

Impact of Dental Visits on Oral Health Awareness in Saudi Arabia

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ABSTRACT

Aim: The aim of this study is to assess the impact of dental visits on oral health awareness among the Saudi population.

Materials and methods: A cross-sectional survey was conducted in Saudi Arabia. An online self-administered questionnaire was distributed from January 2011 to June 2013. The questionnaire consisted of 21 multiple choice questions which was categorized into four: demographic data, dental care status, oral hygiene behavior, and oral health knowledge (OHK). Responses to the questions in the OHK category were grouped and scored according to their percentage of correct answers: 1 = very poor (0 to <25% correct), 2 = poor (25% to <50% correct), 3 = acceptable (50 to <75% correct), and 4 = good (75–100% correct). The sample was divided based on dental visit behavior into poor, average, and good dental visitors. Descriptive statistics, group comparisons, correlations, and linear regressions were conducted using SPSS (V16.0). A significance was set at $p < 0.05$.

Results: A total of 845 participants were included: 73.4% were females, 85.1% were older than 19 years, 76.9% had a college-level education, and 75.3% were from western Saudi Arabia. A total of 14.1% were poor dental visitors, 67.5% were average dental visitors, and 18.5% were good dental visitors. The good dental visitor group showed significantly better results than the other two groups in terms of dental services received, brushing habits, interdental cleansing habits, use of miswak, and OHK ($p < 0.05$). The best predictors with significant but weak effects on dental visit habits were brushing habits, interdental cleansing habits, use of miswak, and OHK ($F(8,836) = 7.212, R^2 = 0.065, p < 0.0001$).

Conclusion: Dental visits were significantly correlated with OHK. However, the impact of dental visits on oral health awareness was found to be weak.

Clinical significance: Well-designed preventive and educational dental visit programs need to be widely implemented as part of the governmental oral health plans.

Keywords: Dental care, Dental visits, Oral health knowledge.

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INTRODUCTION

Dental disease is a major health problem in many countries, because of impairment of function affecting the quality of life and general health. Dental disease is also becoming a major health problem in terms of high cost and the demand for governmental services.¹ Dental care and regular dental visits were claimed to be an effective strategy for disease prevention.^{2,3} Patients' and parents' awareness of oral health issues was found to be a strong factor in significantly reducing the incidence of caries, especially in children.^{3,4} Such findings have caused many health organizations, including the World Health Organization (WHO) and the World Dental Federation (FDI), to heavily invest in collecting data and evidence about the effect and impact of dental care on oral health awareness. Such information is currently considered a cornerstone in planning community-based interventions and prevention strategies for populations.⁵⁻⁹

In Saudi Arabia, multiple studies have been conducted to assess the OHK and practices among the populations in different regions with parallel investment in oral health educational programs. In 2003, Almas et al.¹⁰ assessed 470 teachers in Riyadh City for their knowledge level and dental visit patterns, as such class of the society was thought to play an important role in the success of school-based educational programs. They found an unsatisfactory level of knowledge and oral health practices in both male and female teachers, with male teachers being more satisfied with their oral health than female teachers. They also found that only 32% of the female teachers and 28% of the male teachers regularly visited

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the dentist, while a higher percentage of participants tend to visit the dentist only when they experience pain. Less than half of the participants in their study reported adequate brushing habits.¹⁰ Al-Sadhan¹¹ also evaluated oral health practices and dietary habits among 1,150 intermediate schoolchildren in Riyadh City with unsatisfactory results. She found that nearly 65% of the students cleaned their teeth at least once a day and that only 5.1% used dental floss, with students in private schools reporting significantly

