The HKU Scholars Hub   The University of Hong Kong   香港大學學術庫

Title	Oral health-related quality of life and periodontal status
Author(s)	Ng, SKS; Leung, WK
Citation	Community Dentistry And Oral Epidemiology, 2006, v. 34 n. 2, p. 114-122
Issued Date	2006
URL	http://hdl.handle.net/10722/55449
Rights	The definitive version is available at www.blackwell-synergy.com

Oral health-related quality of life and periodontal status

Sam K. S. Ng[1,2], W. Keung Leung[1]

[1]Faculty of Dentistry, The University of Hong Kong, [2]Department of Psychiatry, Tuen Mun

Hospital, Hong Kong SAR, China,

Running Title: Oral health-related QoL and periodontal status

Corresponding author:

W. Keung Leung

Faculty of Dentistry, The University of Hong Kong, Room 3B39, Prince Philip Dental

Hospital, 34 Hospital Road, Hong Kong SAR, China

Tel: +852-2859-0417

Fax: +852-2858-7874

E-mail: ewkleung@hkucc.hku.hk

Ng SKS, Leung WK. Oral health-related quality of life and periodontal status. Community Dent Oral Epidemiol

Abstract − As patient-centered approaches become more popular, increasing attention is being given to assess the effects of various human health situations on an individual's overall quality of life (QoL). Measures have been used in dentistry to study the effects of orthodontic treatment and oral surgery, but so far little has been reported about the effects of periodontal disease. *Objective:* This study assessed the impact of periodontal health status on QoL. *Methods:* A sub-sample of 767 subjects were selected from a community study (*n* = 1,000) which investigated the association between psychological factors and clinical periodontal attachment level (CAL). The sample included subjects with full mouth mean CAL ≤ 2mm (healthy/low periodontal attachment loss group), and subjects with full mouth mean CAL > 3mm (high/severe periodontal attachment loss group). The subjects were requested to complete the Chinese short-form version of Oral Health Impact Profile (OHIP-14S) and a checklist of self-reported periodontal symptoms during the previous 12 months. *Results:* 727 subjects (95%) completed the questionnaire. The OHIP-14S and subscales scores were significantly associated with 6/7 of the self-reported periodontal symptoms. A comparison of the mean OHIP-14S scores of the healthy/low and the high/severe periodontal attachment loss groups revealed significant differences in respect of the subscales of functional limitation, physical pain, psychological discomfort, physical and psychological disabilities. *Conclusion:* This study demonstrates a significant association between oral health-related quality of life and periodontal disease.

Address

W. Keung Leung

Faculty of Dentistry, The University of Hong Kong, Room 3B39, Prince Philip Dental

Hospital, 34 Hospital Road, Hong Kong SAR, China

Tel: +852-2859-0417

Fax: +852-2858-7874

E-mail: ewkleung@hkucc.hku.hk

Periodontal disease is a major oral health problem, which reportedly affects 15% to 17% of the adult population of Hong Kong, and 5% to 36% of the adult population of the United States (1, 2). Although there have been genuine advances in our understanding of the pathogenesis, prevention and treatment of periodontal disease in recent years, these advances have not been accompanied by a significant reduction in the prevalence and severity of periodontal disease (3, 4). The aetiology and pathogenesis of periodontal disease involves a complicated interplay between the plaque aetiological agents and various genetic and environmental risk factors, and its occurrence is often unpredictable (5). It therefore remains a major concurrent oral health problem.

Periodontal disease has recently been found to be associated with altered systemic health conditions, such as cardiovascular disease, respiratory diseases and diabetes (6-8). Patients with diabetes and osteoporosis (8, 9) are more likely to suffer from periodontal disease. Patients with periodontal disease are also more likely to suffer systemic problems such as cardiovascular problems, ischemic stroke, and adverse pregnancy outcomes (10, 11). Other known periodontal disease risk factors include smoking (12, 13) and psychosocial conditions such as stress and impaired coping (13, 14).

The severity of periodontal disease is usually documented by research clinicians using clinical parameters such as bleeding on probing (BOP), probing pocket depth (PPD), and clinical attachment level (CAL). However, other symptoms of periodontal disease include

the consequences of chronic inflammation and the destruction of tooth supporting tissues, such as redness, bleeding on brushing, loosening of affected teeth, and persistent bad breath. These symptoms are not normally documented in a research report. Such symptoms, however, are highly relevant from the patients' point of view and often have a considerable adverse impact on their daily quality of life (QoL) (15). This is an area which deserves further study.

