Dental Visit Patterns and Oral Health Outcomes in Saudi Children

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Abstract
Background: Health education advocates regular dental visits to improve oral health. There is a need to verify the outcomes associated with various dental visits patterns.

Objective: To assess the relationship of reported and clinically assessed oral health outcomes in Saudi children with their dental visits’ pattern.

Methods: This cross-sectional study included 6–12-year-old schoolchildren from six cities in the Eastern Province of Saudi Arabia in 2015. Parents responded to a questionnaire about dental visit patterns. Through a clinical examination, the presence of caries, sealants and need for referral was assessed. Univariate and multivariate regression was used to assess the association between dental visit patterns and pain in the past 6 months, presence of untreated caries and need for referral after controlling for confounders.

Results: Of the 3000 questionnaires distributed, 2306 (76.9%) parents responded. Significantly higher odds of pain were associated with visiting when in dental pain (odds ratio = 6.81) and never visiting a dentist (odds ratio = 3.44), whereas significantly lower odds were associated with regular checkups (odds ratio = 0.28). No significant association was observed with visits after recall by dentists.

Conclusion: Regular checkups initiated by parents are associated with better reported oral health outcomes in terms of pain, while recall by dentists has no impact on oral health.

Keywords: Checkups, dental visits, oral health, pain, recall, Saudi children

INTRODUCTION
The American Academy of Pediatric Dentistry recommends that children should visit a dentist at regular intervals and that the frequency of these visits should be tailored based on the risk of a disease or condition.[1] In the United Kingdom, everyone visiting the National Health System for regular dental checkups receives documented clinical examination and oral health advice as well as their teeth are charted to be monitored for periodontal condition.[2] In Norway, during their dental recall visits, children receive examination, treatment of conditions and preventive services.[3]

Regular dental checkup visits help promote preventive practices, maintain healthy teeth and oral tissues and increase awareness about benefits of dental services.[4] They also provide opportunities for clinicians to monitor patient compliance with previous advice and to reinforce healthy practices.[5] In fact, regular, preventive visits are associated with positive outcomes, whereas not visiting the dentist

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or seeking care to alleviate pain alone is associated with negative outcomes.\[6\]

Regular dental checkup visits can be arranged for individuals through a recall system, where dentists plan for the return of an individual who had good oral conditions during a previous visit.\[7\] However, not all health-care systems include a recall system, and it cannot be assumed that all dentists would engage in this practice on their own. Alternatively, regular visits are initiated at an individual’s end, where they visit dentists without any perceived dental problems for regular checkup to maintain their oral health.

In Saudi Arabia, the health-care system is accessible to a wide segment of the population.\[8\] In the Ministry of Health facilities, dental treatment is provided free of charge without the need for health insurance. However, there is no system in Saudi Arabia for regular dental visits, and dentists are not required to recall patients for monitoring.\[9\] To date, the School Health Services (SHS) program has offered limited dental services for children, focusing mainly on health education.\[10\] In 2016, the SHS became jointly supervised by the Ministry of Education and the Ministry of Health.\[11\] Public health experts suggested the establishment of a dental recall system for children in this new supervision scheme. However, little is known if differences in oral health outcomes exist between children who are regularly recalled by their dentists and those who seek regular checkups on their own. Thus, there is a need to investigate whether it would be more useful to direct SHS resources toward periodic dental recall or to focus on health education to promote self-care at home and self-seeking of regular dental checkups. Accordingly, the aim of the present study was to assess the relationship between the patterns of dental visits and patient-reported and clinically assessed oral health outcomes.

METHODS

A cross-sectional study was designed to collect data after obtaining the approval (IRB-2015-02-187) from the Institutional Review Board of Imam Abdulrahman Bin Faisal University, Dammam, Saudi Arabia, in December 2015. This study was carried out in accordance with the Declaration of Helsinki, 2013.

