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© 2007 The Authors. Journal compilation © 2007 Blackwell Munksgaard Self-reported oral problems, compared with clinical assessment in an epidemiological study

Abstract: Objectives: To study self-reported oral problems in relation to periodontal clinical findings in an epidemiological investigation. Materials and methods: 1676 individuals, 828 men and 848 women, participated. The clinical examination comprised the number of remaining teeth excluding third molars, plaque index (PLI), gingival index (GI), bleeding on probing (BOP%), calculus index (CI) and the number of teeth with pocket depth (PD) ≥5 mm. Participants answered a questionnaire concerning smoking and snuffing habits and described in their own words any oral problems present. Analysis of variance (anova), unpaired t-test and chi-squared test were the statistical methods used. Results: The questionnaire was completed by 99.4% of participants. Problems of the teeth and mouth were reported by 28.9% of respondents comprising 31.8% females and 26.2% males. The difference between the sexes was statistically significant (P < 0.05). Of the reported oral problems, 57.4% was of periodontal origin. The differences between subjects with and without self-reported mobile teeth showed significant clinical outcome in PLI (P < 0.001), CI (P < 0.01), GI (P < 0.001), BOP% (P < 0.01), the number of teeth with $PD \ge 5 \text{ mm}$ (P < 0.001) and the number of remaining teeth (P < 0.001). The differences between subjects with and without self-reported periodontal disease and with and without bleeding gingiva also showed significant differences in CI (P < 0.05), GI (P < 0.05) and the number of teeth with PD \geq 5 mm (P < 0.05) and in PLI (0.001), CI (P < 0.01), GI (P < 0.001) and BOP% (P < 0.001)respectively. Conclusions: Present study clearly shows that self-reported periodontal problems were confirmed by clinical assessments.

Key words: clinical outcome; epidemiological; oral health; questionnaire; self-report

Introduction

Self-report is an efficient tool and used widely when assessing many diseases, such as cancer, and cardiovascular disease (1), as well as risk factors for disease such as diet, high blood pressure and general health (2).

Self-reported oral health questionnaires have become useful tools in dental research, particularly in health surveys and epidemiological studies because they are time- and cost-effective (3-11). Ankkuriniemi and Ainamo studied self-reported toothache, gingival bleeding and the number of decayed teeth in combination with clinical investigations. They found that selfreported gingival bleeding correlated with gingival bleeding at clinical examination (8). In a longitudinal study, Peek et al. studied self-reported changes in oral health patterns and found that those patterns of change in oral health problems were episodic rather than chronic (12). Taani et al. found, in a study of 12- to 14-year-old school children, positive correlation between self-assessed gingival bleeding and gingival health, and beneficial for monitoring gingival health (13). Further, Buhlin et al. have shown that self-reported gingival bleeding is correlated with gingival bleeding at clinical examination (11).

Self-reporting can even be used for educational purposes. In a study among adolescents, Kallio *et al.* (1997) demonstrated that gingival health can be improved by using questionnaires as an educative tool (14).

The self-reported oral conditions of periodontal disease or bleeding gums have been used in prospective investigations in large population samples to study the relationship between oral conditions and subsequent cardiovascular disease. These studies showed a significant association between self-reported bleeding gums, presence of dentures and known cardiovascular disease (15, 16).

In a recently published study by Ng and Leung, oral healthrelated quality of life and periodontal status was assessed by using a Yes/No checklist of symptoms related to periodontal health (17). In most of these self-reported questionnaires, specific questions were asked. Information regarding self-assessed overall oral health of individuals in relation to the clinical situation is, however, scarce.

However, there is a lack of data concerning self-reported periodontal problems compared with clinical assessment.

The aim was to study self-reported oral problems in relation to periodontal clinical findings in an epidemiological investigation.

Materials and methods

In 1985–1986, a randomized sample was selected from the registry file of all inhabitants of the Stockholm area, of people born on the 20th of any month from 1945 to 1954. The sample comprised 3273 subjects aged 30–40 years. They were informed about the purpose of the study and called for a clinical examination. A total of 1676 individuals, 828 men and 848 women, participated in the study; they answered a questionnaire and underwent a detailed oral clinical examination. All examinations were performed by six periodontitis. The prestudy calibration included six training sessions to ensure consistent registration of the parameters being investigated.