There has been considerable debate on the use of traditional outcome indicators in periodontal therapy. Hujoel et al. (16) commented that these are no more than just surrogate markers. Such indications are also therapist-centered. Studies have recently begun to explore in a broader perspective the relationship between various satisfaction factors and periodontal treatment; in other words, patient-centered outcomes (17-21). This emphasis on QoL is consistent with the concept that health is a resource and not simply the absence of disease (22). Interest in the idea of 'quality of life' is growing rapidly. More than 1,000 new articles are indexed each year under this heading (23). Studies with QoL as outcome measures have been reported in areas such as oral surgery and orthodontics (24, 25). There is increasing agreement among dentists that patients' perceptions should be included in the decision-making process to provide a more comprehensive evaluation of the value and effectiveness of third molar surgery. Needleman et al. (26) explored the impact of oral health on QoL in a group of referred periodontal patients. Little has been reported, however,

about the impact on oral health-related QoL associated with periodontal health or disease in general.

A better understanding of the consequences of periodontal disease and its treatment on patients' perceptions of how their oral health affects their daily lives can help to ensure that the planning and evaluation of periodontal care and treatment adequately addresses patients' needs and concerns. (27, 28). The use of patient-centered measures in dentistry is increasing. A number of instruments have emerged with promising psychometric properties (28, 29).

The aim of this study was to assess the impact of periodontal status on oral health-related QoL. The working hypothesis is that subjects with a high level of clinical attachment loss would have inferior oral health-related QoL.

Material and Methods

Sample

All subjects were selected from a community study conducted at the University of Hong Kong which investigated the associations between psychological factors and clinical periodontal attachment level (14). The study attempted to investigate the association of stress with periodontal disease, making reference to the various components of stress process including stressors, stress responses, coping behaviour, and personality factors (13, 14). The study included a clinical assessment of periodontal status, primarily the clinical

attachment level (CAL) which serves to give an estimation of the historical amount of periodontal destruction in a given patient, of a cross-section sample of 1,000 subjects of 25-64 years. Subjects were recruited from patients attending private general dental clinics and people responding to the advertisement posted in these clinics. A set of 7 psychosocial questionnaires were employed in exploring the association between periodontal status and various psychological variables. Details of the community study and its recruitment procedure was as described in an earlier report (14).

To focus attention on the influence of periodontal conditions on QoL, we sought to compare individuals at the upper and lower ends of the spectrum of periodontal attachment loss severity. A total of 767 subjects were selected from the cross-sectional sample, with either a mean full mouth CAL of ≤ 2mm (healthy/low periodontal attachment loss group), or of > 3mm (high/severe periodontal attachment loss group). The classification of periodontal attachment loss severity was the same as that used by Genco et al. (13).

Data collection

The data collected in the clinical examination included the number of teeth present, the number of caries teeth, the number of occluding pairs (premolars and molars), the number of anterior teeth present (upper and lower, canine to canine), and the measurement of recession (REC) and probing pocket depth (PPD) after dental prophylaxis (30) at six sites on each tooth.

The periodontal parameters have been reported in greater detail elsewhere (14). Several tooth-sites were excluded from the examination: impacted teeth, retained roots, grossly broken down teeth, teeth which were too inaccessible to examine satisfactorily, and teeth whose cemento-enamel junction (CEJ) was indeterminable on clinical examination. REC, PPD and CAL were measured by a modified version of the procedure described by Pilgram et al. (30). REC was measured from the CEJ to the gingival margin, with a positive value if there was recession and a negative value in the absence of recession; while CAL was calculated by summation of PPD and REC. Details of the examination method, standardization and assessment of reliability was described in an earlier report (14).

The Chinese short-form version of the Oral Health Impact Profile (OHIP-14S) and a checklist of self-reported periodontal signs and symptoms were sent by mail to the subjects. A covering letter explaining the purpose and procedures of the study and an informed consent were attached. Demographic data were retrieved directly from the database of the community study.

