

Trends in dental caries and missing teeth in adult patients in Al-Ahsa, Saudi Arabia

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هدفت هذه الدراسة إلى تحديد معدل انتشار النخور وشدتها عند المرضى البالغين المراجعين لمركز أسنان الاحساء في منطقة الاحساء في المملكة العربية السعودية. شملت الدراسة فحص 544 من المرضى البالغين، 42% ذكراً و 58% أنثى وبمعدل عمر 42.7 ± 18.1 سنة، تم فحصهم لتحري النخور السنوية باستعمال معايير منظمة الصحة العالمية لتشخيص النخور السنوية. بلغ معدل انتشار النخور بين العناصر 89.2% ومتوسط DMFT 13.24 ± 11.53 . كان متوسط DMFT عند المرضى الذكور أعلى بشكل واضح ($p < 0.01$) وذلك بالمقارنة مع الإناث، كما أبدى المدنين معدل ($p < 0.01$) أعلى من الريفيين. وشكل معدل الأسنان المفقودة المعدل الأعلى من مكونات DMFT. بلغت نسبة مرضى الرد 17%. وحوالي أكثر من نصف (56.8%) المرضى ممن تجاوزوا الواحد والستين كانوا فاقدوا الأسنان. أظهر تحليل الارتداد الخطي للعمر بالنسبة لمتوسط DMFT زيادة 0.45 لكل سنة من العمر. يمكن الاستنتاج على ان ارتفاع معدل انتشار النخور وشدتها بين عناصر الدراسة.

The aim of the study was to determine dental caries prevalence and severity among adult patients attending Al-Ahsa Dental Center in Al-Ahsa Region of Saudi Arabia. A total of 544 adult patients, 42% males and 58% females with a mean age of 42.7 ± 18.1 years, were examined for dental caries utilizing WHO criteria for diagnosis of dental caries. The caries prevalence among the sample was 89.2% with a mean DMFT score of 13.24 ± 11.53 . The mean DMFT scores of the patients from urban areas (14.03 ± 12.11) were significantly higher than patients from rural areas (11.39 ± 9.84) ($P < 0.01$). Missing teeth was the major component of the total DMFT score. About 17% of the patients were edentulous. However, more than half (56.8%) of the patients above 61 years were edentulous. In conclusion, the caries prevalence and severity were very high among the subjects studied.

INTRODUCTION

Dental caries is one of the three most common infectious diseases in the world today.¹ Several recent studies in Western world indicate that, although the caries prevalence has decreased markedly in children and adults up to the age of 40, the overall risk for caries in older age groups has not decreased appreciably.¹⁻⁸ In some third world countries like China, the caries experience is very low.⁹ However, the caries prevalence is very high in countries such as Pakistan¹⁰, Jordan¹¹ and Kuwait¹².

Al-Shammery *et al.*^{13,14} have conducted comprehensive oral health studies in children and adults for several regions of Saudi Arabia. There are only few other caries prevalence studies^{15,16} in the Saudi adult population. However, no data are

available for caries prevalence of adult population in Al-Ahsa Region, which is located in the Eastern part of Saudi Arabia. Such data are of vital importance in planning for dental health care services (both restorative and preventive) in the area. Therefore, there was a need to obtain some information on the prevalence of dental caries in the adult population of this area. A hospital-based study was conducted in 1998 in Al-Ahsa Region to determine the prevalence and severity of dental caries, treatment and prosthetic needs among its adult population. The prevalence and severity of dental caries data are presented in this article.

SUBJECTS AND METHODS

Al-Ahsa is the largest oasis in the Kingdom of Saudi Arabia and is located between the Arabian Gulf coast and the

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Al-Dahna and Al-Daman deserts in the Eastern Province of Saudi Arabia. The area is very famous for its dates and has about two millions date-palm trees.¹⁷

All the patients who attended the dental center during the last four months of 1998 were selected for the study. The sample comprised of five hundred and forty-four adult patients who were examined for dental caries using WHO criteria for diagnosis of dental caries.¹⁸ Two examiners (one male and one female) were trained and calibrated by a senior faculty member of King Saud University, College of Dentistry, Riyadh, Saudi Arabia. The patients were examined on a dental chair at Al-Ahsa Dental Center. A fiberoptic light source with interchangeable disposable mirror head was utilized for the examination. The dental explorer was used sparingly on doubtful surfaces. In case of any doubt, the tooth was marked as sound. No radiographs were taken. Ten percent of subjects were recalled after one week to determine the consistency of the examiners.

