

Examining the relationship between oral health-promoting behavior and dental visits

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ABSTRACT

Objective: The objective of this study was to explore the relationship between a number of health-promoting behavior and dental visits.

Methods: A stratified sample from 16 primary schools in Riyadh was selected. A total of 1087 students aged 6–12 years were included in the study between October 2017 and January 2018. The World Health Organization (WHO) criteria for assessing dental caries were used to collect clinical data. Information on dental visits and health-promoting behaviors were collected through modified WHO questionnaire. An aggregate variable of eleven health-related behaviors was created. Logistic regression model was used to examine the relationship between regular dental visits and the aggregate health behavior variable accounting for age, sex, parental education, family income, and caries experience.

Results: Only 6.8% of the sample reported regular dental visits. The logistic regression showed that the aggregate variable of health-promoting behavior was significantly related to regular dental visits with odds ratio 1.23 (confidence interval 95% 1.10–1.39). Other variables significantly related to regular dental visits included sex (female), higher family income, and lower mean of caries experience.

Conclusion: Despite the availability of free dental services in Saudi Arabia, most of the dental visits are symptomatic. The observed association between health-promoting behaviors and regular dental visits implies that those at higher risk of oral diseases are less likely to visit a dentist regularly.

Keywords: Dental services, oral health-promoting behavior, regular dental visits

Introduction

Oral health in children is considered a major public health problem, with more than 69.4% of globally affected by the disease.^[1] In developing countries, most of the decay is untreated,^[2] which is mostly attributed to inadequate access to dental services^[3] or to cultural and behavioral factors associated with symptomatic dental visits;^[4,5] other studies have shown that regular dental visits allow early detection and timely intervention, hence, reducing the burden of disease^[6] and, subsequently, reducing the cost of treatment.^[7,8] Furthermore, children who visit the dentist regularly are more likely to utilize preventive dental services.^[9,10]

Saudi Arabia is a high-income developing country that experienced nutritional transition during the past 30 years which was accompanied by a rapid increase in the burden of dental caries.^[11] Although dental services are publicly provided free of charge for children, the majority of the population only visits dentist for emergency with a small proportion of

the population visit the dentist regularly.^[5] This pattern of the use of dental service undoubtedly contributes to an increase in untreated dental caries in the population.^[11,12]

Earlier studies have demonstrated that the regular dental visits as a health-promoting behavior are also associated with other health-promoting behavior.^[4,13] Others have also argued that health-promoting behaviors along with regular dental visits are more likely to cluster among people at the top of socioeconomic hierarchy.^[14] Unsurprisingly, the cluster of health-promoting behavior is also associated with better oral health. Identifying the pattern of behaviors associated with regular dental visits will probably enable identifying and developing health promotion interventions to tackle multiple diseases including oral disease.^[15] Furthermore, distinguishing a set of behaviors associated with regular dental visits can also help identifying those at greater need for promoting the use of services, particularly in a country like Saudi Arabia where the financial barriers to access dental service are minimal.

In this study, we set out to identify the behavioral and socioeconomic characteristics of Saudi children who visit the dentist regularly, using data collected from primary schools in Riyadh. The objective of this paper was to explore the relationship between a number of health-promoting behaviors and regular dental visits.

Methods

The study was approved by the ethical committee at King's College London and Ethical Committee in Ministry of Health (MOH) in Saudi Arabia (ClinicalTrials.gov, ID: NCT03345680. Registered on November 17, 2017).

The study used baseline data from a longitudinal study conducted in Riyadh city in Saudi Arabia. All participants were primary schoolchildren from public schools.^[16] 16 schools were randomly selected from a list provided by the MOH. Children aged 6–12 years were invited to take part in the study. Participants with any medically compromised conditions were excluded from the study.

The sample size calculation of the original longitudinal study was 910 participants, increased to 1087 to allow for dropout. Given that, the sample was intended for longitudinal analysis, a *post hoc* power calculation was conducted with significant level 0.05.

The study included a combined clinical assessment and parents' questionnaire. Clinical assessment of tooth condition was based on the World Health Organization criteria (WHO, 2013). Parental questionnaire was modified from the WHO to collect information on sociodemographic (age, gender, monthly income, mother education, and father education) and behavioral characteristics of the sample.