The impact of oral health on patients' QoL was assessed using the Chinese version of OHIP-14S (31, 32). This is a patient-centered outcome measure based on the World Health Organization's 'disease-impairment-disability-handicap' model. OHIP-14S is one of the most comprehensive instruments available. It is a self-completed questionnaire consisting of 14 items subdivided into seven domains (subscales): functional limitation, physical

discomfort, psychological discomfort, physical disability, psychological disability, social disability, and handicap. These seven conceptual domains were derived from the oral health model described by Locker (15). The instrument's psychometric properties, validity and reliability have been assessed, and good results were obtained (32, 33).

Subjects were asked how frequently they had experienced negative impacts in these respects in the preceding 12 months. Responses to the items were recorded in a 5-point Likert scale: 0 = never; 1 = hardly ever; 2 = occasionally; 3 = fairly often; 4 = very often. In addition, subjects were asked to complete a simple yes/no checklist of symptoms relating to their periodontal health in the past year. They were asked if they had experienced either swollen gums, sore gums, receding gums, loose teeth, drifting teeth, bad breath, or toothache.

Data analysis

Scores were derived from the OHIP-14S by summating the responses on the Likert scales to each of the individual questions. Possible OHIP-14S scores ranged from 0 ('no problems at all') to 56 ('all problems experienced very often'). The unweighted OHIP-14S and subscales scores were used in this study, as the weighted and unweighted OHIP scores in both the long and the short form of the OHIP had similar psychometric performance (34).

Variations in mean OHIP-14S and subscales scores against self-reported periodontal

health (symptoms of periodontal disease) were explored through bivariate analysis employing t-tests for independent samples. Association between OHIP-14S and the socio-demographic data of gender, income and education was evaluated with correlation analysis. These items have been shown to correlate significantly with oral-health related QoL (35). Analysis of covariance was employed to examine the differences in OHIP-14S and subscales scores between the different periodontal statuses (healthy/low periodontal attachment loss group versus high/severe periodontal attachment loss group) after adjustment for possible confounding factors. The correlation between the number of caries teeth, occluding pairs, anterior teeth present and oral-health related QoL was also examined, as these may affect subjects' ability to eat/chew and personal appearance. Data was analyzed using the statistical package SPSS 12.0. The level of significance was set at 0.05 for all tests.

Results

727 of the 767 subjects selected from the cross-sectional sample completed the questionnaires, an overall response rate of 94.7%. The demographic characteristics of the subjects are shown in Table 1. More than two-thirds of the surveyed subjects had at least a secondary education. More than half of the sample reported a monthly household income above HK$10,000 (US$1.00 = HK$7.80). About a quarter of the sample had regular annual

dental check-ups and preventive care. The subjects had a mean of 26 teeth (range 5-32) comprising Healthy/Low CAL subjects with mean 28 teeth (range 18-32) and high/severe CAL subjects with mean 17 teeth (range 5-26).

The distribution of responses according to the items of OHIP-14S is shown in Table 2. The impact of oral health on the life quality of the patients was considerable, in terms of causing functional limitation, physical pain, and physical disability. More than one-tenth of the subjects perceived that they had functional limitation, physical pain or disability fairly or very often.   In other words, they had difficulty chewing, found it uncomfortable to eat, or could not taste their food properly, because of problems with their teeth, mouth, or dentures. The prevalence of negative impact on the psychological domains (discomfort and disability) varied between 4.0% to 6.3%. The impact on the domains of social disability and handicap was less prevalent.

The distributions of subjects with respect to the OHIP-14S and individual subscales were skewed with more subjects scoring lower (Table 2). The mean scores and internal consistency for the OHIP-14S and individual subscales are shown in Table 3. Cronbach's alpha for OHIP-14S and individual subscales were 0.94 or 0.73 – 0.88, respectively.

Subjects' oral health-related QoL was associated with the self-reported periodontal symptoms over the past 12 months. About one-sixth of the subjects reported symptoms of sore gums and receding gums.   Only a small number of subjects reported drifting teeth

(less than 10%) (Table 4). The OHIP-14S score was significantly associated with occurrences of swollen gums, sore gums, receding gums, loose teeth, bad breath, and toothache in the previous year (Table 4). The experience of drifting teeth was not significant.

