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Association between routine visits for dental checkup and self-perceived oral health in an adult population in Rio de Janeiro: the Pró-Saúde Study

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Abstract – Objective: To investigate the association between routine visits for dental checkup and self-perceived oral health. Methods: Cross-sectional data from a study of university employees in Rio de Janeiro – The Pró-Saúde Study. Self-perceived oral health and the reported pattern and frequency of visits to the dentist were obtained through a multidimensional self-administered questionnaire. Results: Data were obtained from 3252 participants. When compared with individuals who reported self-perceived oral health as good ('very good', 'good' or 'fair') individuals who reported self-perceived oral health as bad ('bad' or 'very bad') were significantly more likely to be older, male, less educated, poorer; they also reported more frequently to have lost more teeth and not visiting the dentist for routine dental 'checkup'. Among those who reported visiting for dental checks at least annually, 3% reported bad oral health, as opposed to 15% among those who reported visiting the dentist only when in trouble. Compared with those who reported visiting the dentist at least annually, odds ratio of bad oral health was 3.9 (95% CI, 2.68–5.67) for subjects who reported visiting only when in trouble, 2.6 (95% CI, 1.51–4.62) who reported visiting for dental checks less frequently than once every 2 years, and 1.4 (95% CI, 0.77–2.52) for subjects who reported visiting for dental checks once every 2 years, after controlling for sex, age, education, income and tooth loss. Conclusions: Not visiting the dentist for a routine dental check increased the chance of reporting one's own oral health as bad. In any case, the habit of visiting for dental 'checkup, once per year or once every 2 years was associated with nearly all the individuals perceiving his/her oral health positively. However, in order to gather more solid scientific data to guide public polices it is necessary to perform longitudinal studies, especially experiments in different populations focused mainly on the socioeconomic characteristics and dental clinical conditions.

Based on the natural history of the main oral diseases, it is difficult to justify the semiannual visits to the dentist (1). Nevertheless, 6-monthly dental checkups have been customary in dental services in many parts of the world. It is noteworthy that current guidelines in the UK recommended an end to the 6-monthly routine dental visits (2). Recently, there have been questions regarding

the actual benefits of dental routine visits, especially those related to the effectiveness and cost–benefits of the intervals between such visits (3). Extending the intervals between checkup dental visits has the advantage of making the service accessible to more individuals, and reduces people's exposure to dentist's inconsistent diagnosis and therapeutic conducts, and the risks of unnecessary interventions (4). Among the disadvantages, there is a greater chance that oral diseases progress without any intervention, causing painful and/or irreversible damages to the dentition.

Irregular or not frequent users of dental services have less restored teeth, higher number of carious teeth and more intact teeth than the regular users. Regarding missing teeth, some longitudinal studies did not show significant association with different patterns of dental visits. Among the ones with a significant association, the irregular ones lost approximately three more teeth than the regular ones (3, 5). Routine visits show a positive result over the preservation of a natural and functional dentition; however, the results were independent of the frequency of the visit (at least once per year, biannually or even less frequent than that) (6).

Oral diseases can affect people's lives in many aspects, such as limiting communication, social relations, increasing loss of workdays or school-days, and reducing quality of life (7–9). Therefore, the interest to investigate how individuals perceive their own oral health and the determinants of such perception has grown (10–12). The single item for 'perceived oral health' (POH) is one of the indicators which has been used, since it is a measure of easy application, interpretation and, mostly, because it reflects the personal experience regarding global oral health (13–17).

The individuals' perception about their own oral health seems to be influenced by the number of carious teeth – the greater the number of carious teeth, the worse self-perceived oral health is (7, 18, 19). Toothache, mostly due to caries, also influences how individuals perceive their oral health (19, 20). The main reason for tooth loss is caries (21, 22), and the number of missing teeth also influences the self-perceived oral health (13, 15, 18, 23). Therefore, the clinical condition of the dentition, particularly its history in relation to caries experience, either due to an open cavity, which raises the risk of pain or because the tooth loss, lowering the chewing ability and the self-image satisfaction, is associated with self-perceived oral health. Nonetheless, that association is not strong (7, 13–15, 23). It seems to

be so because POH is directly affected by chewing ability, satisfaction with dental appearance and comfort or absence of pain, rather than by the dentition clinical condition (7, 13, 15, 24). In many cases the presence of caries, periodontal disease, deficient restorations and partial or total tooth loss do not cause sufficient impairment to chewing comfort or aesthetic as to cause a bad POH. Based on that, POH has been proposed as an outcome in oral health, as it adds information about the dental clinical status (7, 10, 11, 25).