Twelve calibrated dentists conducted the clinical examinations. Kappa values for interexaminer reliability in caries diagnosis at tooth level were 0.78.^[16] Caries experience was based on the clinical assessment of decayed, missing, and filled teeth in permanent decayed, missing, and filled teeth (DMFT) and primary teeth (DMFT). Given that, some children will have either primary or permanent teeth, we could not include DMFT and DMFT separately in the regression model as this will lead to the exclusion of children who do not have mixed dentition and reduce the sample significantly. On the other hand, adjusting for caries experience is deemed essential in this analysis; therefore, an aggregate variable of the sum of DMFT and DMFT was created to be used in the analysis.

The main outcome of interest is regular dental visit. The questionnaire included questions on dental visit within the past 12 months and the reason for the visit (regular checkup, pain/emergency, and treatment follow-up). A new variable was created indicating whether participant visited the dentist for regular checkup or not. Sociodemographic variables included

gender, age in month, monthly family income, father education, and mother education (less than high school, high school, and college or more).

The questionnaire included questions on health behavior. These included frequencies of (1) toothbrushing (once or more daily versus less often/never) and (2) use of fluoride toothpaste. There were also nine questions pertaining to frequent weekly consumption of (1) fruits, (2) cake, (3) soft drinks, (4) jam and honey, (5) gum with sugar, (6) sweets and candy, (7) milk with sugar, (8) coffee with sugar, and (9) tea with sugar. All health-related behaviors were coded to indicate a health-promoting behavior (e.g., frequent fruit consumption coded 1 and infrequent soft drink coded 1). An aggregate variable was created by adding up all health-related behaviors which ranged from 0 to 11; the higher score indicates greater number of healthy behaviors.

Data analysis was conducted using Stata version 15. First, we conducted descriptive analysis of all the aforementioned variables the percentage of those who reported regular dental visits within groups of each variable. Finally, logistic regression model was carried out with regular dental visit as dependent variable adjusting for gender, age, family monthly income, mother and father education, caries experience, and the aggregate variable for health-promoting behaviors.

Results

Of the 1087 participants included in the study, data analysis was only conducted for on 887 who had complete data. There was no difference in demographic data between those excluded from the study and the analyzed sample. *Post hoc* power test was 91.7%.

Only 6.8% of the sample reported regular dental visits. Table 1 shows the distribution of all variables used in the analysis and regular dental visits. The mean age was 98.48 months (95% confidence interval [CI]: 97.34–99.62). The study population included 81.3% of females and 18.7% of male participants (721 and 166, respectively). Regular dental visits were 10.12% and 2.4% within female and male, respectively. The percentage of children who had reported regular dental visits was lowest among those whose mothers had the lowest education (4.52%) and highest among those with highest mother education (12.4%). Means of DMFT and DMFT were 0.55 (95% CI: 0.48, 0.62) and 3.11 (95% CI: 2.92, 3.30), respectively. The aggregate mean of caries experience (DMFT+DMFT) was 3.38, 95% CI: 3.16–3.61. The aggregate variable for health-promoting behavior had a mean of 4.72, 95% CI: 4.59–4.86 [Table 1].

The findings of the logistic regression model are shown in Table 2. The aggregate variable of health-promoting behaviors was significantly associated with regular dental visits. For an additional health-promoting behavior, children had odds of

Table 1: Distribution of all variables used in the analysis and regular dental visits among 6–11 years children in Riyadh city ($n=887$)

Variable	Percentage/mean		P*
	Total	Regular dental visit	
Age (months), mean	98.48	97.84	0.74
Sex, %			
Male	18.71	2.41	<0.01
Female	81.29	10.12	
Family income, %			
Lowest	36.08	6.56	<0.001
Middle	31.12	6.52	
Highest	32.81	13.06	
Mother education, %			
Lower than high school	22.44	4.52	<0.01
High school	33.93	6.64	
College or more	43.63	12.4	
Father education, %			
Lower than high school	18.83	7.19	<0.01
High school	33.03	5.12	
College or more	48.14	11.71	
Caries experience, mean	3.38	2.42	<0.01
Health-promoting behavior, mean	4.72	5.64	<0.001

*P from Chi-square test/t-test

1.23 (95% CI: 1.10–1.39) for regular dental visit after adjusting for age, gender, income, parental education, and caries experience. Other variables significantly related to regular dental visits included sex (female), higher family income, and lower mean of caries experience [Table 2].