The study was approved by Ethics Committee of the Karolinska University Hospital at Huddinge. All subjects gave their informed consent to participate.

The clinical examination comprised the number of remaining teeth excluding third molars, the number of teeth with pocket depth (PD) ≥5 mm, plaque index (PLI) (18), calculus index (CI) (19) and bleeding on probing (BOP%). Gingival index (GI) (20) was recorded around each tooth, and the highest score was used as a representative value for the tooth. PD was determined with a Hu-Friedy probe (Hu-Friedy PCPUNC 15, Chicago, IL, USA) and was registered to the nearest millimetre at six sites of each tooth. The presence of removable prostheses, halitosis, tooth displacement and gingival recession was also recorded. Before the clinical examination the subjects answered a questionnaire that included questions about smoking (smoker = current smoker; ex-smoker; never-smoker = never smoked) and snuffing habits. The participants were also asked if they had problems with the teeth and mouth, with 'Yes' or 'No' answer options. If the answer was 'Yes', they were asked to describe the problems in their own words. In the analysis of data the answers from the participants, when appropriate, were transformed to periodontal problems Table 1.

Statistical analysis

For statistical analysis of the number of remaining teeth with $PD \ge 5$ mm, the tooth was used as a unit, e.g. a tooth with one or more sites with $PD \ge 5$ mm was recorded as one tooth unit with $PD \ge 5$ mm. An analysis of variance (ANOVA) and unpaired *t*-test were the statistical methods used. Chi-squared

Table 1. Self-reported oral problems

Parameter	% of all subjects $(n = 1676)$
Parameter Tongue, white lesions coating Jaw-joint/bruxism Toothache Tooth migration/mobility* Periodontitis* Blisters on mouth/lips Fractures of dental fillings, crowns, bridges Problems with wisdom teeth Calculus* Cavities Recession/sensitive teeth*	(n = 1676) 0.5 1.3 0.2 0.3 1.2 1.1 2.2 1.0 1.1 1.9 5.9 1.2
Aching gingiva* Bleeding gingiva* Endodontic problems Saliva Other self-reported problems	1.9 5.3 1.6 0.4 2.1

*Analysed as periodontal problems.

test was the statistical method used when analysing the Yes and No questions regarding problems with the teeth and mouth in comparison between males and females. The Stat View 5.0 statistical program (SAS[®] Institute Inc., Cary, NC, USA) was used for the statistical evaluations. All probability values are two-tailed, and confidence intervals were calculated at the 95% level, P < 0.05 was considered significant.

Results

The questionnaire response rate was 99.4%. Problems of the teeth and mouth were reported by 28.9% of subjects comprising 31.8% females and 26.2% males.

There was a statistically significant (P < 0.05) difference between the sexes regarding self-reported periodontal problems. Of smokers, 29.0% of ex-smokers 33% and of neversmokers 26% reported oral problems. The distribution of the problems in different groups is shown in Table 1. More than half (57.4%) of the problems reported were periodontal problems.

Data for subjects with self-reported mobile teeth are presented in Table 2. Significant differences were found for all clinical parameters (P < 0.01-0.001).

The clinical periodontal outcome of subjects reporting periodontal disease when compared with those reporting no periodontal disease showed significant differences in CI, GI and the number of teeth with PD \geq 5 mm (Table 3).

The clinical periodontal outcome between subjects who reported having bad breath and those who did not report bad breath showed significantly higher CI (P < 0.001) and GI (P < 0.05) in the former group (Table 4). No significant differTable 2. Plaque index (PLI), calculus index (CI), gingival index (GI), bleeding on probing (BOP%), number of teeth with pocket depth (PD) \geq 5 mm and number of remaining teeth in subjects with self-reported teeth that are mobile (mean ± SE) tooth mobility (mean ± SE)

Parameter	Tooth mobility $(n = 5)$	No tooth mobility $(n = 1666)$
PLI	1.43 ± 0.49	0.71 ± 0.01***
CI	1.20 ± 0.40	0.46 ± 0.01**
GI	2.34 ± 0.26	1.27 ± 0.13***
BOP%	82.14 ± 7.32	34.90 ± 0.85**
No. of teeth with PD \geq 5 mm	8.20 ± 4.91	0.85 ± 0.07***
No. of remaining teeth	22.6 ± 3.4	26.7 ± 0.06***

