلالة إحصائية = 0.273)، كما لم يظهر اختلاف في معدل المعيار بين طلاب المدارس العامة والخاصة (6.45 و 5.35، بالترتيب) (دلالة إحصائية = 0.439). يستنتج من هذه الدراسة أن هناك زيادة واضحة في مدى انتشار نخر الأسنان بين طلاب و طالبات مدارس المرحلة المتوسطة في الرياض بعد مرور أربعة عشر عاماً على إجراء المرحلة الأولى لمسح الصحة الفموية في المملكة العربية السعودية.

The objective of this study was to assess the changes in dental caries status among 12-14 year-old schoolchildren in Riyadh, Saudi Arabia, fourteen years after the conduct of an Oral Health Survey of Saudi Arabia Phase I. A total of 205 students of the first grade of intermediate schools (12-14 years of age) were randomly selected, using stratified random sampling from 16 schools in Riyadh, Saudi Arabia. The children were examined, by two trained examiners, for dental caries using the World Health Organization criteria. Of the total sample, only 6.3% were caries free showing that the caries prevalence was 93.7%. The mean DMFT value for the total sample was 5.94 (± 3.95). Male students had a significantly higher mean DMFT value (7.20 ± 3.89) than the female students (4.66 ± 3.59) ($P < 0.0001$). Students residing in urban areas demonstrated a significantly higher mean DMFT value (6.45 ± 3.92) compared to students of rural areas (4.61 ± 3.72) ($P = 0.003$). No statistically significant differences were found between the mean DMFT values of Saudi and non-Saudi students (6.09 and 5.35, respectively) ($P = 0.273$) and also no statistically significant differences were found between the mean DMFT values of private and public school children ($P = 0.439$). The caries prevalence has increased considerably among intermediate schoolchildren in Riyadh, 14 years after the conduction of the Oral Health Survey of Saudi Arabia Phase I.

INTRODUCTION

Dental caries is a disease, which afflicts humans of all ages and in all areas of the world. It is a disease that might never be eliminated because of its multifactorial nature including social, cultural, behavioral, dietary and biological factors that can be associated with its initiation and progression. Several studies have been carried out to assess the dental caries prevalence among children in different parts of the world.¹⁻⁶ In Saudi Arabia, several reports have been published on the prevalence and severity

of dental caries among school children in Riyadh,⁷⁻¹⁰ and in other parts of the kingdom.¹⁰⁻¹⁷

In 1987, a comprehensive epidemiological survey of oral diseases, beliefs, attitudes and habits of the people living in Riyadh region in Saudi Arabia was conducted and was published in 1991.¹⁸ This study, known as the Oral Health Survey Phase I (OHSI), presented very important baseline data on the dental health status of the population in the central province of Saudi Arabia. The

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results of this study showed that 41.8% of the 12-year-old age group was free of dental caries in their permanent teeth and that the mean DMFT value was 1.61 for males and 1.68 for females.¹⁸

Substantial changes have occurred in the ways of living and in the habits and behaviors of young Saudi children since the conduct of the OHSI in 1987 particularly in Riyadh, the capital area of Saudi Arabia. A follow-up study to examine the possible outcome of these changes on the caries prevalence seems to be required. Therefore, a study was undertaken in Riyadh to assess the changes in dental caries status and treatment needs among students in the first grade of primary schools (6 to 7-year old) and first grade of intermediate schools (12 to 14-year-old). The purpose of this paper was to report an aspect of this study, which was the dental caries status in the students of first grade intermediate schools in Riyadh, Saudi Arabia, 14 years after the conduct of the Oral Health Survey of Saudi Arabia Phase I.

METHODS

In the year 2000, the number of intermediate schools in Riyadh was 315 for boys' and 281 for girls'. The number of students attending these schools was 88,671 boys and 82,662 girls, respectively. To determine the sample size for the study, the student population and standard deviation of decayed, missing and filled teeth (DMFT) reported by Al-Shammary et al.¹⁸ in OHSI were used. The sample size that was obtained, with a 95% confidence interval, 80% power of the test and a maximum error of 0.5 in the DMFT, was 206 children. The sample was further divided among the public schools in 5 locations (East, West, North, South and Central) of the urban area (an area with the condition of having at least 100,000 population),¹⁸ private schools and rural (a

village or town which is not more than 50 kilometers away and not within the range of 5 kilometers from the urban center)¹⁸ schools according to the proportion of students in these types of schools. Sixteen schools were randomly selected for the study using stratified random sampling. The stratification was done based on the location and type of schools, using the list of schools obtained from Ministry of Education and Presidency of Girls' Education. Two schools, one for boys and one for girls, were selected from each of the five urban areas, in addition to two private schools (one for boys and one for girls) and four rural schools (two for boys and two for girls).

