Copyright by Quintessence Not for Publication

Oral Health-Related Quality of Life and its Associated Factors in an Indian Adult Population

Shashidhar Acharya[a]

Purpose: The objectives of this study were to describe oral health-related quality of life (OHRQoL) and its associated factors in an Indian adult population.

Materials and Methods: Four hundred and fourteen general dental patients completed the Indian translations of the oral health impact profile (OHIP)-14 and the general health questionnaire (GHQ)-12 through personal interviews. A clinical examination was also performed for dental caries, gingivitis and plaque levels.

Results: Sufficient reliability ($\propto$ = 0.85) and construct validity were demonstrated for the questionnaire. The mean decayed, missing or filled teeth of the study population was 6.93 and the mean gingival index and plaque index scores were 1.07 and 1.06, respectively. Caries status and the number of missing teeth were found to be significantly correlated with most of the subdomains of the OHIP-14. The GHQ-12 scores were also significantly correlated with the 'functional limitation' and 'psychological disability' domains of the OHIP-14. Higher OHIP-14 scores were associated with higher dental anxiety. Females perceived a higher sense of 'social handicap' and 'handicap' due to their oral status than males. It was also found that patients with caries and missing teeth had higher GHQ-12 scores.

Conclusions: The results of this study showed that caries status, psychological distress and dental anxiety had an important effect on the OHRQoL.

Key words: behavioural sciences, India, oral health-related quality of life, reliability, validity

Oral Health Prev Dent 2008; 6: 175–184. *Submitted for publication: 22.05.07; accepted for publication: 02.08.07.*

The concept of quality of life (QoL) has been investigated from several aspects. In 1977, Index Medicus accepted it as a scientific concept, and it was later accepted by the World Health Organization (WHO). QoL has been described as a multidimensional concept including physical, emotional, social and other factors (Bech, 1992; Parmenter, 1994; Sorensen and Naess, 1996). It has been defined by Schipper et al (1990) as the functional effect of an illness and its consequent therapy upon a patient, as perceived by the patient, or as an individual's overall satisfaction with life and general sense of personal well-being (Shumaker et al, 1990).

QoL, in relation to oral conditions pertaining to problems with eating, nutrition, social interaction, emotional and psychological functioning, as well as the idea that discomfort, disability and oral impairments of various kinds have social and economic impacts has been described in the literature by Reisine and Miller (1986), Locker (1989), Reisine et al (1989) and Adulyanon et al (1996). Reisine and Miller (1986) determined that the oral impact on QoL can be important for both the individual and the society. Several instruments measuring oral health-related quality of life (OHRQoL) have been developed and evaluated by various authors such as Slade and Spencer (1994), Leao and Sheiham (1996), Slade (1997), McGrath and Bedi (2001), Slade et al (1998) and Allen and Locker (2002).

[a] *Department of Community Dentistry, Manipal College of Dental Sciences, Manipal University, Manipal 576104, India.*

Correspondence: *Shashidhar Acharya, 1-2-50 B, 'Bhagyashree', Kunjibettu, Udupi, Karnataka 576102, India. Tel: +91 820 2527031. Web: www.manipal.edu/cod. Email: shashidhar_acharya@yahoo.com*

Copyright by Quintessence Not for distribution

The oral health impact profile (OHIP) developed by Locker and Miller (1994) is a well-known method for identifying dimensions in OHRQoL, as it is one of the most sophisticated and popular instruments for measuring OHRQoL. It measures the individual's perception of the social impact of oral disorders on their well-being. OHIP-49 contains 49 questions that capture seven conceptually formulated dimensions based on Locker's theoretical model of oral health, given by Locker (1988) and adapted from the WHO's framework used to classify impairments, disabilities and handicaps (World Health Organization, 1980). The OHIP-14 was developed by Slade (1997) as a shorter version of the OHIP for settings where the full battery of 49 questions were inappropriate. It has emerged as a powerful tool in the assessment of OHRQoL, and consists of 14 items organised in seven subscales that address aspects of oral health that may compromise a person's physical, psychological and social well-being.

A considerable body of evidence now exists on the validity and reliability of the OHIP-14 in a number of hospital settings and dental conditions, including surgical removal of impacted molars (McGrath et al, 2003a, b), elderly partially edentulous and complete edentulous patients seeking dental rehabilitation (Locker et al, 2001) and oral lichen planus (Hegarty et al, 2002).