Kappa methods were used to determine inter-examiner agreement. There was a very high degree of agreement between the reference examiner and the two investigators (97.7% for the male examiner and 95.1% for the female examiner) for decayed, missing and filled teeth. The intra-examiner reliability of repeated subjects for male and female investigators was found to be 98.9% and 94.8%, respectively.

RESULTS

The mean age of 544 patients was 42.68 ± 18.06 years (Range: 13-102 years). The gender distribution was 230 males (42.3%, age range 14-102 years, mean 48.37 ± 19.61) and 314 females (57.7%, age range 13-85 years, mean 38.53 ± 15.62). Table 1 describes the age distribution by gender and area of residence. Significantly higher percentage (24%) were males than females (8.3%) at the age groups above 61 years, and there were more urban patients (18.1%) in the

Table 1. Age distribution by gender and area of residence

Factor	Age group (years)	Age group (years)						Total
		≤ 20	21 - 30	31 - 40	41 - 50	51 - 60	≥ 61	
Gender	Male	22 (9.6)	33 (14.4)	26 (11.4)	44 (19.2)	49 (21.4)	55 (24.0)	229 (42.2)
	Female	35 (11.1)	88 (28.0)	75 (23.9)	39 (12.4)	51 (16.2)	26 (8.3)	314 (57.8)
Area of residence	Urban	38 (10.0)	83 (21.8)	66 (17.3)	63 (16.5)	62 (16.3)	69 (18.1)	381 (70.2)
	Rural	19 (11.7)	38 (23.5)	35 (21.6)	20 (12.3)	38 (23.5)	12 (7.4)	162 (29.8)
Total		57 (10.0)	121 (22.3)	101 (18.6)	83 (15.3)	100 (18.4)	81 (14.9)	543

Statistical Package for Social Sciences (SPSS Windows version 10.0) was utilized to compute the descriptive statistics. The t-test was used to compare the mean DMFT between gender (male/female) and area of residence (urban/rural). The analysis of variance (ANOVA) with Tukey Post Hoc multiple range test were employed to compare the severity of caries between age groups. Chi-square test was carried out to test the relationship of gender, area of residence and age groups with caries prevalence.

sample than rural patients (7.4%) in this age group.

Caries Prevalence (Table 2)

Only 10.8% of the patients were caries free. There was no significant difference in overall caries prevalence ($P = 0.792$) between male (89.6%) and female (88.9%) patients. However, the prevalence of decayed and filled teeth was significantly higher in female than male patients with P values of 0.005

Table 2. Number and percentage distribution of DMFT by gender, area of residence and age.

	Gender			Area			Age-group				Total (%)
	Male (%)	Female (%)	P value	Urban (%)	Rural (%)	P value	≤ 30 (%)	31- 50 (%)	≥ 51 (%)	P value	
Decay	44.8	57.0	0.005	46.5	64.4	<0.0001	53.9	60.3	41.4	0.001	51.8
Missing	78.7	78.3	0.921	79.0	77.3	0.658	48.9	87.0	99.4	<0.0001	79.5
Filled	13.0	24.2	0.001	21.3	15.3	0.110	28.7	26.1	3.9	<0.0001	19.5
DMFT	89.6	88.9	0.792	89.0	89.2	0.838	75.3	92.4	100.0	<0.0001	89.2

and 0.001, respectively. Similarly, there was no significant difference ($P = 0.838$) in overall caries prevalence between urban (89.0%) and rural (89.2) patients. However, rural patients showed higher ($P < 0.0001$) prevalence of decayed teeth than the urban patients. The overall caries prevalence and the subjects with missing teeth increased significantly ($P < 0.0001$) with age. More than half (51.8%) of the patients had at least one decayed tooth, and four in every five (80%) had at least one missing tooth. Only one in five (19.5%) patients had at least one filled tooth.