A statistically-significant correlation was detected between the OHIP-14S score with education (-0.23, $P < 0.001$) and number of teeth present (-0.45, $P < 0.001$), but no significant association was detected in respect of gender, number of caries teeth, income, number of anterior teeth or occluding pairs. A comparison of the mean scores of the OHIP-14S and individual subscales between the subjects of healthy/low periodontal attachment loss group versus high/severe periodontal attachment loss group, before and after adjustment for age, the effects of education and number of teeth present, is shown in Table 5. The differences were significant in the total score and the domains of functional limitation, physical pain, psychological discomfort, physical disability, and psychological disability. The differences in social disability and handicap subscales were not significant.

Discussion

Quality of life is increasingly acknowledged as a valid, appropriate and significant indicator of service need and intervention outcomes in contemporary public health research and practice. Health-related QoL measures, including objective and subjective assessments, are

especially useful for evaluating efforts to prevent disabling chronic diseases and assessing their effectiveness (36). Assessing the consequences of impaired oral health from the patient's perspective has emerged as an important research area (37). This has led to an increase in the use of patient-centered oral health status measures, primarily attempting to measure the impact of oral health on QoL (38).

A study by Needleman et al. (26) attempted to explore the impact of oral health on QoL in periodontal patients. However, its sample was confined to referred periodontal patients attending a private periodontal practice. Accordingly, periodontal status was found to have a significant impact on QoL. The lack of a control sample of subjects limited the extent to which these findings could be generalized to a larger population.

The present study attempted to explore the difference in QoL in subjects with various periodontal conditions. The criterion variable of full mouth mean clinical attachment level (CAL) was not intended as an indication for treatment, nor a direct and specific parameter in measurement of disease severity. Nevertheless, it provided a valid estimate of the historical amount of periodontal destruction in a given patient (39, 40). Making use **of** the sub-sample in the community study of psychological factors contributing to periodontal disease (14), it allowed a broad variation in periodontal condition to be studied. The potential for difference in CAL at vary vulnerable sites between individual might theoretically influence the QoL of the corresponding subject in varying extend. A bigger

sample size, however, would be needed for such purpose considering the present results from functional limitation, physical pain, physical disability, handicap items of OHIP-14S.

Three-quarters of the subjects reported that they had not visited a dentist for at least a year, except to seek treatment for a specific dental problem.   This indicated that most of the individuals surveyed were non-regular attenders, and this was in line with earlier reports (41, 42).   It was assumed that roughly the same proportion of the individuals surveyed with periodontal attachment loss had not had their periodontal disease properly treated or controlled.

As the analysis of QoL was based on self-reported questionnaires, the validity of the instrument was important. Since its development in 1994 (31), the applications of OHIP in research and public health care practice have empirically substantiated its appropriate validity and sensitivity to the disease-related attributes. Establishment of goodness of fit of the collected data of the studied population to the hypothetical structure of instrument used is important. The Cronbach coefficients of the OHIP-14S and subscales were high (Table 3). In fact, the lowest Cronbach recorded (0.73) was from the handicap subscale. These high correlations indicated that items being used and constructed from the hypothetical constellation of items of each subscale measured a common factor and had reasonably satisfactory convergent validity when applied in the present sample of subjects.

Variations in oral health impact on QoL in relation to self-reported symptoms of

periodontal diseases were apparent (Table 4). Experiences of swollen gums, sore gums, receding gums, loose teeth, bad breath, and toothache were associated with increased impact. This also added further to the discriminant validity of the instrument in differentiating subjects with different self-reported periodontal status. Discriminative ability is an important issue of patient-centered measures so as to ensure that they are sensitive and responsive in assessing the consequence of periodontal disease, identifying treatment needs, and completion of care (43).

Besides validity and reliability, issues concerning the cultural specificity of health-related self-reported measures have been discussed by various researchers (44, 45). Impact due to the socio-demographic parameters of age, gender and social class are culture-sensitive. The impacts of gender and social class on oral-health related QoL have been demonstrated in a study of its association with dental anxiety in the United Kingdom, accounting for about 18% of the variance of the total score (35). The current research regarding the Chinese cohort studied demonstrated social class, in term of educational level, was associated with the OHIP-14S score while gender did not. The variance due to age, education and number of standing teeth were therefore adjusted in the present study to control for possible confounding effects.