better oral hygiene practice than students in public schools. She also found that the mothers' educational level was directly related to children's oral hygiene habits.¹¹ Farsi et al.¹² further assessed oral health attitudes and knowledge among 2,586 Saudi students aged 12–18 years from middle school and high school in Jeddah, Saudi Arabia, and highlighted a low level of knowledge, particularly related to periodontal disease. The researchers reported that only 33.1% of the participants knew that using dental floss helps prevent periodontal disease. They also noticed that dental pain was the main reason for visiting the dentist among students.¹² Amin and Al-Abad¹⁰ assessed oral hygiene practices, dental knowledge, dietary habits, and their relation to caries among 1,115 male primary school children in Al Hassa City in Saudi Arabia using the WHO diagnostic criteria for oral health surveys with unsatisfactory results in all aspects assessed.¹³ They also found that 29% of the children who participated in their study never received oral hygiene instructions.¹³ Abdullah et al.¹⁴ also reported that 51.8% of all age subgroups in his study did not know the effect of fluoride on dental caries and that the main reason for visiting a dentist was for extraction (30.5%) followed by pain relief (28.9%).¹⁴ All of the aforementioned studies reported unsatisfactory oral health status, oral hygiene practice, OHK level, and dental visit patterns among the Saudi population.^{10–15}

In support of the many studies that assessed oral hygiene status and knowledge of oral health in different regions of Saudi Arabia, some studies assessed the prevalence of dental caries and gum diseases among the Saudi population. Two systematic reviews conducted by Al-Agili¹⁶ and Khan et al.¹⁷ concluded that the prevalence of caries among the Saudi population is considered high, ranging from 60 to 80% in children and adults, with decayed-missing-filled teeth (DMFT) index scores ranging from 3.5 to 5.0. Such estimates indicate that the 2000 WHO goals are still unmet in Saudi Arabian children, which reflects a serious need for oral health awareness and preventive guidance protocols and measures.^{16,17}

Despite a large number of studies assessing oral health in Saudi Arabia, limited studies have focused on assessing the relationship between dental visits, as a preventive guidance measure, and oral health awareness. The objective of this study is to assess the impact of dental visits on oral health awareness in Saudi Arabia. The findings of this study will help policy makers, dental educators, and practice managers better understand the current status of dental visit preventive protocols, upon which further strategic and educational planning for oral health awareness and prevention programs can be developed in Saudi Arabia.¹⁶

MATERIALS AND METHODS

A cross-sectional survey was conducted in Saudi Arabia to assess the relationship between dental visits and oral health awareness status among the Saudi population. A structured questionnaire was designed based on a thorough review of the literature. The questionnaire was written in the Arabic language and distributed using an online self-administered method with an attempt to include individuals from different regions of Saudi Arabia. The period of data collection extended from January 2011 to June 2013. Ethical approval was obtained from the Research Ethics Committee of the Faculty of Dentistry at King Abdulaziz University, Jeddah, Saudi Arabia.

Based on previous studies and power of test, the sample size was calculated to be $n = 800$. Responses with incomplete answers were excluded.

The questionnaire consisted of 21 multiple choice questions designed to assess "oral health awareness." The questions were

designed to include four main categories: (a) demographic data, (b) dental care status, (c) oral hygiene behavior, and (d) OHK. Oral health awareness was assessed by two categories: oral hygiene behavior and OHK.

The demographic data included age, gender, place of residence (region), and educational level. Dental care status was assessed by two questions: dental visit behavior and dental service status. The oral hygiene behavior section had seven questions that were designed to assess the habits and use of different brushing and dental cleansing aids, including toothbrushes, dental floss, toothpicks, and miswak. The OHK section had 12 questions that were designed to assess the knowledge level with regard to understanding dental caries as a disease, different dietary habits and their effects on oral health, oral hygiene maintenance strategies, and the general treatment needs for managing decayed teeth.

To indicate the overall OHK level, responses to the OHK questions were grouped and scored based on the percentages of correct answers as follows:

- 1 = very poor (when the respondents answered 0 to <25% of the OHK questions correctly).
- 2 = poor (when the respondents answered 25 to <50% of the OHK questions correctly).
- 3 = acceptable (when the respondent answered 50 to <75% of the OHK questions correctly).
- 4 = good (when the respondents answered 75–100% of the OHK questions correctly).

For the objective of this study, the sample was divided into three main groups based on dental visit behavior. The groups were defined as follows: (1) poor dental visitors (including the respondents that reported, "I never visited a dentist"), (2) average dental visitors (for the respondents that reported, "I visit a dentist only when I have pain"), and (3) good dental visitors (for the respondents that reported, "I visit my dentist every 6 months").