The study was conducted along a survey assessing the oral health of schoolchildren in the Eastern Province of Saudi Arabia in 2015. In this study, children from the following six cities were targeted: Dammam, Al Khobar, Dhahran, Qatif, Saihat and Ras Tanura. The sample size was calculated (https://select-statistics.co.uk/calculators/sample-size-calculator-population-proportion/) based on the following assumptions: margin of error = 3%, confidence level = 95% and estimated sample proportion with caries = 50%. The required sample size was 1056, which was doubled to obtain estimates for both males and females (a total sample size of 2112). The Directorate of Education was contacted to obtain permission to access schools with the required sample size in the 6 cities so that the sample would be representative. An invitation for participation was sent to primary schools for whom the authors obtained the permission. Accordingly, all schools whose authorities agreed were included in this study (n = 14). Schoolchildren from the 1st to 6th Grade (aged 6–12 years) were recruited for this study if they were free from systemic diseases, as verified from the school records, and if their parents consented to their participation in writing.

Data were collected using a questionnaire based on the Basic Screening Survey (BSS) of the Association for State and Territorial Dental Directors after removing items that do not apply to the Saudi setting such as questions related to ethnic background, eligibility for school lunch program and reference to Medicaid.\[12\] The World Health Organization methodology was followed to translate and adapt the validated questionnaire.\[13\] Accordingly, the authors translated the BSS questionnaire to Arabic and then back-translated it to English. Two bilingual dentists read the original English and the translated Arabic versions and independently confirmed their similarity. The questionnaire was further pilot tested for clarity on 20 participants, who were not included in the study. It was sent home to parents along with a letter of introduction explaining the purpose of the study and a consent form for their child’s participation. The questionnaire collected information about age and gender in addition to type of dental visits from the following five categories: never visited a dentist, visited only when in dental pain, visited after being recalled by a dentist, visited for regular checkups or visited for other reasons. Parents were also asked if their child had any dental pain in the past 6 months; if they had an insurance covering dental treatment; if they thought their child did not have a dental problem that was serious enough to require a visit to the dentist; if their child needed dental treatment but could not obtain it and if their child brushed teeth twice a day using fluoridated toothpaste. The filled questionnaires were collected by teachers and handed to the representative of the school administration, who was in contact with the study team.

A clinical examination – based on the BSS methodology\[13\] – assessed (a) untreated dental caries (clinically assessed open lesions that were not restored
or detected without the use of radiographs), (b) need for referral (to treat any condition such as caries, trauma, gingival problems and malocclusion) and (c) the presence of sealant on permanent teeth. A team of examiners (interns and senior dental students; n = 17) prepared for the study by discussing the examination criteria in two sessions of 45 min each. Subsequently, two training and calibration sessions were conducted where 15 children were independently examined to assess agreement between examiners and a gold standard examiner. Examiners with an acceptable agreement with the gold standard (kappa ≥0.6) collected data for the study (n = 10). Examination was conducted on school premises in areas designated for the study such as gyms or unused classrooms. Children were seated on portable dental chairs, and a portable dental light was used for illumination (Aseptico, WA, USA). Disposable mirrors were used for retraction and visualization. Disposable explorers were used to remove debris from teeth, ascertain the presence of sealant and help in detecting caries through assessing the discontinuity of enamel, if needed. Screeners examined the child and recorders documented the findings in the study forms.

Univariate logistic regression models were used to individually investigate the association of the four dental visit categories with oral health outcomes, both reported (pain) and clinically assessed (untreated caries and need for referral). In addition, association was also investigated with other factors such as gender, age, factors increasing the chances of dental visits (having dental insurance), factors reducing the chances of dental visits (perceiving a problem as not serious enough to require a visit to the dentist and being in need of treatment but not obtaining it), home preventive practices (brushing teeth twice daily using fluoridated toothpaste) and professionally applied preventive regimens (sealant on permanent teeth). Four multivariable logistic regression models were developed to assess the association of each of the four visiting patterns (i.e., never visiting a dentist, visiting when in dental pain, recalled by dentist and regular checkups) with reported and clinically assessed health outcomes (exposures) controlling for all confounders. Analysis was conducted using the Statistical Package for Social Sciences (IBM SPSS for Windows version 20.0, IBM Corp., Armonk, NY, USA). The significance level was set at 5%.

