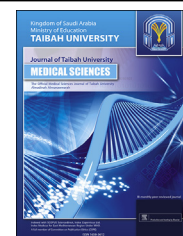




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Original Article

Can the prevalence of dental caries be used as an indicator of the quality of dental services? A cross-sectional study among children in Almadinah Almunawwarah, KSA



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الملخص

أهداف البحث: تقرير عن حالة تسوس الأسنان والاستفادة من خدمات طب الأسنان للأطفال من سن ٦ إلى ١٢ عاما.

طرق البحث: أجريت هذه الدراسة التحليلية المقطعية في أربع مدارس ابتدائية في الفترة من يناير إلى مارس ٢٠١٣. تم جمع البيانات الكمية والنوعية باستخدام استبانة بالإضافة إلى فحص الفم السريري. تم تسجيل حالة التسوس خلال فحص الفم السريري باستخدام مؤشرات التدهور، والفقد، و المحشو؛ ومؤشر المتدهور والمفقود والمحشو.

النتائج: من العدد الإجمالي ل ٣٨٤ طالبا، استجاب ٣٣٠ (معدل الاستجابة ٨٦٪). كان ثلثا المشاركين (٦٥٪) من الإناث، وكان لديهم تسوس الأسنان أكثر بكثير في كل من الأسنان اللبنية والدائمة مقارنة بالذكور. كان متوسط مؤشر التدهور والمفقود والمحشو للأطفال ٦-١٢ عاما ٤.٩ و ٣.١ على التوالي. وبلغ معدل انتشار تسوس الأسنان بين الأطفال في عمر ٦ أعوام ٨٦٪ وللأطفال في عمر ١٢ عاما ٦٨٪. أفاد جميع المستجيبين باستخدام فرشاة الأسنان بينما أفاد ٢٠٪ بزيارة طبيب الأسنان بانتظام. كان معدل انتشار تسوس الأسنان لأولئك الذين لم يقوموا بزيارة طبيب الأسنان بانتظام ٧٨٪، وذكروا أن "الخوف" (٢٩٪)، وأيضا "لا يوجد سبب لزيارة طبيب الأسنان" (٢٠٪) من أسباب عدم زيارتهم لطبيب الأسنان. من بين من قاموا مؤخرا بزيارة طبيب الأسنان، تم تشخيص ٦٩٪ منهم بالتسوس وكانت طرق العلاج الأكثر شيوعا أخذ الدواء (٥٠٪) والتعليمات عن نظافة الفم (١٩٪).

الاستنتاجات: معدل انتشار تسوس الأسنان في هذه الفئة من الأطفال مماثلة لدراسات سابقة أجريت في المملكة العربية السعودية. وما زالت الاستفادة من خدمات طب الأسنان منخفضة إلى حد ما، وهؤلاء الأطفال الذين راجعوا عيادات الأسنان تلقوا الخدمات الوقائية.

الكلمات المفتاحية: تسوس الأسنان؛ جودة الخدمات؛ انماط الاستخدام؛ ممارسات نظافة الفم

Objectives: To report on the caries status and utilization of dental services of 6- and 12- year-old children.

Methods: This cross-sectional analytical study was conducted in four primary schools during January through March 2013. Quantitative and qualitative data were collected by using an interview-based questionnaire and a clinical oral examination. Clinical oral examination recorded caries status using the decayed (D/d), missing (M/m) and filled (F/f) index; Decayed, Missing and Filled Index (DMFT).

Results: Of a total of 384 students, 330 responded (response rate of 86%). Two thirds (65%) of participants were females and they had significantly more caries ($p < 0.05$) in both primary and permanent dentitions as compared to males. The mean DMFT for 6-year-old and 12-year-old children were 4.9 and 1.3, respectively. The prevalence of caries amongst 6-year-old children was reported to be 86% and that for 12-year-old was 68%. All respondents reported using a toothbrush and 20% claimed to visit a dentist regularly. Those who did not

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regularly visit a dentist had 78% prevalence of caries and they suggested “fear” (29%) and “no reason to visit a dentist” (20%) as reasons for not visiting a dentist. Of those who recently visited dentists, 69% were diagnosed with caries and the most common treatment modalities received were medication (50%) and oral hygiene instructions (19%).

Conclusion: The prevalence of dental caries in this cohort of children was similar to that of earlier studies done in the KSA. The utilization of dental services remained fairly low and those children who did attend dental clinics primarily received preventive services.