Descriptive statistics were used to report the different categories assessed in the three groups. A Chi-square test was conducted to test for differences in demographic distribution between the studied groups. Data were then analyzed for mean comparisons between the studied groups using multivariate analysis of variance (MANOVA), followed by univariate ANOVA and *post hoc* Bonferroni tests for the three categories: dental care status, oral hygiene behavior, and OHK. Correlations and multiple stepwise regression analysis were further conducted to assess the association with and effect of dental visits on the variables used to assess oral health awareness in the current study. Normality was assumed using Levene's test for homogeneity of variance. The significance level was set at $p < 0.05$. Data were processed and analyzed using Excel (Microsoft Excel, Version 2013) and SPSS version 16.0.

RESULTS

A total of 900 participants responded in the given time. However, the response of only 845 participants was complete and, thus, included in this study. Females accounted for approximately three-quarters of the sample (73.4%), and most respondents were older than 19 years old (85.1%). The majority of the respondents had attained at least a college-level education (76.9%) and were mostly from the western region of Saudi Arabia (75.3%).

Approximately half of the respondents (67.5%) reported visiting a dentist only in cases of pain (average visitors). Less than one-fifth of the participants (14.1%) were poor visitors, while approximately one-fifth (18.5%) reported attending dental visits every 6 months

Table 1: Demographic characteristics of the respondents (frequency and percentages) among the three studied groups

Variables	Dental visit behavior				p value
	Poor n = 119 (14.1%)	Average n = 570 (67.5%)	Good n = 156 (18.5%)	Total n = 845 (100%)	
Age (in years)					
<19	25 (21%)	86 (15.1%)	15 (9.6%)	126 (14.9%)	0.031**
≥19	94 (79%)	484 (84.9%)	141 (90.4%)	719 (85.1%)	
Gender					
Male	45 (37.8%)	132 (23.2%)	48 (30.8%)	225 (26.6%)	0.002*
Female	74 (62.2%)	438 (76.8%)	108 (69.2%)	620 (73.4%)	
Region					
North	2 (1.7%)	18 (3.2%)	1 (0.6%)	21 (2.5%)	0.085
South	0	8 (1.4%)	2 (1.3%)	10 (1.2%)	
Central	24 (20.2%)	82 (14.4%)	27 (17.3%)	133 (15.7%)	
East	10 (8.4%)	23 (4.0%)	12 (7.7%)	45 (5.3%)	
West	83 (69.7%)	439 (77.0%)	114 (73.1%)	636 (75.3%)	
Level of education					
Secondary school	5 (4.2%)	20 (3.5%)	3 (1.9%)	28 (3.3%)	0.060
High school	29 (24.4%)	109 (19.1%)	17 (10.9%)	155 (18.3%)	
College and above	83 (69.7%)	432 (75.8%)	135 (86.5%)	650 (76.9%)	
Others	2 (1.7%)	9 (1.6%)	1 (0.6%)	12 (1.4%)	

Significant using the Chi-square test at the * $p < 0.05$ and ** $p < 0.01$ levels

(good visitors). The results further indicated a significant difference between the groups in age ($p < 0.05$) and gender distribution ($p < 0.01$) (Table 1).

A statistically significant difference was found using MANOVA, followed by one-way ANOVA and *post hoc* Bonferroni tests to determine the differences in the means of the studied groups (Table 2). Dental service status: only 44% of all respondents received complete dental services. However, the good and average dental visitors received a significantly better quality of dental services than the poor visitors ($p < 0.001$). Brushing habits: approximately 60% of the respondents reported brushing their teeth more than once daily. The good dental visitors reported significantly better brushing habits than the poor and average dental visitors ($p < 0.001$). Interdental cleansing habits: although the participants' interdental cleansing habits were poor (22.8% performed it once or more daily), the good visitors reported significantly better results, with 44% using interdental cleansing aids once or more daily ($p < 0.001$). Types of toothbrushes used: a total of 88% of the respondents used regular toothbrushes, with no significant difference between the groups ($p > 0.05$). Other dental cleansing aids: the use of dental floss, toothpicks, and miswak was very poor among all respondents: only 17% used dental floss, 6% used toothpicks, and 12% used miswak once a day or more. However, a significant difference was reported between the groups only for using miswak ($p < 0.001$), as the good dental visitors reported slightly higher percentages of use than the other two groups. Toothbrush care awareness: in total, 89% of the respondents were aware of the need to change their toothbrush every 2–3 months, with no significant difference between the groups ($p > 0.05$). OHK level: almost half of the respondents (53%) showed an acceptable OHK level: 50 to <75% of their answers regarding OHK were correct. However, the good dental visitors had significantly better knowledge levels than the poor and average dental visitors ($p < 0.01$).