RESULTS

The questionnaire was sent to parents of 3000 schoolchildren and returned by 2306 parents (response rate = 76.9%). The children were from Dammam (58.5%), Al Khobar (18.3%), Qatif (9.8%), Dhahran (7.3%), Saihat (3.9%) and Ras Tanura (2.2%). The mean (±standard deviation) age of the children was 10.4 (±3.2) years, and the majority were males (1364; 59.2%). Of all children included in this study, 35.7% had experienced dental pain in the past 6 months and 7.4% needed dental treatment but could not obtain it. In total, 23.7% of the children had health insurance, and 48.1% brushed their teeth twice daily with fluoridated toothpaste. Only 3.6% reported that their children did not have a problem serious enough to require a dental visit. Clinical examination showed that 57.8% of the children had untreated caries, 42.7% needed referral to receive dental treatment and 6.4% had sealant on permanent teeth. The majority of children never visited a dentist (38.3%) or visited only on presentation of dental pain (30.3%), with 14.4% visiting for regular checkups and 0.9% visiting after dentist recall; 16.1% visited the dentist for other reasons.

In univariate analyses, age and gender were found to be significantly associated with pattern of dental visit, with males and older children being more likely to have never visited a dentist (odds ratio [OR] = 3.78 and 1.29, respectively) [Table 1]. The inability to obtain the needed treatment was significantly associated with higher odds of only visiting when in dental pain and lower odds of regular checkups (OR = 2.27 and 0.37, respectively). The perception that a child did not have a serious dental problem was associated with significantly lower odds of regular checkups (OR = 0.43). Brushing teeth twice daily with fluoridated toothpaste was associated with significantly higher odds of visiting a dentist (OR for visiting when in dental pain, after being recalled and for regular checkups = 2.27, 3.70 and 2.68, respectively). Professionally provided preventive agent (sealant) was associated with significantly higher odds of regular checkups (OR = 1.79) and lower odds of never visiting a dentist (OR = 0.66). Having insurance coverage was not significantly associated with the pattern of dental visits. Visiting a dentist when in dental pain was significantly associated with higher odds of pain in the past 6 months (OR = 5.02), whereas never visiting a dentist and regular checkups were associated with significantly lesser odds of pain (OR = 0.55 and 0.28). The same pattern was observed with regard to untreated caries (OR = 2.13, 0.75 and 0.72, respectively) and the need for referral to receive treatment (OR = 1.82, 0.78 and 0.50, respectively) [Table 1].

In multivariate analyses, significantly higher odds of pain in the past 6 months was associated with visiting the dentist when in pain and never visiting a dentist (OR = 6.81 and 3.44, respectively), whereas significantly lower odds of pain was associated with regular checkups.
(OR = 0.28). There was no significant association with visits after dentist recall. Clinically assessed oral health outcomes had weaker and nonsignificant relationship with dental visits, except for a significantly higher odds of need for referral to receive treatment in case of visiting when in pain (OR = 1.91) [Table 2].

**DISCUSSION**

Regular dental checkup visits are often advocated to promote preventive practices, and thus improve oral health.\(^\text{[14]}\) However, in Saudi Arabia, the differences between outcomes associated with various dental visit patterns are not well known. This study found that among 6–12-year-old Saudi children in the Eastern Province of Saudi Arabia, the odds of pain were higher among those who never visited a dentist or visited only when in pain and lower among those with regular dental checkups. Pain and visiting after recall were not found to be significantly associated. This difference may be attributed to a combination of professional monitoring and parental motivation in regular checkups. The findings of the current study agree with that of a study where reported bad oral health and regular dental visits were found to be inversely related in 6–11-year-old American children (OR = 0.25).\(^\text{[14]}\)