Discussion

In this study, we used data from 16 randomly selected primary schools in Riyadh to examine the relationship between regular dental visits and an aggregate variable of health-promoting behaviors. The accumulation of health-promoting behaviors was associated with higher probabilities of regular dental visits after accounting for socioeconomic, demographic variables, and caries experience.

While other studies demonstrated that dental visits cluster with other health-related behaviors,^[4,17] in this paper, we showed that regular dental visits are associated with an aggregate variable of health-related behaviors. However, we used different set of behaviors and examined the association in schoolchildren in Saudi Arabia. Socioeconomic condition, caries experience, and gender were all significantly related to regular dental visits in the current study. This was in line with the previous studies in Europe among children and adults.^[4,10] Interestingly in the current study, caries experience was inversely associated with regular dental visit, given its nature as a health-promoting behavior.

Table 2: Odds ratio from logistic regression model for the association between regular dental visits and all variables used in the analysis among 6–12 years children in Riyadh city ($n=887$)

Variable	OR (95% CI)
Age	0.99 (0.98–1.01)
Sex	
Male (reference group)	5.32** (1.86–15.19)
Family income	
Lowest (reference group)	
Middle	1.06 (0.54–2.11)
Highest	2.11* (1.12–3.98)
Mother education	
Lower than high school (reference group)	
High school	1.41 (0.579–3.42)
College or more	2.36 (0.97–5.69)
Father education	
Lower than high school (reference group)	
High school	0.42 (0.18–1.01)
College or more	0.69 (0.31–1.54)
Caries experience	0.90* (0.83–0.98)
Health-promoting behavior	1.23** (1.10–1.39)

* $P<0.05$, ** $P<0.01$. OR: Odds ratio, CI: Confidence interval

Overall, a low percentage of the study population (6.8%) visited the dentist regularly despite the availability of free dental services in Saudi Arabia. This was relatively smaller percentage than that reported in the only other Saudi study that examined regular dental checkup (11%).^[5] However, the aforementioned study used a national sample of an older age group.^[5] The low percentage of regular visits reported in both studies might be attributed to symptomatic dental visits as a characteristic of the Saudi population.

The aggregate variable of health-related behaviors used in this study included a number of behaviors closely related to dental caries and other health-related outcomes. Interestingly, toothbrushing, use of fluoride toothpaste, and infrequent consumption of food and drinks containing free sugar, all protective of dental caries, were all associated with regular dental visits which were less common among those with greater dental experience. This demonstrates an inverse care law not only those who mostly need the service were less likely to receive it^[18] but also those at higher risk of caries due to adopting unhealthy behavior were less likely to receive much needed dental services. In other words, the cumulative exposure to unhealthy behaviors was aggravated by inadequate use of dental services for regular checkup. Furthermore, higher family income was associated with regular dental visits. Unsurprisingly, there is apparent socioeconomic inequality in children's caries in Saudi Arabia.^[19]

In Saudi Arabia, comprehensive dental services are available free of charge through the Ministry of Health's primary health-care

units and hospitals. However, this does not seem to promote asymptomatic dental visits or eliminate inequality in dental visits. It is possible that asymptomatic use of dental visits is not part of the Saudi cultural, where the majority believe they only need to see the dentist when they perceive the need for treatment. Identifying behavioral and sociodemographic characteristic of those who regularly visit the dentist might help in developing specific strategy with the potential to impact on the social norms of the population. On the other hand, the persistent inequality in regular dental visits in Saudi despite the availability of free services reflects indirect socioeconomic barriers such as cost of transportation, waiting time in the clinic, and taking time off work.^[20] Other health concerns could also precede the priority of regular dental checkups among those at bottom of the social hierarchy.

While an earlier study in Saudi Arabia argued that a health-promoting behavior, namely toothbrushing was associated with regular dental visits,^[5] the current study uniquely used a cumulative indicator of 11 health-promoting behaviors which included behaviors not directly related to dental caries such as fruit and vegetable consumption and demonstrated an association with regular dental visits. Furthermore, the association persisted even after accounting for socioeconomic factors and clinical indicators. The findings of the study could enable the development of specific intervention to promote asymptomatic dental visits.

The study has few limitations worth mentioning. First, this is a cross-sectional study which does not support temporality. Second, skewness of data in terms of gender distribution may lead to bias. This, however, was inevitable given that the principal investigator is a female who had limited access to male schools. Third, self-reported data are subjected to reporting bias.