It is possible that dental checkup changes, for the better, the natural history of oral diseases, reducing the number of teeth with open carious cavity, periodontal disease or deficient restoration which cause pain and impairment to comfort, chewing and appearance. Dental checkups could also have an informative and soothing effect, making individuals feel more confident about their oral health; both effects – changing for the better the natural history of oral diseases and informing/soothing – would increase the chances of a positive self-evaluation of oral health.

The hypothesis that routine visits to the dentist have a positive impact on oral health-related quality of life has not been investigated in Brazil and in other countries, it has been scarcely investigated (3, 6). The McGrath and Bedi study (26) is an exception. According to that study, regular patients (annual visit to the dentist) reported that oral health had an impact on their overall quality of life (OR = 1.30; 95% CI, 1.04–1.63) and, especially, a positive impact (OR = 1.44; 95% CI, 1.18–1.77), comparing with irregular patients (less frequent than annual), after adjusting for age, sex and social class. However, the main conclusion of the most important review paper on this subject pointed to the lack of evidence for the real effectiveness of different intervals for dental checkups on quality of life (3). Consequently, this study intended to evaluate the relation between frequency of routine visits to the dentist and POH among a working population in Brazil.

Methods

Design and study population

This study analysed cross-sectional data obtained from the Pró-Saúde Study, a cohort of the employees of a university in Rio de Janeiro, started in 1999–2001, with the main objective of investigating the association between social factors and health

outcomes. The study population consisted of technical and administrative employees of the university, excluding those under temporary contract or temporarily transferred to other institutions at the time data were collected. Compared with the general population, it is characterized by higher levels of education and better income (27). In this study, we analysed 3252 individuals who represented 77.9% of those eligible for participation during the 1999–2001 baseline data collection; for 244 (5.8%) individuals, nonparticipation was due to refusal and the remaining 678 nonparticipants could not be located due to leaves of absence or other unspecified reasons. Self-administered and multidimensional questionnaires were applied during working hours, after an informed consent is read and signed (the informed consent was approved by the ethics committee of the State University of Rio de Janeiro), in the offices or auditoriums, and with the support of trained inquirers. Methods to guarantee the quality of information were used, including: a pilot study, the test–retest reliability measurement, and double data entry (28).

Definition of the variables

The outcome variable was POH, represented by the question: 'in general, how do you consider your oral health (teeth and gums)?' The answer options were: 1, 'very good'; 2, 'good'; 3, 'fair'; 4, 'bad'; 5, 'very bad'. The categories: 'very good', 'good' and 'fair' were aggregated in a group labelled good POH; the categories 'bad' and 'very bad' were aggregated in another group labelled bad POH. The type of aggregation was due to the patterns of agreement of the answers observed in the test–retest reliability study, e.g. some individuals who first reported their oral health as 'fair' tended to report it as 'good' in the retest. This trend suggests that in this population, the 'fair' status is closer to the 'good' status rather than to the 'bad' one. Besides, statistical models fitted better with such aggregation compared to the alternative one.

The main explanatory variable was the reported frequency of routine visits to the dentist. The participants were asked: 'in general, how often do you go to the dentist for a routine checkup?' The answer options were: 'never been to the dentist'; 'not used to routine visits, only go to the dentist when there is a problem'; 'less frequent than every 2 years'; 'every 2 years'; 'at least once per year'. In this analysis, the option 'never been to

the dentist' was aggregated to the 'not used to routine visits, only go to the dentist when there is a problem' due to the small number of individuals who answered 'never been to the dentist' ($n = 31$), and also because both categories might have individuals relatively similar regarding 'dentistry culture'. In addition, this aggregation yielded better results in the sensitivity analysis compared with separate categories. The covariates were: age, sex, income, education and number of missing teeth. Income was originally informed through the gross family income. Then it was divided by the number of family members and converted into the number of minimum wages at that time (R$18 000), and separated in three categories of monthly per capita family income: '<3', '3–6' and '>6' minimum wages. Education was categorized into: 'incomplete elementary', 'complete elementary' (which includes incomplete high school), 'complete high school' (which includes incomplete university/college) and 'complete university/college or over'. Number of missing teeth was considered in an aggregate format: 'never lost a tooth' was joined to 'lost one or a few teeth' and labelled as 'natural functional dentition'; 'lost many teeth' and 'lost almost all teeth or lost all teeth' were also joined and named as 'natural nonfunctional dentition' (6).