The impact of oral health on the QoL of the subjects was appreciable, 22% (157/727) reported that their oral health status impacted on their QoL in one or more ways (i.e. scores

of 'fairly often' or 'very often' in one or more of the OHIP-14S items). Oral health status was frequently perceived as impacting on QoL because it affected feeling (by making food taste worse), led to physical pain (by making food uncomfortable to eat), and resulted in physical disability (by interrupting meals). This draws attention to the influence of periodontal condition on daily life and its significance for overall QoL.

Clinical periodontal status was significantly associated with oral health-related quality of life. Those with full mouth mean CAL above 3mm (i.e. high/severe periodontal attachment loss group) scored significantly higher on the impact of oral health on their QoL in the OHIP-14S and various subscales, except on the social disability and handicap subscales. That is, people might perceive that their social functions and overall satisfaction with life would not be significantly affected because of their oral health status. The low prevalence of negative impact in these two subscales with respect to the overall study sample might help account for the insignificant results. Many local Chinese, as reflected in the utilization of dental care pattern (Table 1), tend to pay little attention to dental care and fail to anticipate the need for treatment and maintenance care (42). The overall OHIP-14S score demonstrated a significant difference in subjects of different periodontal status. After all, the population studied was derived from a community sample (14). The generalizability of present findings would be considered as satisfactory.

In comparison with the study conducted by Needleman et al. (26), findings in the

present study differed in that the social disability and handicap domains of the QoL were not associated with periodontal attachment loss. The periodontal attachment loss in the subjects of the present study, based on a community sample, can be expected to be less severe than in a sample of patients attending a referral periodontal practice. It appeared to be the case even the low use of dental services among the study population would potentially increase their disability and handicap. Furthermore, the scores of the subscales of these two particular domains were relatively small (Table 3) and probably failed to register the difference. Cultural specificity may also be one of the reasons accounting for the difference. The relatively low utilization of preventive and maintenance dental health care in the local population (Table 1) probably reflects the perceived importance of oral health condition in its social context.

In conclusion, there exists a significant difference between oral health-related QoL in predominantly non-regular dental attenders of different periodontal status as assessed using the OHIP as a QoL measure. Those with better periodontal condition, i.e. with minimal history of periodontal destruction, are more likely to have a better QoL, and vice versa. This is the first scientific study to demonstrate that periodontal destruction can directly affect QoL. The instrument demonstrated discriminative validity in identifying individuals with self-reported symptoms associated with periodontal diseases and those with clinical evidence of accumulated periodontal destruction. These findings have significant

implications for the employment of patient-centered outcome measures as objective clinical parameters of periodontal disease in assessment, planning and provision of treatment, and subsequent evaluation of care. Periodontists perhaps need to utilize this tool to evaluate if successful therapist-centered outcome co-relates with patient-centered outcome. Greater understanding of the difference in oral health that exists between periodontally healthy versus periodontally compromised patients beyond clinical parameters is important because it will provide an insight into the consequence of periodontal problems for patients' daily life and QoL, as well as illustrating the need for addressing these disparities. Further research is also recommended to assess whether the measure of oral health-related quality of life as a patient-centered outcome is sensitive to changes in clinical periodontal status over time and also at the level of the individual.

Acknowledgement

Reference

1. Holmgren CJ, Corbet EF, Lim LP. Periodontal conditions among the middle-aged and the elderly in Hong Kong. Community Dent Oral Epidemiol 1994;22:396-402.

2. Oliver RC, Brown LJ, Loe H. Periodontal diseases in the United States population. J Periodontol 1998;69:269-78.

3. Downer MC. The changing pattern of dental disease over 50 years. Br Dent J 1998;185:36-41.

4. Albandar JM, Brunelle JA, Kingman A. Destructive periodontal disease in adults 30 years of age and older in the United States, 1988-1994. J Periodontol 1999;70:13-29.

5. Page RC, Kornman KS. The pathogenesis of human periodontitis: an introduction. Periodontol 2000 1997;14:9-11.

6. Hujoel PP, Drangsholt M, Spiekerman C, DeRouen TA. Periodontal disease and coronary heart disease risk. J Am Med Assoc 2000;284:1406-10.

7. Scannapieco FA, Ho AW. Potential associations between chronic respiratory disease and periodontal disease: analysis of National Health and Nutrition Examination Survey III. J Periodontol 2001;72:50-6.

8. Soskolne WA, Klinger A. The relationship between periodontal diseases and diabetes: an overview. Ann Periodontol 2001;6:91-8.