The Pearson correlation was further conducted to assess the correlation between dental visits and oral health awareness.

The results indicated a significantly high correlation between dental visits and brushing habits and interdental cleansing habits ($p < 0.001$). A significant moderate correlation was also found with the use of miswak and OHK level ($p < 0.01$). A significant but low correlation was also reported with the type of toothbrushes used ($p < 0.05$). Conversely, no significant correlation was found between dental visits and the following factors: the use of dental floss, the use of toothpicks, and toothbrush care awareness ($p > 0.05$) (Table 3).

The effect of dental visits on oral health awareness was assessed by regression analysis. Based on dental visits, the results indicated that only 6.5% of the dental visit results were affected by the variables correlated with dental visit behavior. Thus, the results indicated that the current dental visit status had a significant but weak effect on the different measures used to assess oral health awareness ($F(8,836) = 7.212, R^2 = 0.065, p < 0.0001$). Furthermore, the results indicated the following best model with the best predictive ability for dental visits:

$$y = 1.503 + 0.120 (\text{interdental cleansing habits}) + 0.091 (\text{brushing habits}) + 0.129 (\text{the use of miswak}) - 0.070 (\text{OHK})$$

DISCUSSION

The findings of the current study showed multiple figures that highlight the unsatisfactory level of dental care status in Saudi Arabia. Only one-fifth of the respondents in this study reported that they visited a dentist every 6 months and were considered good visitors, while 67% visited a dentist only when they experienced pain (average visitors). This finding is in agreement with the findings of Abdullah et al.¹⁴ and Ahmad et al.¹⁸ who reported that most people tend to visit a dentist only when they experience pain. Furthermore, only 44% of the participants received complete dental services. Ahmad et al.¹⁸ also found that the most common types of dental treatment provided in Saudi Arabia were restorations (35%), scaling and polishing (21%), and extractions (18%) with no comprehensive or preventive treatment. He also reported that a small number of

Table 2: Frequency and percentage of respondents (within each dental visit group) regarding the variables used to assess the three categories

Variables	Dental visit behavior				p value
	Poor n = 119	Average n = 570	Good n = 156	Total n = 845	
Dental service status					
No dental service	50 (42.0%)	23 (4.0%)	15 (9.6%)	88 (10.4%)	0.0005***
Limited dental service	24 (20.2%)	311 (54.6%)	49 (31.4%)	384 (45.4%)	
Complete dental service	45 (37.8%)	236 (41.4%)	92 (59.0%)	373 (44.1%)	
Significant difference	a	b	b		
Oral hygiene behavior					
Brushing habits					
Never brush	2 (1.7%)	10 (1.8%)	5 (3.2%)	17 (2%)	0.0005***
Rarely brush	17 (14.3%)	72 (12.6%)	5 (3.2%)	94 (11.1%)	
Once daily	47 (39.5%)	160 (28.1%)	33 (21.2%)	240 (28.4%)	
More than once daily	53 (44.5%)	328 (57.5%)	113 (72.4%)	494 (58.5%)	
Significant difference	a	a	b		
Interdental cleansing habits					
Never clean	31 (26.1%)	96 (16.8%)	18 (11.5%)	145 (17.2%)	0.0005***
Rarely clean	71 (59.7%)	367 (64.4%)	69 (44.2%)	507 (60%)	
Once daily	9 (7.6%)	70 (12.3%)	57 (36.5%)	136 (16.1%)	
More than once daily	8 (6.7%)	37 (6.5%)	12 (7.7%)	57 (6.7%)	
Significant difference	a	a	b		
Types of tooth brushes used					
Regular tooth brush	106 (89.1%)	512 (89.8%)	128 (82.1%)	746 (88.3%)	0.066
Sophisticated or specialized toothbrush	13 (10.9%)	54 (9.5%)	28 (17.9%)	95 (11.2%)	
Others	0	4 (0.7%)	0	4 (0.5%)	
Other dental cleansing aids					
Dental floss (once a day or more)	25 (21.0%)	94 (16.5%)	31 (19.9%)	150 (17.8%)	0.868
Dental toothpicks (once a day or more)	6 (5.0%)	41 (7.2%)	4 (2.6%)	51 (6%)	0.828
Miswak (once a week or more)	13 (10.9%)a	63 (11.1%)a	31 (19.9%)b	107 (12.7%)	0.005**
Toothbrush care awareness					
Aware (changes the brush every 2–3 months)	108 (90.8%)	510 (89.5%)	137 (87.8%)	755 (89.3%)	0.715
Not aware (change the brush only when lost)	11 (9.2%)	60 (10.5%)	19 (12.2%)	90 (10.7%)	
OHK					
OHK					
Very poor (0 to <25%)	0	8 (1.4%)	0	8 (0.94%)	0.019*
Poor (25 to <50%)	41 (34.5%)	195 (34.2%)	36 (23.1%)	272 (32.1%)	
Acceptable (50 to <75%)	63 (52.9%)	300 (52.6%)	85 (54.5%)	448 (53%)	
Good (75 to 100%)	15 (12.6%)	67 (11.8%)	35 (22.4%)	117 (13.8%)	
Significant difference	a	a	b		