P < 0.01; *P <0.001

Table 3. Plaque index (PLI), calculus index (CI), gingival index (GI), bleeding on probing (BOP%), number of teeth with pocket depth (PD) \ge 5 mm and number of remaining teeth in subjects with self-reported periodontal disease (mean ± SE)

Parameter	Periodontal disease $(n = 19)$	No periodontal disease $(n = 1652)$
PLI	0.71 ± 0.11	0.71 ± 0.01 NS
CI	0.77 ± 0.18	0.46 ± 0.01*
GI	1.56 ± 0.13	1.27 ± 0.13*
BOP%	49.29 ± 8.10	34.90 ± 0.85 NS
No. of teeth with PD \geq 5 mm	2.20 ± 0.73	0.86 ± 0.07*
No. of remaining teeth	26.0 ± 0.73	26.8 ± 0.06 NS

Table 4. Plaque index (PLI), calculus index (CI), gingival index (GI), bleeding on probing (BOP%), number of teeth with pocket depth (PD) \geq 5 mm and number of remaining teeth in subjects with self-reported bad breath (mean ± SE)

Parameter	Bad breath $(n = 15)$	No bad breath (<i>n</i> = 1656)
PLI	0.83 ± 0.10	0.71 ± 0.01 NS
CI	1.07 ± 0.22	0.45 ± 0.01***
GI	1.56 ± 0.12	1.27 ± 0.13*
BOP%	46.99 ± 8.62	34.94 ± 0.85 NS
No. of teeth with PD \geq 5 mm	1.40 ± 1.08	0.87 ± 0.07 NS
No. of remaining teeth	26.8 ± 0.39	26.8 ± 0.06 NS

P < 0.05; *P <0.001

ences were found regarding problems from the teeth and mouth between subjects with self-reported calculus and subjects that not had reported to have calculus.

Subjects reporting gingival recessions showed significantly lower PLI, GI and BOP% and significantly more remaining teeth than subjects reporting no gingival recessions (Table 5). Subjects reporting aching gingiva had significantly higher CI than subjects without aching gingiva (Table 6).

Subjects reporting bleeding gingiva had significantly higher PLI, CI, GI and BOP% than subjects without bleeding gingiva (Table 7).

Table 5. Plaque index (PLI), calculus index (CI), gingival index (GI), bleeding on probing (BOP%), number of teeth with pocket depth (PD) \geq 5 mm and number of remaining teeth in subjects with self-reported gingival recessions (mean ± SE)

Parameter	Gingival recessions (<i>n</i> = 99)	No gingival recessions $(n = 1577)$
PLI	0.61 ± 0.05	0.71 ± 0.01*
CI	0.38 ± 0.05	0.46 ± 0.02 NS
GI	1.12 ± 0.05	1.29 ± 0.13**
BOP%	27.9 ± 3.1	34.5 ± 0.9*
No. of teeth with $PD \ge 5 \text{ mm}$	1.29 ± 0.39	0.85 ± 0.07 NS
No. of remaining teeth	27.2 ± 1.14	26.7 ± 0.06*

P < 0.05; *P <0.001

Table 6. Plaque index (PLI), calculus (CI), gingival index (GI), bleeding on probing (BOP%), number of teeth with pocket depth (PD) \geq 5 mm and number of remaining teeth in subjects with self-reported aching gingiva (mean ± SE)

Parameter	Aching gingiva (n = 32)	No aching gingiva (<i>n</i> = 1639)
PLI	0.67 ± 0.08	0.71 ± 0.01 NS
CI	0.71 ± 0.16	0.54 ± 0.01*
No. of teeth with PD ≥ 5 mm	1.38 ± 0.60	0.86 ± 0.07 NS

**P < 0.05

Table 7. Plaque index (PLI), calculus index (CI), gingival index (GI), bleeding on probing (BOP%) and number of teeth with pocket depth (PD) \geq 5 mm in subjects with self-reported bleeding gingiva (mean ± SE)