Data analysis

The study population was characterized according to POH, visits to the dentist, sex, age, education, family income per capita and tooth loss.

The distribution of POH according to the four categories of visits to the dentist was described in terms of the covariates. The differences were tested using the chi-squared and Fisher's test. Logistic regression was applied and first degree multiplicative interactions between visits to the dentist and the covariates were tested. The adequacy of modelling was evaluated by the deviance and the residuals analysis. Individuals who did not respond to all questions were excluded from the logistic regression analysis ($n = 187$). Statistic tests were considered as significant at $\alpha = 5\%$. All the analyses were performed using the statistics software STATA 7.0 (Stata Corp LP, College Station, TX, USA).

Test–retest analyses were carried out based on data collected at the same university site, from 92 temporary workers who completed the questionnaire twice (second time after a 1-week interval). To evaluate test–retest reliability, kappa coefficients

were estimated: for POH, it was 0.79 (95% CI, 0.51–1.00); for routine visits to the dentist, 0.71 (95% CI, 0.60–0.80); and for missing teeth, 0.83 (95% CI, 0.72–0.91). The covariates also had almost perfect kappa, varying from 0.83 to 0.98. A more detailed analysis of the test–retest reliability of the POH variable was reported elsewhere (29).

Results

The study population consisted predominantly of women (56.1%), individuals younger then 49 years old (82.5%), with university graduation or over (42.5%) and 60.7% were in the category of three minimum wages per capita or more.

Differences among the individuals in four dental visiting routines, according to demographic and clinical characteristics

The dental visiting routines were significantly associated with the demographic and clinical variables (Table 1). When compared with those who reported 'not used to routine visits, only go to the dentist when there is a problem', individuals who reported routine visits were mostly younger, female, with higher education, presented higher family per capita income, and a natural functional dentition.

Association between frequency of dentist visits and POH

Among the individuals who reported 'only go to the dentist when there is a problem', 15.1% perceived their oral health as bad. Among those who visited the dentist for routine dental checkups, 7.9%, 4.1% and 3% ('less frequent than every 2 years', 'every 2 years' and 'at least once a year' respectively), reported POH as bad (Table 2).

The chance of reporting bad POH was nearly six times higher for those who only go to the dentist when there is a problem than for those who visited the dentist for routine dental checkups at least once a year (OR = 5.8; 95% CI, 4.02–8.26). After controlling for demographic and clinical characteristics, the odds ratio was reduced to 3.9 (95% CI, 2.68–5.67) (Table 3).

Individuals excluded from the logistic regression analysis (6%), because of missing value in any variable included in the present study, had fewer missing teeth and lower socioeconomic (SE) position than those included in the analysis. There was no multiplicative interaction between routine visits to the dentist and any covariates. The goodness-of-fit tests as well as residuals analysis indicated that 89% of the individuals were correctly classified.

Table 1. Description of the study population according to dental visiting routines (the Pró-Saúde Study, 1999–2001)

| | Routine visit to the dentist for a checkup | | | | | |
	Only go to the dentist when I have a problem (n = 1076)[a]	Less frequent than every 2 years (n = 265)	Every 2 years (n = 417)	At least once a year (n = 1307)	Total, all (n = 3065)	P-value
Demographic characteristics						
Age, mean (SD)	43 (8.7)	41 (7.6)	40 (8.2)	42 (8.2)	42 (8.4)	0.008
Sex						
% Female	46.4	53.6	56.6	64.4	56.1	<0.001
Education (%)						
Incomplete primary school	12.4	5.3	2.9	4.2	7.0	<0.001
Complete primary school	20.1	10.2	11.0	12.9	14.9	
High school	38.1	37.7	34.3	33.4	35.5	
University/college or over	29.5	46.8	51.8	49.5	42.5	
Family income per capita (%)						
<3 Minimum wages	53.2	35.1	29.0	32.0	39.3	<0.001
3–6 Minimum wages	28.0	34.3	36.9	34.4	32.5	
>6 Minimum wages	18.9	30.6	34.1	33.6	28.2	
Clinical characteristics						
Tooth loss[b]						
% Nonfunctional natural dentition	39.2	22.3	18.2	20.0	26.7	<0.001

[a]Also includes 31 individuals who reported never been to the dentist.
[b]Tooth loss = loss of all or almost all teeth was named nonfunctional natural dentition; no or a few lost teeth was named functional natural dentition.