In our study, the percentage of children with no previous visits was high (38.3%). Similarly, researchers from India reported that the first dental visit tends to happen late at 6–12 years of age.\(^\text{[15]}\) One-third of the children in our study visited the dentist only when in dental pain. This agrees with the findings of Farsi et al.,\(^\text{[16]}\) who showed that utilization of dental services among Saudi children was of low-to-medium frequency and irregular, being mainly used for pain relief. Al-Kheraif and Al-Bejadi\(^\text{[17]}\) found that 84% of 9–11-year-old female Saudi schoolchildren visited a dentist only when in pain and 9.5% never visited a dentist. They speculated that this high percentage of nonregular visits was because of dental anxiety, high cost of dental care and lack of parental encouragement. Murshid\(^\text{[18]}\) found that 71.5% of the 1–8-year-old children from Riyadh, Saudi Arabia, visited the dentist when in pain and 27.3% visited for regular checkups. Rajab et al.\(^\text{[19]}\) reported that among 6–11-year-old Jordanian children from urban areas, 12% never visited a dentist, while 86% and 11% visited the dentist for only symptomatic reasons and dental checkups, respectively. Low rates of dental visits for regular checkup are not only prevalent among Saudi children but also among Saudi adults. In a large-scale survey of adult participants, the Saudi Health Information Survey found that only 11.5% of the participants visited a dentist for routine checkups, while 48.6% visited for a complaint.\(^\text{[20]}\) Collectively, this signifies that irregular dental visit practices may persist from childhood to adulthood, and thus it is essential to modify this behavior. Future studies should evaluate on what grounds dentists base their decision to recall patients and the barriers that need to be addressed. This would allow a better understanding the impact of different factors including the reimbursement system (salary-based versus achieving health outcomes),

**Table 1: Factors associated with pattern of dental visits in univariate regression (n = 2306)**

| Parameters                                      | OR (95% CI)          |
|------------------------------------------------|----------------------|
| Males versus females                            | 3.78 (3.02-4.73)*    |
| Age                                            | 1.29 (1.24-1.34)*    |
| Pain in the past 6 months                       | 0.55 (0.45-0.67)*    |
| Needed dental treatment but could not get it     | 0.88 (0.60-1.31)     |
| Insurance available                             | 0.84 (0.65-1.09)     |
| Brushing teeth twice daily using fluoridated toothpaste | 0.33 (0.27-0.40)     |
| Not having a serious dental problem             | 1.47 (0.90-2.40)     |
| Has untreated caries                            | 0.75 (0.62-0.91)*    |
| Has need for referral                           | 0.78 (0.61-1)        |
| Has sealant on permanent teeth                  | 0.66 (0.45-0.96)*    |

| Parameters                                      | OR (95% CI)          |
|------------------------------------------------|----------------------|
| Never visited a dentist                         | 0.35 (0.28-0.43)*    |
| Visit when in dental pain                       | 0.77 (0.74-0.81)*    |
| Recalled by dentist (0.9%)                      | 0.38 (0.05-2.86)     |
| Regular checkups (14.4%)                        | 0.72 (0.29-1.82)     |

*Statistically significant at \(P\leq0.05\). SD – Standard deviation; OR – Odds ratio; CI – Confidence interval

**Table 2: Association of dental visits pattern with parent-reported and clinically assessed oral health outcomes in multivariate regression**

| Parameters                                      | AOR (95% CI)          |
|------------------------------------------------|----------------------|
| Pain in the past 6 months                       | 6.81 (4.89-9.49)*    |
| Untreated caries                                 | 0.91 (0.54-1.55)     |
| Need for referral                                | 1.91 (1.12-3.25)*    |

| Parameters                                      | AOR (95% CI)          |
|------------------------------------------------|----------------------|
| Never visited a dentist                         | 0.92 (0.24-3.52)     |
| Visit when in dental pain                       | 0.75 (0.31-1.81)     |
| Recalled by dentist (0.9%)                      | 0.94 (0.12-2.25)     |
| Regular checkups                                | 0.28 (0.18-0.43)*    |

*Statistically significant at \(P\leq0.05\). AOR – Adjusted odds ratio for age, gender, location, having insurance, having a need for treatment and not obtaining it, perceiving problem as serious, having sealant and brushing teeth twice daily using fluoridated toothpaste; CI – Confidence interval
training (prevention oriented versus intervention oriented) and workload (in terms of patients seen and types of procedures provided).