Parameter	Bleeding gingiva (<i>n</i> = 90)	No bleeding gingiva (<i>n</i> = 1581)
PLI CI GI BOP% No. of teeth with PD ≥ 5 mm	$\begin{array}{l} 0.86 \pm 0.06 \\ 0.64 \pm 0.08 \\ 1.47 \pm 0.05 \\ 47.1 \pm 3.8 \\ 1.29 \pm 0.39 \end{array}$	0.70 ± 0.01*** 0.45 ± 0.01** 1.27 ± 0.13*** 34.4 ± 0.9*** 0.85 ± 0.07 NS

P < 0.01; *P <0.001

Discussion

In present study in which patients could report their oral problems have not to our knowledge been used in previous epidemiological studies (Table 1). This has provided us with a unique opportunity to obtain a general view of oral problems in relation to periodontal clinical outcome of a large cohort (n = 1676) in an urban area. In our study, 99.4% of the 1676 participants answered the questionnaire in comparison with Brodeur *et al.*, who reported corresponding rates of 77% and 44.5% (10). In contrast to Andrews *et al.*, the present study shows that tobacco users do not report more oral health problems than non-users (21). Self-reported mobile teeth (Table 2) is an important information in epidemiological survey as patients complaining of tooth mobility have been demonstrated to have severe periodontal disease (24). Here only 1.2% of subjects reported periodontal disease, when compared with 17.1% clinically diagnosed with the disease. Thus, all subjects with self-reported periodontal disease had clinically diagnosed periodontal disease (Table 3). However, it seems to be very difficult for a non-dentist to diagnose his or her own periodontal disease (9). This is in agreement with Gilbert and Nuttall, they found that self-reporting of periodontal disease was not successful, as many people with some indications of periodontal disease appeared to be unaware of the disease (22).

We found in an earlier study that patients with clinically diagnosed foetor ex ore also suffered from periodontal disease (26), in contrast to this study in which bad breath reported by the patient did not indicate the presence of periodontal disease (Table 4). Self-reported bad breath in our study likely resulted from a significant amount of calculus combined with gingival inflammation. The combined effect might give patients an unpleasant taste in their mouth, which can be mistaken for clinical halitosis. Self-reported determination of calculus in epidemiological studies is of limited value as it is very difficult for patients to assess calculus level. This may partly arise from patients having little knowledge of calculus distribution in the mouth. The low clinical values of PLI, GI and BOP% in subjects with self-reported gingival recessions (Table 5) are probably the result of intense brushing of the teeth. Aching gingiva also seems to be connected to a large amount of calculus (Table 6). Self-reported gingival bleeding may be one of the most reliable indicators of the overall level of dental health (Table 7). This is in agreement with a cross-sectional study by Kallio of self-assessment of bleeding and plaque to monitor gingival health among adolescent. They found self-assessment of bleeding as a useful method for monitoring gingival health of populations (24). The study by Ng and Leung showed that experience of swollen gums, sore gums, receding gums, loose teeth, bad breath and toothache were associated with increased impact of periodontal disease (17). Self-reported bleeding of gums has been used in several earlier surveys, to study changes in oral health status and in epidemiological studies (7, 10, 22, 25). The validation of self-reported periodontal disease in several studies has been evaluated by Blicher et al., and they concluded that results varied across populations and self-reported measures (26). The result from our study shows that higher validity could be obtained by the use of combinations of selfreported questions and clinical data, this is in agreement with Blicher et al. (26). Additional studies are needed to evaluate the potential use of such self-reported measures. Valid selfreported measures would be useful for conducting survey research and for large-scale epidemiologic studies with limited resources.

Conclusions

Present study clearly shows that self-reported periodontal problems were confirmed by clinical assessments.