To the best of our knowledge, this is the first study that assessed regular dental visits in this age group, considering the availability of free dental services in Saudi Arabia and cultural norms of symptomatic dental visit. This study also examined the association of accumulative indicators of health-related behaviors and regular dental visits. The findings of this study will potentially benefit policies aiming at promoting the uptake of dental visits.

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Ethics Approval and Consent to Participate

The protocol for this trial has been approved by King's College London Research Ethics Committee, UK (HR-16/17- 4683) and King Abdulaziz City for Science and Technology (H-01-R-012). Parents will sign written informed consent forms agreeing the participation of their children in the trial.

Conflicts of Interest

All authors declare that they have no conflicts of interest.

References

1. Frencken JE, Sharma P, Stenhouse L, Green D, Laverty D, Dietrich T. Global epidemiology of dental caries and severe periodontitis a comprehensive review. *J Clin Periodontol* 2017;44:S94-105.
2. Kassebaum N, Bernabé E, Dahiya M, Bhandari B, Murray C, Marcenes W. Global burden of untreated caries: A systematic review and metaregression. *J Dent Res* 2015;94:650-8.
3. Ensor T, Cooper S. Overcoming barriers to health service access: Influencing the demand side. *Health Policy Plan* 2004;19:69-79.
4. Kino S, Bernabé E, Sabbah W. Socioeconomic inequality in clusters of health-related behaviours in Europe: Latent class analysis of a cross-sectional European survey. *BMC Public Health* 2017;17:497.
5. El Bcheraoui C, Tuffaha M, Daoud F, Kravitz H, AlMazroa MA, Al Saeedi M, *et al.* Use of dental clinics and oral hygiene practices in the Kingdom of Saudi Arabia, 2013. *Int Dent J* 2016;66:99-104.
6. World Health Organization. Oral Health Promotion: An Essential Element of a Health-Promoting School. Geneva: World Health Organization; 2003.
7. Retna K. Assessment of dental treatment required and analysis of cost in the management of dental caries among semiurban primary school children of Kerala. *J Ind Soc Pedod Prev Dent* 2000;18:29-37.
8. Lee JY, Bouwens TJ, Savage MF, Vann WF Jr. Examining the cost-effectiveness of early dental visits. *Pediatr Dent* 2006;28:102-5.
9. Savage MF, Lee JY, Kotch JB, Vann WF. Early preventive dental visits: Effects on subsequent utilization and costs. *Pediatrics* 2004;114:e418-23.
10. Shaban R, Kassim S and Sabbah W. Socioeconomic inequality in the provision of specific preventive dental interventions among children in the UK: Children's dental health survey 2003. *Br Dent J* 2017;222:865.
11. Costa FS, Silveira ER, Pinto GS, Nascimento GG, Thomson WM, Demarco FF. Developmental defects of enamel and dental caries in the primary dentition: A systematic review and meta-analysis. *J Dent* 2017;60:1-7.
12. Al Agili DE. A systematic review of population-based dental caries studies among children in Saudi Arabia. *Saudi Dent J* 2013;25:3-11.
13. Sabbah W, Tsakos G, Sheiham A, Watt RG. The role of health-related behaviors in the socioeconomic disparities in oral health. *Soc Sci Med* 2009;68:298-303.
14. Kino S, Bernabé E, Sabbah W. The role of healthcare and education systems in co-occurrence of health risk behaviours in 27 European countries. *Eur J Public Health* 2017;28:186-92.
15. McAloney K, Graham H, Law C, Platt L. A scoping review of statistical approaches to the analysis of multiple health-related behaviours. *Prev Med* 2013;56:365-71.
16. Alayadi H, Sabbah W, Bernabé E. Effectiveness of school dental screening on dental visits and untreated caries among primary schoolchildren: Study protocol for a cluster randomised controlled trial. *Trials* 2018;19:224.
17. Singh A, Rouxel P, Watt R, Tsakos G. Social inequalities in clustering of oral health related behaviors in a national sample of British adults. *Prev Med* 2013;57:102-6.
18. Hart JT. The inverse care law. *Lancet* 1971;297:405-12.
19. Agili A, Ebrahim D, Alaki SM. Can socioeconomic status indicators predict caries risk in schoolchildren in Saudi Arabia? A cross-sectional study. *Oral Health Prev Dent* 2014;12:277-88.
20. Cheema J, Sabbah W. Inequalities in preventive and restorative dental services in England, Wales and Northern Ireland. *Br Dent J* 2016;221:235.