A total of 205 students of the first grade of intermediate schools (12-14 years of age) were examined during the period of April/ May 2002. Two trained examiners (one male and one female) examined the students in the selected schools. The examiners were trained and calibrated by the same senior faculty member of the College of Dentistry, King Saud University who served as one of the reference examiners in the OHS of Saudi Arabia. After training and calibration, both the male and female examiners obtained a very high degree of agreement (over 92%) with the reference examiner using the Kappa method. The diagnosis of the dental caries status was based on the World Health Organization (WHO) criteria.¹⁹

The selected schools were informed before the examination visit. Each child was examined under natural light using a disposable mirror, while seated on a portable chair. No radiographs were taken, and the dental probe was only used to confirm the diagnosis. In case of doubt the tooth was considered to be sound.

Statistical Package for Social Sciences (SPSS windows version 10.0) was used 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 gender (male/female), area (urban/rural), nationality (Saudi/ non Saudi) and different urban areas (east, west, north, south and central). The significant level was set at 0.05.

RESULTS

Of the two hundred and five students examined, 103 were males and 102 were females. About 80% of the study sample were Saudis and nearly 72% were selected from urban areas.

Of the total sample, only 6.3% were caries free indicating that the caries prevalence was 93.7%. The mean DMFT value for the whole sample was 5.94 (\pm 3.95). Analysis of the DMFT showed that the mean D value was 5.44 (\pm 3.87), the mean M value was 0.15 (\pm 0.62) and the mean F value was 0.35 (\pm 0.97) indicating that the D (decay) component was the major constituent of the DMFT index (Table 1).

Table 1. Caries experience of intermediate school children in Riyadh by gender

	Male			Female			P value	TOTAL		
	n	x	SD	n	x	SD		n	x	SD
Decay (D)	103	6.71	3.78	102	4.16	3.53	<0.0001	205	5.44	3.87
Missing (M)	103	0.21	0.81	102	0.09	0.32	0.147	205	0.15	0.62
Filled (F)	103	0.28	0.77	102	0.41	1.14	0.338	205	0.35	0.97
DMFT	103	7.20	3.89	102	4.66	3.59	<0.0001	205	5.94	3.95

Male students had a higher mean DMFT value (7.20 ± 3.89) than the female students (4.66 ± 3.59) and the difference between the two groups was statistically significant ($P < 0.0001$) as shown in Table 1. The mean value of decay component of the DMFT was the highest for both males and females (6.71 and 4.16, respectively) and the difference between the two groups

was found to be statistically significant ($P < 0.0001$) as shown in Table 1.

Students residing in urban areas demonstrated a significantly higher mean DMFT value (6.45 ± 3.92) compared to students from rural areas (4.61 ± 3.72 and $P = 0.003$) as shown in Table 2. For both groups the D component constituted over 91% of the total DMFT value.

Table 3 shows that no statistically significant differences were found between the mean DMFT values of Saudi and non-Saudi students at 6.09 and 5.35, respectively. Differences were found, however, between the mean values of the M and F components of the index between Saudi and non-Saudi students at $P = 0.037$ and $P = 0.002$, respectively (Table 3).

Table 2. Caries experience of intermediate school children in Riyadh by area (urban / rural)

	Urban			Rural			p value	TOTAL		
	n	x	SD	n	x	SD		n	x	SD
Decay (D)	148	5.89	3.90	57	4.28	3.58	0.007	205	5.44	3.87
Missing (M)	148	0.18	0.71	57	0.09	0.29	0.364	205	0.15	0.62
Filled (F)	148	0.39	1.06	57	0.25	0.69	0.358	205	0.35	0.97
DMFT	148	6.45	3.92	57	4.61	3.72	0.003	205	5.94	3.95

Table 3. Caries experience of intermediate school children in Riyadh by nationality (Saudi / non-Saudi)

	Saudi			Non-Saudi			p value	TOTAL		
	n	x	SD	n	x	SD		n	x	SD
Decay (D)	162	5.50	3.81	43	5.21	4.12	0.662	205	5.44	3.87
Missing (M)	162	0.18	0.67	43	0.05	0.21	0.037	205	0.15	0.62
Filled (F)	162	0.41	1.07	43	0.09	0.37	0.002	205	0.35	0.97
DMFT	162	6.09	3.88	43	5.35	4.19	0.273	205	5.94	3.95

Private school children were found to have a higher mean DMFT value than public school children but the difference between the two groups was

Table 4. Caries experience of intermediate schoolchildren in Riyadh by school type (public / private)

	Public			Private			p value	TOTAL		
	n	x	SD	n	x	SD		n	x	SD
Decay (D)	26	5.83	3.80	22	6.23	4.52	0.657	148	5.89	3.90
Missing (M)	126	0.18	0.75	22	0.14	0.35	0.778	148	0.18	0.71
Filled (F)	126	0.33	0.87	22	0.68	1.81	0.155	148	0.39	1.06
DMFT	126	6.34	3.89	22	7.05	4.13	0.439	148	6.45	3.92

Table 5. Caries experience of intermediate schoolchildren categorized by districts in Riyadh (urban only)