Keywords: Dental caries; Oral hygiene practices; Quality of services; Utilization patterns

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Introduction

There is a strong drive in most countries, including KSA, to evaluate and improve the quality of health services. As in other countries, oral health has often been ignored in KSA, and as a result, there have been gaps in the provision of dental services, as reflected by the high caries levels and low utilization of dental services.^{1,2} This has been confirmed by the low prevalence of filled and missing teeth reported in studies over the past few years.^{1,2}

Research suggests that educating families on their children’s oral health and the importance of accessing dental services could facilitate broader improvement in children’s dental status.^{3,4} Studies have reported that some prophylactic treatment such as dental sealants could have a positive impact on both the health outcomes and the costs of later treatment.^{4,5} This could reduce the burden of disease and allow for more preventive rather than curative services.

Dental care should be a homeostatic balance between preventive and curative care.⁴ Preventive care includes oral health education, cleaning of teeth and placement of dental sealants and is aimed at preventing dental problems. Curative care involves reparation of the problems caused by tooth decay and periodontal disease.⁴ There is a need to clearly determine how to measure the quality of care that is delivered to children. There is limited data on the success of using standardized measures to assess the quality of dental care. This will be the first study in Almadinah Almunawwarah to utilize a questionnaire to try to determine the quality and type of dental services.

Dental caries is one of the most common dental disorders affecting millions globally.^{6,7} It is a major cause of tooth loss worldwide, especially among children.⁸ Many factors are responsible for dental caries, including diet, oral hygiene practice, dental service access and individual socioeconomic status.⁴ These factors, in combination with a high sucrose

diet amongst the youth in KSA,⁹ make the provision of adequate dental services a large challenge.

Almadinah Almunawwarah, a city in the KSA has an estimated population of 1 million people. The number of young children is estimated to be approximately 35% of the population, and the prevalence of dental caries amongst these children is reasonably high. Al-Malik et al. (2006)⁹ reported high caries levels amongst 6- and 7-year-olds and concluded that there was a need for an effective prevention program in primary schools. This was confirmed by another study performed in Almadinah Almunawwarah that also reported relatively high levels of caries.¹⁰ The authors concluded that there was a need for school preventive measures and recommended school dental health education programs for children and their parents in order to improve their oral health. The epidemiological data on caries levels in various regions of KSA indicate a low to moderate caries experience with apparent social variations.⁷

This study is considered to be the first study in KSA that has reported on both the prevalence of dental caries and the quality of dental services provided by dental health providers.

The aim of the study was to report on the caries status and dental service utilization of 6- and 12-year-old children in Almadinah Almunawwarah.

Materials and Methods

This was a cross-sectional analytical study conducted on 6- and 12-year-old school children registered in Almadinah Almunawwarah, KSA, in 2012. A list of primary schools was obtained from the Ministry of Education. Four schools (10%) were randomly selected, and of these, two were male schools and two were female schools. Among the schools, two were private and two were government schools.

The rationale for the study was explained to the principals of each of the selected schools. They were informed about the importance and the reasons for the study, and consent forms were given to the principal. The parents were given the consent forms, a questionnaire and a cover letter explaining the rationale and objectives of the study. Only children with signed consent forms were examined. All information was confidential, and no names were recorded on the data sheets.

Data were collected by two means: a questionnaire and a clinical examination. The questionnaire consisted of both quantitative and qualitative data regarding oral hygiene practice, frequency of visits to dental clinics and preventive advice provided by oral health staff to the children. It was given to the 6-year-old children together with the consent forms and was completed by the parent or guardian. For the 12-year-old children, the questionnaire was self-administered on the day of the clinical examinations. If the children had problems completing the questionnaire, dentists were available to assist them. The questionnaire was in Arabic and consisted of a combination of 15 open- and closed-ended questions. The questionnaire was developed from questionnaires used in other similar studies and was piloted in a group of children prior to the study.¹¹

The clinical oral examinations were carried out in the schools’ medical treatment rooms. These examinations were

Table 1: Mean caries indices according to gender and age.

Age	Gender	d (\pm SD)	m (\pm SD)	f (\pm SD)	Mean	D (\pm SD)	M (\pm SD)	F (\pm SD)	Mean
6 yrs	Males	3.26 (3.57)	0.11 (0.41)	0.26 (0.79)	3.63	0.02 (0.13)	0.0	0.0	0.02
	Females	5.17* (4.21)	0.20 (0.62)	0.18 (0.73)	5.55	0.10 (0.41)	0.0	0.0	0.10
	Combined (n = 171)	4.48 (4.09)	0.17 (0.55)	0.21 (0.75)	4.86	0.70 (0.34)	0.0	0.0	0.7
12 yrs	Males	0.65 (1.14)	0.09 (0.39)	0.40 (0.92)	1.14	0.40 (0.92)	0.02 (0.13)	0.25 (0.76)	0.67
	Females	1.33* (2.7)	0.11 (0.38)	0.14 (0.97)	1.58	1.23 (1.75)	0.07 (0.33)	0.43 (1.54)	1.73
	Combined (n = 145)	1.06 (2.26)	0.10 (0.39)	0.24 (0.94)	1.4	0.90 (1.5)	0.05 (0.27)	0.36 (1.28)	1.31