9. Wactawski-Wende J, Grossi SG, Trevisan M, Genco RJ, Tezal M, Dunford RG, et al. The role of osteopenia in oral bone loss and periodontal disease. J Periodontol 1996;67:1076-84.

10. Offenbacher S, Katz V, Fertik G, Collins J, Boyd D, Maynor G, et al. Periodontal infection as a possible risk factor for preterm low birth weight. J Periodontol 1996;67:1103-13.

11. Scannapieco FA, Bush RB, Paju S. Associations between periodontal disease and risk for atherosclerosis, cardiovascular disease, and stroke. A systematic review. Ann

Periodontol 2003;8:38-53.

12. Haber J, Kent RL. Cigarette smoking in a periodontal practice. J Periodontol 1992;63:100-6.

13. Genco RJ, Ho AW, Grossi SG, Dunford RG, Tedesco LA. Relationship of stress distress and inadequate coping behaviors to periodontal disease. J Periodontol 1999;70:711-23.

14. Ng SKS, Leung WK. A community study on the relationship of stress, coping, affective dispositions and periodontal attachment loss. Community Dent Oral Epidemiol accepted CDOE 05/52R.

15. Locker D. Measuring oral health: a conceptual framework. Community Dental Health 1988;5:3-18.

16. Hujoel PP, Leroux BG, DeRouen TA, Powell LV, Kiyak HA. Evaluating the validity of probing attachment loss as a surrogate for tooth mortality in a clinical trial on the elderly. J Dent Res 1997;76:858-66.

17. Whitehead SP, Watts TL. Short-term effect of Keyes' approach to periodontal therapy compared with modified Widman flap surgery. J Clin Periodontol 1987;14:599-604.

18. Kalkwarf KL, Kaldahl WB, Patil KD. Patient preference regarding 4 types of periodontal therapy following 3 years of maintenance follow-up. J Clin Periodontol 1992;19:788-93.

19. Matthews DC, McCulloch CAG. Evaluating patient perceptions as short-term outcomes of periodontal treatment - a comparison of surgical and non-surgical therapy. J Periodontol 1993;64:990-7.

20. Fardal O, Johannessen AC, Linden GJ. Patient perceptions of periodontal therapy completed in a periodontal practice. J Periodontol 2002;73:1060-6.

21. Lee JM, Song KB, Sohn HY, Jeong SH, Kwon HK. Comparison between patient expectation before and satisfaction after periodontal surgical treatment. J Periodontol 2002;73:1037-42.

22. Public Health Service. Healthy people 2000: national health promotion and disease prevention objectives. Washington, DC: US Department of Health and Human Services, Public Health Service; 1990.

23. Muldoon MF, Barger SD, Flory JD, Manuck SB. What are quality of life measurements measuring? Br Med J 1998;316:542-5.

24. Cunningham SJ, Hunt NP. Quality of life and its importance in orthodontics. J Orthod 2001;28:152-8.

25. McGrath C, Comfort MB, Lo ECM, Luo Y. Can third molar surgery improve quality of life? A 6-month cohort study. J Oral Maxillofac Surg 2003;61:759-63; discussion 764-5.

26. Needleman I, McGrath C, Floyd P, Biddle A. Impact of oral health on the life quality of periodontal patients. J Clin Periodontol 2004;31:454-7.

27. McGrath C, Bedi R. The value and use of 'quality of life' measures in the primary dental care setting. Prim Dent Care 1999;6:53-7.

28. Allen PF. Assessment of oral health related quality of life. Health Qual Life Outcomes 2003;1:40. Available at: http://www.hqlo.com/content/1/1/40.

29. Slade GD, editor: Measuring Oral Health and Quality of Life. Chapel Hill, NC: University of North Carolina, Dental Ecology; 1997.

30. Pilgram TK, Hildebolt CF, Yokoyama-Crothers N, Dotson M, Cohen SC, Hauser JF, et al. Relationships between radiographic alveolar bone height and probing attachment level: data from healthy post-menopausal women. J Clin Periodontol 2000;27:341-6; Erratum in: J Clin Periodontol 2004;31:75.

31. Slade GD, Spencer AJ. Development and evaluation of the Oral Health Impact Profile. Community Dent Health 1994;11:3-11.