Significant using the one-way ANOVA test at the * $p < 0.05$, ** $p < 0.01$, and *** $p < 0.001$ levels
 Estimates with different symbols are significantly different between groups (by Bonferroni *post hoc* criteria)

his studied population (13%) never visited a dentist.¹⁸ In support of this finding, 14% of our respondents also reported never visiting any dental clinics or seeing a dentist. Such findings indicate that the dental services in Saudi Arabia need to be expanded to cover all the population as well as to be comprehensive in planning.

The good dental visitors in the current study showed significantly better results in practicing oral hygiene habits than

the average and poor dental visitors. Although the OHK level was considered acceptable among all groups, it still requires a great deal of improvement. Furthermore, approximately 60% of the respondents reported good brushing habits (more than once daily); their awareness of tooth brushing was high, and 89% were aware of the need to change their toothbrush every 2–3 months. However, the interdental cleansing habits and the use of dental



Table 3: Results of Pearson's correlation coefficient analysis based on "Dental visits"

Predictors	Pearson correlation	p value
Brushing habits	0.136	0.0005***
Interdental cleaning habits	0.175	0.0005***
Types of toothbrushes used	0.064	0.032*
The use of dental floss	-0.005	0.440
The use of toothpicks	-0.021	0.270
The use of miswak	0.092	0.004**
Toothbrush care awareness	0.003	0.461
OHK	-0.091	0.004**

Significant using the Pearson correlation test at the * $p < 0.05$, ** $p < 0.01$, and *** $p < 0.001$ levels

floss, toothpicks, and miswak were found to be very poor among all groups, with only 22.8% of the participants showing proper interdental cleansing practice. Such findings indicate a lack of full oral health awareness among the Saudi population with better knowledge than attitude and practice. Similarly, Togoo et al.¹⁹ assessed OHK and practices among 9- to 12-year-old school children in a rural area in southern Saudi Arabia and found that the majority of students had an adequate level of knowledge on oral health but had poor oral hygiene practices.¹⁹

Dental visits in the current study were shown to have a significant correlation with brushing habits, interdental cleansing habits, the use of miswak, and the OHK level. However, the impact of dental visits on oral health awareness was found to be weak. Well-designed preventive dental visits are well documented by multiple studies in different countries and confirmed with a recent longitudinal study conducted by Thomson et al.²⁰ to have a significant impact on oral health status and be associated with a lower prevalence of caries.²⁰⁻²³ Thus, the current findings highlight the significant need to improve dental visit patterns in Saudi Arabia, as they seem not fully utilized as a preventive guidance measure.

The causes and factors behind the poor dental visit pattern need to be explored and understood. Ahmad et al.¹⁸ found that the most common reasons for not visiting dentists were high cost, followed by fear and lack of time. Togoo et al.¹⁹ also found that the insufficient awareness of parents of children's oral health care and inaccessible dental care clinics affect the pattern of children's dental visits. However, a lack of adequate oral health awareness and the importance of preventive dental measures might be other important factors that need investigation.