Table 2. Prevalence of bad self-perceived oral health according to dental visiting routines, demographic characteristics and dentition clinical condition (the Pró-Saúde Study, 1999–2001)

	Self-perceived oral health		
	n	% Bad[a]	P-value
Routine visit to the dentist for a checkup[b]			
Only go to the dentist when I have a problem[c]	1076	15.1	<0.001
Less frequent than every 2 years	265	7.9	
Every 2 years	417	4.1	
At least once a year	1307	3.0	
Demographic characteristics			
Age, mean (SD)	3065	44 (8.5)	0.02
Sex			
Female	1718	6.6	0.004
Male	1347	9.4	
Education			
Incomplete primary school	214	13.1	<0.001
Complete primary school	458	12.2	
Complete high school	1089	9.5	
University/college	1304	4.0	
Family income per capita			
<3 Minimum wages	1204	12.5	<0.001
3–6 Minimum wages	996	6.2	
>6 Minimum wages	865	3.0	
Clinical characteristics			
Tooth loss[d]			
Nonfunctional natural dentition	818	18.1	<0.001
Functional natural dentition	2247	4.1	
Total	3065	7.8	

[a]Bad POH = aggregation of categories bad and very bad.
[b]The difference of routine visit every 2 years and at least once a years was not statistically significant ($P = 0.28$).
[c]Also includes 31 individuals who reported never been to the dentist.
[d]Tooth loss = loss of all or almost all teeth was named nonfunctional natural dentition; no or a few lost teeth was named functional natural dentition.

Table 3. Odds ratio (95% CI) in the association of bad self-perceived oral health and dental visiting routines adjusted by sex, age, education, income per capita and tooth loss (the Pró-Saúde Study, 1999–2001)

	OR (95% CI)[a]
Routine visit to the dentist for a checkup[b,c]	
At least once a year	1.0
Every 2 years	1.4 (0.77–2.52)
Less frequent than every 2 years	2.6 (1.51–4.62)
Only go to the dentist when I have a problem	3.9 (2.68–5.67)
Tooth loss[d]	
Functional natural dentition	1.0
Nonfunctional natural dentition	4.2 (3.03–5.89)

[a]Percentage correctly classified = 89.07.
[b]OR without adjustment = every 2 years (1.4; 95% CI, 0.77–2.47); less frequent than every 2 years (2.8; 95% CI, 1.62–4.84); only go to the dentist when I have a problem (5.8; 95% CI, 4.02–8.26).
[c]From 3252 participants, 187 were excluded from the logistic regression analysis for not answering all the questions ($n = 3.065$).
[d]Tooth loss = loss of all or almost all teeth was named nonfunctional natural dentition; no or a few lost teeth was named functional natural dentition.

Discussion

Our study, along with the one by McGrath and Bedi (26), represent one of the first efforts to investigate the potential association between the habit of visiting the dentist and POH. However, there are important differences between our study and this other study: (i) we used a POH item with known psychometric properties (13, 14, 17); (ii) we have been able to investigate potential differences between varying frequencies of visits to the dentist on POH as opposed to its dichotomization (regular and irregular visits); (iii) we have adjusted our analyses by the number of missing teeth, an important indicator of oral functioning and of SE position. Therefore, our study adds new information to the findings of McGrath and Bedi (26).

In our study population, just a few (7.8%) reported bad POH. That percentage was expressively higher only for those who did not go to the dentist for routine dental checkups (15.1%). Having dental checkups within shorter or longer intervals

seems to help individuals to have a positive self-perception about their oral health. Longer intervals for routine dental checkups (2 years) did not increase the chance of bad self-perceived oral health, when compared with shorter intervals (at least once a year). Even longer intervals (over 2 years) increased only slightly the chance of a bad self-perceived oral health.

Other important finding was the strong and independent association between natural functional dentition and POH. Not having a natural functional dentition increased four times the chances of bad self-perceived oral health. As dental checkup was independently associated with both the maintenance of a natural functional dentition (6) and perceiving oral health as good, its influence upon POH probably results from reducing the number of missing teeth, improving the clinical condition of the remaining teeth, and also because visits to the dentist might reassure and inform people, making them feel more confident about their oral health and, consequently, more prone to report their oral health as good.