32. Wong MC, Lo ECM, McMillan AS. Validation of a Chinese version of the Oral Health Impact Profile (OHIP). Community Dent Oral Epidemiol 2002;30:423-30.

33. Slade GD. Derivation and validation of a short-form oral health impact profile. Community Dent Oral Epidemiol 1997; 25:284-90.

34. Allen PF, Locker D. Do item weights matter? An assessment using the oral health impact profile. Community Dent Health 1997;14:133-8.

35. McGrath C, Bedi R. The association between dental anxiety and oral health-related quality of life in Britain. Community Dent Oral Epidemiol 2004;32:67-72.

36. Hennessy CH, Moriarty DG, Zack MM, Scherr PA, Brackbill R. Measuring health-related quality of life for public health surveillance. Public Health Rep 1994;109:665-72.

37. Buck D, Newton JT. Non-clinical outcome measures in dentistry: publishing trends 1988-98. Community Dent Oral Epidemiol 2001;29:2-8.

38. Birch S, Ismail AI. Patient preferences and the measurement of utilities in the evaluation of dental technologies. J Dent Res 2002;81:446-50.

39. Locker D, Leake JL. Risk indicators and risk markers for periodontal disease experience in older adults living independently in Ontario, Canada. J Dent Res 1993;72:9-17.

40. Greenstein G. Contemporary interpretation of probing depth assessments: Diagnostic and therapeutic implications. A literature review. J Periodontol 1997;68:1194-205.

41. Schwarz E, Lo ECM. Dental health knowledge and attitudes among the middle-aged and the elderly in Hong Kong. Community Dent Oral Epidemiol 1994;22:358-63.

42. Dental Service Head Office. Oral health survey 2001: common dental diseases and oral health related behaviour. Hong Kong SAR: Department of Health; 2002.

43. Weintraub JA. Uses of oral health related quality of life measures in public health. Community Dent Health 1998;15:8-12.

44. Allison P, Locker D, Jokovic A, Slade G. A cross-cultural study of oral health values. J Dent Res 1999;78:643-9.

45. Corless IB, Nicholas PK, Nokes KM. Issues in cross-cultural quality-of-life research. J Nurs Scholarsh 2001;33:15-20.

Table 1   Demographic characteristics of subjects ($n = 727$)

Demographic Characteristics	n	Percentage (%)
Gender		
Male	342	47.0
Female	385	53.0
Age in Years		
25 to 34	229	31.5
35 to 44	256	35.2
45 to 54	161	22.1
55 to 64	81	11.2
Marital Status		
Never Married	254	34.9
Married	400	55.0
Separated/Divorced	48	6.6
Widowed	25	3.4
Education		
None/Pre-school	23	3.2
Primary	148	20.4
Secondary	431	59.3
Tertiary (Non-Degree)	35	4.8
University Degree or above	90	12.4
Household Income (in Hong Kong Dollars)[a]		
Less Than $4,999	73	10.9
$ 5,000 - $ 9,999	202	30.2
$ 10,000 - $ 14,999	173	25.9
$ 15,000 - $ 19,999	93	13.9
$ 20,000 - $ 24,999	53	7.9
$ 25,000 - $ 29,999	23	3.4
More Than $ 30,000	52	7.8
Time of last dental visit		
1 year or less		
for check-up and professional cleaning	178	24.5
for dental problem	83	11.4
1 to 3 years	229	31.5
More than 3 years	185	25.4
Never visited dentist	45	6.2
Could not remember	7	1.0

^aTotal number = 669; 58 subjects refused to disclose income details; US$ 1.00 = HK$ 7.80.

Table 2   Distribution of OHIP-14S individual items response

	never		hardly ever		occasionally		Fairly/very often[a]	
	n	%	*n*	%	*n*	%	*n*	%
Functional limitation								
Difficulty chewing	253	34.8	252	34.7	98	13.5	124	17.1
Trouble pronouncing words	276	38.0	339	46.6	65	8.9	47	6.5
Physical pain								
Uncomfortable to eat	252	34.7	262	36.0	130	17.9	83	11.4
Sore spots	376	51.7	203	27.9	116	16.0	32	4.4
Psychological discomfort								
Worried	470	64.6	197	27.1	26	3.6	34	4.7
Miserable	505	69.5	105	14.4	71	9.8	46	6.3
Physical disability								
Less flavour in food	406	55.8	151	20.8	63	8.7	107	14.7
Interrupt meals	409	56.3	183	25.2	77	10.6	58	8.0
Psychological disability								
Upset	432	59.4	172	23.7	91	12.5	32	4.4
Been embarrassed	426	58.6	179	24.6	93	12.8	29	4.0
Social disability								
Avoid going out	620	85.3	80	11.0	20	2.8	7	1.0
Trouble getting on with others	632	86.9	70	9.6	16	2.2	9	1.2
Handicap								
Unable to function	657	90.4	50	6.9	16	2.2	4	0.6
Unable to work	658	90.5	37	5.1	18	2.5	14	1.9