In our study, almost half of the children brushed their teeth twice daily. This contrasts with the findings of Amin and Al-Abad,[21] who reported a lower prevalence (24.5%) among male Saudi primary schoolchildren. Their results were lower possibly because only 61.3% of their samples were from urban areas. In our study, brushing teeth twice daily was significantly associated with visiting a dentist, which may be explained by both being preventive practices. Similar to our study, higher odds of brushing teeth twice daily were reported among adult Saudis who visited the dentist for routine checkups (OR = 5.77) as well as among those visiting only because of a complaint (OR = 1.60). The authors of that study attributed this association to increased awareness after contacting dentists during the visits.[20] The same association was also reported in Jordanian children, where dental visits improved oral hygiene.[19]

In the present study, sealant prevalence was low and had a more specific association with dental visits’ pattern than brushing teeth twice daily with fluoridated toothpaste, where the odds were significantly higher for regular checkups. This might be expected because sealants and regular checkups indicate parental motivation and dentists’ commitment to prevention. This agrees with results from South Africa, where 3.5% of the 12-year-old children studied had sealant, which was associated with higher odds of regular preventive dental visits (OR = 3.55).[22]

Some factors such as health insurance and the ability to obtain care have previously been reported to affect dental visits.[21] However, in the current study, none of these factors was significantly associated with the pattern of dental visits. This may be attributed to the universal coverage of the Saudi health-care system.

The current study showed that the pattern of dental visits was not significantly associated with having untreated caries, except for recall by dentists, which had higher nonsignificant odds in multivariate regression. This might be because dentists may primarily have recalled children at high risk. Treatment may have been provided in addition to, or instead of, preventive services in these recall visits. No such pattern was noticed among children with regular checkups, indicating that these latter visits occurred regardless of caries presence.

In the current study, the significantly higher need for referral was associated with visiting when in dental pain. This finding concurs with that of Vargas and Ronzio,[21] who reported an OR of 2.12 for normative needs among 6–18-year-old children with episodic dental visits. Conversely, Bell et al.[14] reported that 6–11-year-old American children with treatment needs were more likely to receive preventive visits (OR = 2.16). They attributed this to the possibility that the parents may have misunderstood the study questionnaire in addition to a real change in practice to seek preventive visits after being motivated by dentists in treatment sessions.

Large sample size, geographical diversity in the sample and studying both reported and clinically assessed outcomes increase the confidence in our findings. The implications of this study are that parents should be educated and encouraged to take their children to dentists for regular checkups. This study did not find evidence to support the benefit of recall by dentists, and thus the authors recommend that further studies should be conducted before it is included in the Saudi SHS program.

A limitation of this study is that its cross-sectional design cannot support causality, which can only be proved by a longitudinal study. Further, this study did not assess the frequency of visits, the services provided or their duration, and these need to be addressed in future studies along with the impact of parents’ and dentists’ treatment preferences on health outcomes. Information about the study outcomes (i.e., dental visits’ patterns) was obtained through a questionnaire completed by parents and is thus susceptible to recall bias. It may have been possible that some parents could have misclassified their children by selecting the pattern they remembered or favored. Another limitation is the relatively small number of children who visited the dentist on recall, which might explain the nonsignificant association. Nevertheless, the results of this study can be generalized to children with a similar background: moderate oral hygiene and low frequency of regular visits despite having access to dental care. In other groups, where recall is more prevalent, the prevention offered by dentists may have a stronger effect on oral health. In addition, the present study reflects the elective recall by dentists. This may differ from the adherence of SHS dentists to future obligatory recall regulations. The low prevalence of recall visits in the current study decreases the likelihood that dentists would immediately shift to this practice, although subsequent gradual adoption may follow. Such practice would imply that dentists assume a greater responsibility for the oral health of children and that parents play a secondary role. This practice would also require a paradigm shift in the role of SHS from treating oral diseases to primarily monitoring and preventing them.
CONCLUSION

Regular checkups, where parents seek dentists’ care to monitor children's oral health, are associated with less pain in the past 6 months among 6–12-year-old Saudi children in the Eastern Province of Saudi Arabia. Never visiting a dentist or visiting only when in dental pain is associated with having pain in the past 6 months. Visiting when in dental pain was also associated with double the odds of need for referral. Recall visits by dentists had no significant association with reported or clinically assessed outcomes. Therefore, according to this study, parents should be educated and encouraged to take their children to dentists for regular checkups.

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Conflicts of interest
There are no conflicts of interest.

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