*Statistically significant ($p < 0.05$) using the independent samples T-test.

performed under florescent lighting with the children seated on a regular chair; the operator used a mirror and a round-ended probe according to the World Health Organization criteria (1997).¹² The prevalence of dental caries was recorded using the decayed, missing and filled Index (dmft) and the Decayed, Missing and Filled Index (DMFT) for primary and permanent dentitions, respectively. Four calibrated examiners (two males and two females) performed all of the clinical examinations. Inter- and intra-examiner variability was measured by re-examining every 10th patient. The inter- and intra-examiner reliability was 95%.

The data were analysed using the SPSS version 15 software package. The descriptive analysis included means and standard deviations, and the statistical significance was set at $p < 0.05$.

Results

A total of 385 students were given consent forms and questionnaires. Of these, 330 (86%) students responded to the questionnaires, but 14 students did not provide consent for the dental examination. Hence, a total of 316 students were examined, but when reporting on knowledge and practices, a sample of 330 was included. There were no significant differences in the knowledge or caries prevalence; thus, they were combined for ease of analysis.

Two-thirds of the sample (65%) were female. The 6- and 12-yr-old females had a significantly ($p < 0.05$) higher level of decay in their primary and permanent dentition compared to the males (Table 1).

Table 2 shows the association between gender and the presence or absence of caries. The majority of 6- and 12-year-old females had caries (91% and 74%, respectively), while amongst the males, 77% of 6-year-olds had caries. The

overall dental caries prevalence amongst the 6-year-olds was 86%, and that of the 12-year-olds was 68%.

Of the 330 who completed the questionnaire, all of them (100%) reported using a toothbrush either alone or with a tooth stick. Of the 325 students who completed the question regarding regular visits to the dentist, 64 (20%) students answered that they visit a dentist regularly. Of those who did not visit a dentist regularly, the most common reasons cited were fear (29%), no reason to visit the dentist (20%) and inaccessibility (4%). Those who reported being afraid of the dentist ($p = .02$) and those who felt they had no reason to visit the dentist ($p = .007$) had significantly more caries compared to the rest of the sample. Of those who had visited a dentist during the last three months, the majority received medication and oral hygiene instructions (Table 3). There were no significant differences between genders or types of treatment received and caries prevalence.

There were no significant differences between the children who attended the government and private schools in terms of dental visits. However, a highly significant number of government school children ($p < .001$) reported that the cost of dental treatment was a barrier for them when wanting to visit the dentist compared to private school children.

Of those who reported visiting a dentist regularly, 69% were diagnosed with dental caries. This proportion was lower than the 78% of children who presented with caries and who did not visit the dentist on a regular basis.

Discussion

This was the first study conducted to compare the caries and the utilization rates in Almadinah Almunawwarah. The response rate of 86% was acceptable, and many of those who did not provide consent were either absent on the day of examination or had forgotten to let their parents sign the form.

Table 2: Prevalence of dental caries for males and females in 6- and 12-year-olds.

Age	Gender	Caries (dmft \pm DMFT)	No caries	Total
6 yrs	Males (n = 62)	48 (77.4%)*	14 (22.6%)	62 (100%)
	Females (n = 109)	99 (90.8%)*	10 (9.2%)	109 (100%)
	Combined	147 (86.0%)	24 (13.0%)	171 (100%)
12 yrs	Males (n = 57)	33 (57.9%)	24 (42.1%)	57 (100%)
	Females (n = 88)	65 (73.9%)*	23 (26.1%)	88 (100%)
	Combined	98 (67.6%)	47 (32.4%)	145 (100%)
Total population		245 (77.5%)	71 (22.5%)	316 (100%)

*Statistically significant ($p < 0.05$) using the Chi-square test.

Table 3: Breakdown of dental services received by patients according to age as reported by the parent/patient (n = 325).

Age	Scaling/Polishing n (%)	Restorations n (%)	Extractions n (%)	Oral hygiene instruction n (%)	Medication n (%)	Others n (%)
6yrs (n = 178)	15	8	6	28	112	20
12 yrs (n = 147)	23	7	9	41	69	21
Total	38 (11%)	15 (4%)	15 (4%)	69 (19%)	181 (50%)	41 (12%)

The mean dmft of the 6-year-olds was relatively high (4.9) but was not as high as the value of 6.4 reported by Al-Tamimi et al. (1998)¹³ for 6-year-old children in Almadinah Almunawwarah. A possible reason for this discrepancy could have been the fact that the previous study was performed more than 10 years ago and the KSA has developed considerably since then. Another study conducted in 2010 by Al-Dossari et al.¹⁴ reported a mean dmft of 2.7 for the same age group. This study was performed in 11 regions of KSA and showed that the mean dmft has been steadily decreasing over the past 10–15 years in KSA. A possible reason for the low dmft score reported could be a result of the fact that the authors combined the dmft score for the 6- and 12-year-olds, which could have skewed the results and resulted in a lower caries prevalence amongst the primary dentition. This is supported by the high prevalence of individuals with caries, which was between 74% and 90% in the primary dentition.