[a]subjects with negative impacts.

Table 3   Mean scores and internal consistency for OHIP-14S and individual subscales

	Mean Scores (±SD)	Range	Internal Consistency (Cronbach's α)
Functional limitation	1.99 ± 1.92	0 - 8	0.77
Physical pain	1.82 ± 1.88	0 - 8	0.88
Psychological discomfort	1.02 ± 1.69	0 - 8	0.88
Physical disability	1.54 ± 2.08	0 - 8	0.79
Psychological disability	1.25 ± 1.76	0 - 8	0.85
Social disability	0.38 ± 1.09	0 - 8	0.81
Handicap	0.29 ± 1.01	0 - 7	0.73
OHIP-14S	8.31± 10.76	0 - 55	0.94

Table 4   Self-reported symptoms of periodontal disease over preceding 12 months and quality of life

		OHIP-14S scores	
	n	(Mean ± SD)	*P* - value[a]
Swollen gums			
yes	67	12.82 ± 5.09	< 0.01
no	660	7.85 ± 7.07	
Sore gums			
yes	118	12.28 ± 4.97	< 0.01
no	609	7.54 ± 6.97	
Receding gums			
yes	125	12.72 ± 6.66	< 0.01
no	602	7.39 ± 6.49	
Loose teeth			
yes	84	13.77 ± 5.77	< 0.01
no	643	7.60 ± 6.54	
Drifting teeth			
yes	44	14.57 ± 6.18	N.S.
no	683	7.91 ± 6.31	
Bad breath			
yes	67	15.52 ± 5.40	< 0.01
no	660	7.58 ± 6.75	
Toothache			
yes	95	9.83 ± 5.36	< 0.01
no	632	8.08 ± 6.83	

[a]*t* – test.

Table 5 Unadjusted scores (Mean ± SD) and adjusted scores (Mean ± SE) of OHIP-14S and individual subscales of subjects in the two levels of CAL severity

	Periodontal attachment loss[a]					
	Unadjusted Scores (Mean ± SD)		Adjusted Scores (Mean ± SE)			
	Healthy/Low	High/Severe	Healthy/Low	High/Severe	Statistics	
	($n = 584$)	($n = 143$)	($n = 584$)	($n = 143$)	F^{b}	P- value
Functional limitation	1.22 ± 0.51	5.14 ± 1.42	1.11 ± 0.44	5.41 ± 1.24	6.72	<0.01
Physical pain	1.04 ± 0.53	4.76 ± 1.27	0.96 ± 0.43	4.86 ± 1.26	6.13	<0.05
Psychological discomfort	0.35 ± 0.39	3.78 ± 1.23	0.32 ± 0.37	3.95 ± 1.12	4.36	<0.05
Physical disability	0.64 ± 0.57	5.23 ± 1.28	0.59 ± 0.43	5.33 ± 1.23	5.43	<0.05
Psychological disability	0.50 ± 0.51	4.32 ± 1.20	0.45 ± 0.40	4.38 ± 1.09	4.28	<0.05
Social disability	0.37 ± 0.74	0.42 ± 0.59	0.35 ± 0.73	0.45 ± 0.57	2.22	0.14
Handicap	0.28 ± 0.60	0.33 ± 0.52	0.26 ± 0.56	0.34 ± 0.51	2.32	0.13
OHIP-14S	4.41 ± 2.74	24.19 ± 7.04	3.78 ± 2.25	25.09 ± 5.94	4.24	<0.05

[a]CAL categories (mean full mouth CAL): healthy/low = 0 to 2.0 mm; high/severe > 3.0 mm (13).

[b]Adjusted for age, education and number of teeth; ANCOVA.