Caries Severity (Table 3)

The overall mean DMFT score of all the patients was 13.24 ± 11.53 . The mean

DMFT score of male and female patients was 15.24 ± 12.73 and 11.77 ± 10.35 respectively, which was different significantly ($P = 0.001$). However, when the comparison was conducted between males and females in each age group, no statistical significance was observed because the age-group had a confounding effect as shown in Table 1. Furthermore, decayed and filled teeth components of mean DMFT scores were higher in female patients with P values of 0.005 and 0.002, respectively. Since, many epidemiological studies consider DMFT with and without 3rd molars to cover impacted and unerupted 3rd molars. Therefore, DMFT without 3rd molars was also computed. The mean DMFT score of males and females excluding the 3rd molars was 12.79 ± 11.36 and 9.39 ± 9.30 ,

Table 3. Distribution of DMFT and its components by gender, area of residence and age.

		Gender			Area			Age – group				Total n=544
		Male n=230	Female n=314	P value	Urban n=381	Rural n=163	P value	≤ 30	31 – 50	≥ 51	P value	
Decay	\bar{X}	1.63	2.40	0.005	1.64	3.12	<0.0001	1.89 ^{ab}	2.59 ^a	1.76 ^b	0.034	2.08
	SD	2.91	3.47		2.79	3.98		3.01	3.70	2.98		3.26
Missing	\bar{X}	13.29	8.68	< 0.0001	11.98	7.79	<0.0001	1.91 ^a	8.21 ^b	21.71 ^c	<0.0001	10.63
	SD	13.13	10.32		12.64	8.97		3.53	9.07	10.90		11.80
Filled	\bar{X}	0.32	0.69	0.002	0.56	0.48	0.586	0.75 ^a	0.77 ^a	0.09 ^b	<0.0001	0.54
	SD	1.08	1.67		1.43	1.54		1.75	1.68	0.49		1.46
DMFT	\bar{X}	15.24	11.77	0.001	14.03	11.39	0.008	4.55 ^a	11.57 ^b	23.56 ^c	<0.0001	13.24
	SD	12.73	10.35		12.11	9.84		5.47	9.57	9.66		11.53
DMFT without 3 rd molar	\bar{X}	12.79	9.39	<0.0001	11.56	9.13	0.006	3.36 ^a	9.02 ^b	20.08 ^c	<0.0001	10.85
	SD	11.36	9.30		10.90	8.72		4.64	8.66	8.98		10.35

respectively. The difference of above two means was highly significant ($P < 0.0001$). However, there was no significant difference when this DMFT was compared for each age group. The mean DMFT score of urban patients (14.03 ± 12.11) was significantly higher ($P = 0.008$) than rural patients (11.39 ± 9.84). The patients from rural areas showed significantly higher ($P < 0.0001$) mean decayed teeth as compared to patients from urban areas, while urban patients showed significantly higher ($P < 0.0001$) mean missing teeth than their rural counterparts. The mean DMFT score increased across the age groups with a linear relationship between DMFT score and age. The decayed and filled teeth components of the DMFT score significantly decreased after the age of 50 years, while the missing teeth component took a significant jump during this period ($P < 0.0001$). The DMFT without the 3rd molar showed the same pattern with age groups as the total DMFT.

Edentulous Patients (Table 4)

About 17% of the patients were edentulous. Among the age group of 41-50 years, 18.1% did not have any teeth, while in patients who were 61 year of age or higher, 56.8% were edentulous. Male patients (25.7%) and those from urban (21.3%) areas showed significantly higher percentage ($P < 0.0001$) of edentulism

compared with female (10.2%) and rural patients (6.1%). However, within each age group, no significant differences were observed in relation to gender and area of residence, with the exception of age group of 51-60 years for area of residence.