Geographic location	n	Decay (D) X ± S	Missing (M) X ± S	Filled (F) X ± S	DMFT X ± S
North	23	5.57 ± 3.8	0.09 ± 0.2	0.39 ± 1.0	6.04 ± 3.6
South	21	6.05 ± 4.4	0.19 ± 0.6	0.19 ± 0.6	6.43 ± 4.5
East	39	6.13 ± 3.5	0.10 ± 0.3	0.13 ± 0.4	6.36 ± 3.4
West	21	5.95 ± 3.7	0.52 ± 1.6	0.71 ± 1.2	7.19 ± 4.3
Central	22	5.23 ± 3.8	0.09 ± 0.2	0.41 ± 0.9	5.73 ± 3.9
Private	22	6.23 ± 4.5	0.14 ± 0.3	0.68 ± 1.8	7.05 ± 4.1
TOTAL	148	5.89 ± 3.9	0.18 ± 0.7	0.39 ± 1.0	6.45 ± 3.9

not statistically significant ($P=0.439$) as shown in Table 4. By comparing the mean DMFT values among the public schools of the urban area, the Western area of Riyadh had the highest value of 7.19 (± 4.33) while the lowest value was in the Central area 5.73 (± 3.94), but the difference between the two groups was not statistically significant (Table 5).

DISCUSSION

This study was a follow-up of the national survey (OHSI), carried out in Riyadh in 1987.¹⁸ It was conducted to identify any changes that might have occurred in the caries status during the 14 year time difference among intermediate school children. In the OHSI, Al-Shammery et al. found that among the 12-years-old group, 41.8% were free from caries, whereas the results of this study

showed that only 6.3% of the total sample was caries free. The present study shows that the caries prevalence has increased to a very serious level compared to the previous studies.^{7,8,10,18}

The results of OHSI showed also that the mean DMFT value for 12-year-old students was 1.61 for males and 1.68 for females.¹⁸ In this study however, the mean DMFT value was 7.20 for males and 4.66 for females, which shows an increase of nearly four and a half times for males and over two and a half times for females. The mean DMFT value in this study was also found to be higher than the values noticed in other studies done on similar age groups in different parts of Saudi Arabia,^{7,8,12-14} and in other countries.^{2,3,6} This increase in caries levels might be attributed to changes in the life style and eating habits such as the greater intake of in between meal snacks and the increase in the frequency of consumption of sweetened foods and drink.^{8,14,20-22} It could also be compounded by a general lack of interest in dental health care and preventive measures, low dental health knowledge and difficulties in obtaining professional dental care.

Male students in this study had a higher mean DMFT value than females, which is the opposite of the results obtained in the OHSI where females had higher mean DMFT value than male students. This finding could be related to the fact that female students in intermediate schools were found to use the toothbrush, toothpaste and clean their teeth more frequently than their male counterparts.²³

The decay component was the major contributor in the DMFT value, in this study, constituting over 91% of the score. This is consistent with the results of the OHSI and other studies conducted on similar age groups in different areas of Saudi Arabia.^{7-9,12-14} This is interpreted to mean that the high number of untreated

caries is still prevalent and there is an immediate need for providing restorative services to this age group.

In this study, the mean DMFT value and the value of the D component were higher among students residing in urban areas compared to rural areas which does not agree with the findings of the OHSI where no difference between the two groups was found. A possible explanation might be that students residing in urban areas have more access to and consume more sweetened snacks and drinks than student residing in rural areas.

No statistically significant differences were found between Saudi and non Saudi school children in the mean DMFT values and in the mean value of the decay component indicating that there were no differences in the eating habits and ways of living. Statistically significant differences, however, were found between the filled and missing component, which shows that non-Saudi children received less dental treatment possibly because they had limited access to dental health care.

Although the results of this study showed that private school children showed a higher mean DMFT value than public school children, this difference was not statistically significant. This finding disagrees with the findings reported by other studies where public school children presented with higher mean DMFT values.^{12, 24} It could be that students from private school were from higher socio-economic level, which might have given them a higher opportunity to gain access to more sugary snacks and drinks. Although, the differences found in mean DMFT values between western and central areas of Riyadh were not statistically significant, it could be attributed to differences in socio-economical levels.

The results of the present study showed that the dental caries prevalence has

increased to a very serious level among intermediate school children in Riyadh in the last 14 years period since the OHSI was conducted. This indicates that there are still shortcomings in the area of both preventive and curative dental care.

More oral health education programs must be deployed in an attempt to control oral diseases, and school based approaches should be combined with family and community directed preventive programs. Also, a high number of untreated caries in these children requires immediate attention. The information obtained from this study could be used to determine the most appropriate measures to be undertaken and to decide the most appropriate resources and logistic requirements needed to meet the current situation.

CONCLUSION

The results of this study indicated that the prevalence of dental caries has increased considerably among intermediate schoolchildren in Riyadh, 14 years after the conduct of the Oral Health Survey of Saudi Arabia Phase I.

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