An initiative study was conducted by Togoo²⁴ in Saudi Arabia that investigated the potential and difficulties of implementing dental preventive measures in Saudi Arabia from the dentists' perspective. Despite the great potential and importance of such measures reported by most dentists, multiple challenges were discussed. Social factors were reported as the most challenging factors in implementing preventive dental programs in Saudi Arabia. Other challenges included inadequate workforce, lack of enough supportive dental auxiliaries, lack of cooperation from schools,²⁴ and lack of trained dental staff to motivate and empower patients and parents.^{3,16,19,20} Lack of access to oral healthcare, unaffordable dental care in many places, and the challenges of the growing and aging population were also of concern.⁵

Oral health has been considered a popular topic and a major health concern by the WHO since 2002. In its latest strategies, the WHO, as well as the FDI, put oral health in the forefront as a human

right and, thus, considered oral disease prevention to be an integral component of chronic disease prevention and general health promotion programs.^{5,25} Accordingly, oral health prevention and guidance programs are currently becoming a part of the global health strategy. Many attempts have started to implement such a strategy at a school-based, population-based, and dental work sector-based levels with reported successes in improving oral health status.²¹⁻²³

All findings regarding oral health status in Saudi Arabia highlight the urgent need for policymakers to make a wise decision with clear strategic planning for oral health promotion and guidance. Many challenges along with a strong body of evidence-based research and guidance need to be addressed and planned for carefully.¹⁹ All dental service sectors, including educational and nonacademic sectors, should contribute to a healthy environment that improves the daily living conditions of the population.^{5,25} Multiple models for implementing oral health promotion strategies have been proposed, such as the FDI model, which defined five areas of priority for implementing oral health promotion programs.⁵ The first area is meeting the increasing need and demand for oral health care in multiple ways, such as improving the oral health literacy of the public, optimizing the overall workforce planning, and providing adequate resources for education and training. The second area is expanding the role of existing oral healthcare professionals. This expansion can be achieved by oral healthcare professionals playing a leading role in patient education and disease prevention, as well as guiding and supervising teams of oral healthcare workers. Oral healthcare professionals can also play a role in screening and referring patients for other general health conditions. Others have also proposed the potential role of nondental providers in screening young children and referring those at high risk of dental caries to dental care at the appropriate time.²⁶ The third area is shaping a responsive educational model by putting a stronger focus on the dental curriculum on public health and epidemiology to train dentists to be competent in serving their community. The fourth area is mitigating the impacts of socioeconomic dynamics by emphasizing the importance of oral health awareness in all policies in an attempt to assure the sustainability of oral health care despite changes in economic status. Finally, the fifth area is fostering fundamental and translational research and technology to ensure the implementation of updated and evidence-based approaches to oral health care service.⁵ Saudi Arabia, as one of the largest and leading countries in the developing world, must take fast action to meet the demands of global health to survive in the competing world.

CONCLUSION

The results indicated that the dental visit pattern is unsatisfactory in Saudi Arabia and that OHK and practice need great improvement. In addition, the current dental visit status did not have a high impact on oral health awareness and is, thus, not fully utilized as a preventive measure in Saudi Arabia. Such findings call for urgent action from policymakers to incorporate oral health promotion programs into the human care and rights policies.

LIMITATIONS

The current study design is dependent on an online survey. Not all people have Internet access and are able to respond to online questionnaires. Missing interviewer or guidance in such

study designs might also be a limitation. It is also harder to draw probability samples based on website visits. Such limitations might lead to less reliable data and the generalizability of the results less assumable.

ETHICS APPROVAL AND INFORMED CONSENT

The study was approved by the institutional ethics committee and informed consent was obtained from every participant.

CONSENT FOR PUBLICATION

Consent was obtained from the study participants for publication.

DATA AVAILABILITY

Not applicable.

AUTHOR CONTRIBUTIONS

AIL designed the study, AMB prepared the questionnaires, AHQ collected the data from the study participants, and AHH analyzed the data and drafted the manuscript.

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