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References

- 1 Newell SA, Girgis A, Sanson-Fisher RW, Savolainen NJ. The accuracy of self-reported health behaviors and risk factors relating to cancer and cardiovascular disease in the general population: a critical review. *Am J Prev Med* 1999; **17**: 211–229.
- 2 Tormo MJ, Navarro C, Chirlaque MD, Barber X. Validation of self diagnosis of high blood pressure in a sample of the Spanish EPIC cohort: overall agreement and predictive values. EPIC Group of Spain. J Epidemiol Community Health 2000; 54: 221–226.
- 3 Gooch BF, Dolan TA, Bourque LB. Correlates of self-reported dental health status upon enrollment in the Rand Health Insurance Experiment. *J Dent Educ* 1989; **53**: 629–637.
- 4 Bakdash B. Oral hygiene and compliance as risk factors in periodontitis. J Periodontol 1994; 65(5 Suppl.): 539–544.
- 5 Soder PO, Jin LJ, Soder B, Wikner S. Periodontal status in an urban adult population in Sweden. *Community Dent Oral Epidemiol* 1994; 22: 106–111.
- 6 Axelsson G, Helgadottir S. Comparison of oral health data from self-administered questionnaire and clinical examination. *Community Dent Oral Epidemiol* 1995; 23: 365–368.
- 7 Joshipura KJ, Douglass CW, Garcia RI, Valachovic R, Willett WC. Validity of a self-reported periodontal disease measure. J Public Health Dent 1996; 56: 205–212.
- 8 Ankkuriniemi O, Ainamo J. Dental health and dental treatment needs among recruits of the Finnish Defence Forces, 1919–91. Acta Odontol Scand 1997; 55: 192–197.

- 9 Unell L, Soderfeldt B, Halling A, Paulander J, Birkhed D. Oral disease, impairment, and illness: congruence between clinical and questionnaire findings. *Acta Odontol Scand* 1997; 55: 127–132.
- 10 Brodeur JM, Payette M, Beniger M, Charbonneau A, Olivier M, Chabot D. Periodontal diseases among Quebec adults aged 35 to 44 years. J Can Dent Assoc 2001; 67: 34.
- 11 Buhlin K, Gustafsson A, Andersson K, Hakansson J, Klinge B. Validity and limitations of self-reported periodontal health. *Commu*nity Dent Oral Epidemiol 2002; **30:** 431–437.
- 12 Peek CW, Gilbert GH, Duncan RP, Heft MW, Henretta JC. Patterns of change in self- reported oral health among dentate adults. *Med Care* 1999; 37: 1237–1248.
- 13 Taani DQ, Alhaija ES. Self-assessed bleeding as an indicator of gingival health among 12–14-year-old children. *J Oral Rehabil* 2003; 30: 78–81.
- 14 Kallio P, Ainamo J, Dusadeepan A. Self-assessment of gingival bleeding. Int Dent J 1990; 40: 231–236.
- 15 Buhlin K, Gustafsson A, Hakansson J, Klinge B. Oral health and cardiovascular disease in Sweden. J Clin Periodontol 2002; 29: 254–259.
- 16 Howell TH, Ridker PM, Ajani UA, Hennekens CH, Christen WG. Periodontal disease and risk of subsequent cardiovascular disease in U.S. male physicians. J Am Coll Cardiol 2001; 37: 445–450.
- 17 Ng SK, Leung WK. Oral health-related quality of life and periodontal status. *Community Dent Oral Epidemiol* 2006; 34: 114–122.
- 18 Silness J, Loee H. Periodontal disease in pregnancy. II. Correlation between oral hygiene and periodontal condition. *Acta Odontol Scand* 1964; 22: 121–135.
- 19 Greene JC, Vermillion JR. The Simplified Oral Hygiene Index. J Am Dent Assoc 1964; 68: 7–13.
- 20 Loee H, Silness J. Periodontal disease in pregnancy. I. Prevalence and severity. Acta Odontol Scand 1963; 21: 533–551.
- 21 Andrews JA, Severson HH, Lichtenstein E, Gordon JS. Relationship between tobacco use and self-reported oral hygiene habits. *J Am Dent Assoc* 1998; **129**: 313–320.
- 22 Gilbert AD, Nuttall NM. Self-reporting of periodontal health status. Br Dent J 1999; 186: 241–244.
- 23 Soder B, Johansson B, Soder PO. The relation between foetor ex ore, oral hygiene and periodontal disease. *Swed Dent J* 2000; 24: 73–82.
- 24 Kallio P. Self-assessed bleeding in monitoring gingival health among adolescents. *Community Dent Oral Epidemiol* 1996; 24: 128–132.
- 25 Kononen M, Lipasti J, Murtomaa H. Comparison of dental information obtained from self-examination and clinical examination. *Community Dent Oral Epidemiol* 1986; 14: 258–260.
- 26 Blicher B, Joshipura K, Eke P. Validation of self-reported periodontal disease: a systematic review. J Dent Res 2005; 84: 881–890.

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