Some may argue that those who belong to higher SE groups frequently go for dental checkups, and also have a better oral health as a result of belonging to those SE groups. In such scenario, oral health and the habit of going for checkups are considered consequences of belonging to that SE group, instead of considering the oral health a consequence of routine checkups. Despite the efforts to avoid such confounding in the multivariate analysis, it is likely that such control might have not been totally effective. Therefore, there might still remain some residual confounding in the association between checkup and POH. If so, the protection given by the checkup, as stated in this study, would be smaller or null. However, it is important to note that the number of missing teeth was also controlled for. Given that the number of missing teeth is a strong indicator of SE level, and that the association between POH and dental checkup remained significant even after controlling for this characteristic, it is unlikely that this association was entirely due to confounding.

A limitation of our study resides on the time aspect, since both, exposure and outcome, in cross-sectional studies are assessed at the same moment, preventing conclusive results about causal relationships. However, reverse causality (30) might not have occurred in our study since if this was the case it would be expected that those with worse POH would, as a consequence, visit the dentist more frequently. On the other hand, those with better POH would visit the dentist less frequently, because they do not perceive important problems with their oral health. However, our population behaved in the opposite way: among those with bad POH, only 16.3% reported visiting the dentist at least once a year, whereas among those with good POH, 44.9% reported the same. Evidence from other studies confirmed that individuals with more oral diseases and at lower SE position, do not generally visit the dentist for routine checkups; in contrast, individuals with less oral diseases and at higher SE position do visit dentists for routine checkups. If the incidence of oral disease were an important determinant of visiting dentists, people with higher risks of presenting oral disease would visit dentists more frequently than those with lower risks. Ours and other studies show the opposite situation (31–37). Therefore, in this study we considered that, the habit of visiting (or not) the dentist for a routine checkup was established before, and/or independently from a good or bad perception of oral health.

Another limitation of our study is that data on dental routine visits and the number of missing teeth were self-reported; such source of information may be considered less valid than registers or direct observation. However, data from other studies suggest that self-reports regarding these two variables are acceptable (6, 38–41) and their reliability in our study was satisfactory according to the kappa values.

Two hypotheses can be raised from our findings. First, we can infer that, actually, individuals benefit from routine visits to the dentist. If so, good POH could be a consequence of good treatment, in terms of the maintenance of the natural functional dentition and, also, more opportunities to receive preventive actions, with positive effects in the clinical condition of the teeth, and information and reassurance regarding the state of the dentition. The other hypothesis refers to the potential occurrence of social desirability (42), which means that visiting the dentist regularly makes people feel cooperative regarding their health care, as they are behaving in accordance to social prescription of visiting dentists regularly. Fulfilling a socially desired behaviour, mostly expected from those with higher education and income levels, might provide psychological wellbeing, which leads to a positive perception of the oral health, even if it is not actually a good one. On the other hand, even if there is a perception of positive oral health and one

is feeling well about his/her chewing ability, good appearance of the teeth and comfort/no pain, people could feel that there is something wrong about their teeth if they do not go for a dental checkup for a long period, as is recommended by dental professionals and is practiced by people of higher SE groups. In this case, even when there is a good perception of the oral health, they would report it as bad. It was not possible for us to directly measure the effect of social desirability in our results, but such phenomenon is compatible with our findings as the association of checkup and POH remained strong and statistically significant (OR = 2.6; 95% CI, 1.51–4.62) after adjusting for the number of missing teeth. Therefore, even among individuals in whom variation in an important clinical indicator of oral health was absent, those who reported the habit of dental checkup visits also reported good POH. Thus, social desirability might be a mechanism through which the habit of visiting the dentist for a checkup increases the chances of good POH.

The main role of dental care is helping the maintenance of a natural dentition for the whole life, along with all biological and psychosocial functions (43–45). Regarding the maintenance of a natural dentition, longer intervals for routine dental checkup seem to be as beneficial as shorter intervals (3, 6). Similarly, in terms of POH, directly related to psychosocial functions, routine dental checkup visits once every 2 years seem to be compatible with high proportions of individuals with good POH (95.9%), contrasting with 84.9% who visit only when in trouble. Aiming at keeping a natural functional dentition and a positive self-perception of oral health, people could be advised to visit the dentist for a routine checkup once every 2 years or more frequently. However, in order to gather more solid scientific data to guide public polices it is necessary to perform longitudinal studies, especially experiments in different populations focused mainly on the SE characteristics and dental clinical conditions (46, 47).

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