The DMFT scores for the 12-year-old children were lower than those reported by a review conducted by Al Ansari (2014).¹⁴ This could be a result of the changing levels of knowledge and the improved quality of oral hygiene practices. This is reflected in the results of the questionnaire that showed that 100% of respondents were using a toothbrush or a tooth stick daily. This is much higher than that reported by Otaibi et al. in 2003³ and reflects the improvement in oral hygiene in KSA. The tooth stick has been used as a mechanical cleaning device in the Middle East for centuries and is derived from the bark of certain trees.

Although the schools were selected randomly, the actual number of children at each school was not known. The female schools had more children compared to the male schools; thus, there were more females than males. In addition, many male students were absent on the examination days, and some did not provide informed consent. The females had a higher prevalence of dental caries compared to the males; this result was similar to other studies.¹⁴ This could be the result of diet habits, oral hygiene practices, early eruption of teeth or fear of the dentist.

All of the children reported using toothbrushes to clean their teeth and most of them brushed twice daily.

The bulk of the mean dmft/DMFT scores were a result of the d/D component, which stresses the fact that many of these children were not receiving dental care. This was similar to other studies conducted in the KSA.^{1,2} This is confirmed by the low m/M and f/F scores, which highlight the need for further education and oral health promotion. Lack of utilization of dental services was attributed to fear and lack of knowledge.

Of those who attended a dentist, the majority received medication, followed by oral hygiene instructions. This indicated that the majority received preventive services even

though our results showed that this sample actually required more restorative services. The possible reasons for this could be that when the children visited a dentist, the caries was so severe that they required medication prior to treatment. Another reason could be that some dentists were reluctant to treat young children and thus medicated and referred them to other practices, as confirmed by Krikken et al. (2012).¹⁵ Many patients visit a dentist because of pain; once the pain subsides as a result of the medication, the patient does not go back for follow-up treatment. The fact that so few of the children received dental restorations and extractions could be because of the fear of a dentist, the cost of treatment or lack of knowledge regarding treatment options. Many dentists provided oral hygiene instructions; this was a positive result and hopefully will improve the quality of oral hygiene practices and reduce future dental caries.

An interesting finding was the high number of governmental school children who felt that the cost of dental visits was a strong reason for them to not visit the dentist. This implies that these children thought of going to a dentist but were either told that they cannot afford it or had a preconception that dental treatment was expensive.

Conclusion

The mean dmft/DMFT scores were similar to those of earlier studies performed in KSA and confirm the trend that the prevalence of dental caries has been decreasing steadily over the past 10–15 years. However, females generally had significantly higher levels of caries compared to males. Most of the children did not visit a dentist regularly, and dental fear was the most common reason cited for this. Those who visited a dentist reported to have received mostly preventive services rather than the required restorative services.

Limitations

Because of limited time constraints, all confounders could not be included in the study, and as a result, future studies are being planned to examine these effects.

Recommendations

To improve the quality of dental services in Almadinah Almunawwarah, a multi-sectorial approach is required. Children from 4 to 5 years of age should be screened for dental conditions and educated about dental diseases. This could ensure that children with a high risk for dental caries and those with existing dental caries can be promptly referred and appropriately treated.

School programs and outreach activities need to be implemented by dental schools and dentists in the Ministry

of Health; these programs must be measurable, sustainable and effective.

Further studies to determine the current needs in terms of manpower and resources required to treat this unmet burden of disease are currently being carried out. It is hoped that this will provide a practical and relevant solution for the government and the citizens and will ensure quality dental services that are appropriate to the children of Almadinah Almunawwarah.

Conflict of interest

The authors have no conflict of interest to declare.

Consent

All authors declare that written informed consent was obtained from the patients (or other approved parties) for publication of this case report and accompanying images.

Ethical approval

All authors hereby declare that all experiments have been examined and approved by the appropriate ethics committee and have therefore been performed in accordance with the ethical standards put forth in the 1964 Declaration of Helsinki.

Authors' contributions

MSM and MSA conceptualized the study and wrote the proposal. TH designed the study. TH, AB, and HB collected the data and wrote the methods. AB and TH completed the statistics. HB and MSA completed the discussion and conclusion. MSM completed the literature review. All the authors read and approved the final manuscript.

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