DISCUSSION

The study was conducted on a convenient sample of patients attending the dental center of Al-Ahsa region. The results should therefore be read with caution. Since there were no such data available in the literature, to the authors' best knowledge, in cross-sectional or hospital based study from this region, the study therefore provides useful preliminary information about caries prevalence and severity in adult dental patients from Al-Ahsa region. The results indicate a very high caries experience in the study population. This information will help in dental health care planning for the adult population.

The present study has shown a high caries prevalence when compared to studies from other countries.^{3,4,8,9,12} This study, which was first of its kind in Al-Ahsa region, showed even higher mean DMFT scores when compared to other Saudi studies.^{13,14} However, such a high caries prevalence could be attributed to the nature of sample, which consisted of patients attending a dental center. The mean DMFT scores of this study are quite

Table 4. Number and percentage of edentulous patients in relation to gender and area of residence

		≤ 40 years	41 – 50 years ¹	51 – 60 years	≥ 61 years	Total ²
		n (%)	n (%)	n (%)	n (%)	n (%)
Gender	Male	0 (0.0)	9 (20.5)	16 (32.7)	34 (61.8)	59 (25.7)
	Female	0 (0.0)	6 (15.4)	14 (27.5)	12 (46.2)	32 (10.2)
	<i>P</i> value		0.549	0.570	0.184	< 0.0001
Area	Urban	0 (0.0)	14 (22.2)	25 (40.3)	42 (60.9)	81 (21.3)
	Rural	0 (0.0)	1 (5.0)	5 (13.2)	4 (33.3)	10 (6.1)
	<i>P</i> value		0.081	0.004	0.076	< 0.0001
Total		0 (0.0)	15 (18.1)	30 (30.0)	46 (56.8)	91 (16.7)

¹ Percentages are within the age group, e.g. 20.5% of males of 41-50 years old were edentulous.

² Percentages are within the demographic factor; e.g. 25.7% of the males were edentulous.

close to the scores reported in the study carried out in Riyadh¹⁵, which had the same setup as the present study.

The study showed that the mean DMFT score in males was not significantly different from that of females, if the confounding effect of age were taken out, which is in agreement with the previous studies.^{14,15} The missing teeth component was the main cause for the higher DMFT value in males. However, when the confounding effect of age were taken out, there was no significant difference between the genders.

The result showed the influence of area of residence on caries prevalence of a person. Adults living in urban areas were more likely to have experienced dental caries and become edentulous. Several other studies have reported higher DMFT value for urban patients.¹³⁻¹⁵ However, the result of this study of more edentulous patients in urban areas than rural areas do not agree with earlier Saudi as well as United States data.^{14,19} In fact, Al-Shammery *et al.*¹⁴ showed that there was no significant difference between male/female and urban/rural individuals in relation to the presence of permanent teeth in older age groups. The different finding in this study could be due to recent changes in the dietary habits in urban areas, resulting in more caries and periodontal diseases and consequently more tooth loss. The mean filled teeth components for urban and rural adults were not significantly different, indicating comparable services in both areas.

The progression of DMFT with increasing age is a universal fact. However, this study showed a very high mean missing teeth for the patients aged 51 years or above which is very different when compared to all other studies. Again, such a high figure could be due to the convenient nature of the study sample, i.e. patients attending a dental center. Only few patients who visited the dental

center were free of caries experience and majority of them was less than 30 years of age. However, the caries prevalence was the same in male/female and urban/rural patients, indicating a homogeneous nature of sample in relation to gender and area of residence.

One-sixth of the patients who visited the dental center during the study period were edentulous. The Al-Ahsa Dental Center is a tertiary care institution, and patients are referred here for advanced treatment such as full dentures. Hence, a large number of edentulous patients were seen in the sample.

CONCLUSION

In conclusion, the caries prevalence and severity in adult patients attending Al-Ahsa Dental Center was very high. The need for oral health care is evident in all the age groups. However, it will be unrealistic to try to control oral diseases by traditional curative methods only. Continuous efforts are required to implement community-based public awareness and preventive programs. For long term planning, the problem needs to be controlled at the school level. If public awareness is continuously reinforced, it is expected that the present trends could be reversed as has happened in developed countries.

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