The OHIP-14 has been extensively translated and modified in different countries and cultures alike; in Germany by John et al (2002), in China by Wong et al (2002), in Sri Lanka by Ekanayake and Perera (2003) and in Sweden by Larsson et al (2004). The scientific advisory committee of the medical outcomes trust (2002) has specifically mentioned that cultural and language adaptation is an important attribute of a QoL instrument.

According to Cooper (1996), stress is an unavoidable part of an individual's working life, that poses a threat to the QoL, as well as the physical and psychological well-being. Stress has been shown to adversely affect oral health. Marcenes and Sheiham (1992) reported a significant association between poor periodontal status and high work demands and a poor marital relationship. Marcenes et al (1993) reported a significant association between marital or family problems and oral symptoms, after adjustment for other variables. Freeman and Goss (1993) revealed a significant correlation between occupational stress and type A personality with increased pocket depth. They also suggested that psychological stress may down-regulate the periodontal cellular immune response. Findings from preliminary studies supported the existence of a positive correlation between psychological stress and periodontal disease. However, few studies have analysed psychological distress as a possible variable in OHRQoL.

Documenting variations in OHRQoL in a population provides important information for the evaluation of oral healthcare. The oral disease burden in India is showing a steady increase in recent years. The findings of the recent National Oral Health Survey conducted by the Dental Council of India (2002 to 2003) reported the caries prevalence among adults in India between 80% and 85% with the mean decayed, missing or filled teeth (DMFT) ranging from 5.4 to 14.9 among different regions. Similarly, the prevalence of periodontal disease among adults was reported at 80 to 90%. Although numerous studies on OHRQoL and its associated factors in adult populations have been reported from many developed and developing countries, no such studies have been reported from India. The objectives of this study were to describe OHRQoL and its associated factors in an Indian adult population.

MATERIALS AND METHODS

Subjects

This study was carried out among a convenience sample of general dental patients who reported to the comprehensive dental care centre of the department of community dentistry, Manipal College of dental sciences, Manipal, India. The dental centre caters for the population of the towns and villages of the Udupi District. The patient population reporting to the centre was predominantly rural (as is the population of India) and of middle class and lower middle class origin. Ethical clearance was obtained from the ethical committee of the university prior to the study. All patients (consecutive attendees) who reported to the centre and provided informed consent for the study were included. The patients were recruited in the waiting area before their appointment. Persons below the age of 18 and edentulous patients were excluded from the study.

Assessment measures

Two psychometric questionnaires were used; the OHIP-14 questionnaire that asked about problems patients might have encountered with their teeth, mouth or dentures during the previous year and the GHQ-12 questionnaire as well as one history

Copyright by Quintessence Not for publication

form. The GHQ-12, a widely applied instrument used to indicate psychological distress, is the short form of the GHQ designed by Goldberg (1970) as a self-administered instrument for use in community settings. The GHQ-12 is designed to detect possible psychiatric morbidity in the general population. The questionnaire was based on 12 questions inquiring the informants about their general level of happiness, depression, anxiety and sleep disturbance over the previous 4 weeks. The Likert method was used in this study where values of 0 to 3 were assigned to the columns (total score range 0 to 36) with a higher score indicating greater distress.

The history form collected the general information about the age, sex and dental anxiety of the patient. Dental anxiety was assessed with the help of a global rating of anxiety (not anxious, slightly anxious and very anxious) and not with any standardised scale. This was done keeping in view the time needed to fill the questionnaires and patient's cooperation. The two psychometric questionnaires were translated according to accepted standards described by the scientific advisory committee of the medical outcomes trust (2002) and Beaton et al (2000). The original English versions were translated twice independently into the Indian version, first by a local Indian clinician with extensive knowledge of the English language and second by a professional translator. Both translations were merged into one version. These versions were then translated back into English. A pilot study in a responding focus group of 25 dental patients was performed to test the conceptual equivalence and content validity of the questionnaires. The interviewer asked the questions and marked the answers. The personal interview process was selected to prevent missing answers.

Clinical examination

In addition to the questionnaires, the subjects were clinically examined for dental caries using the DMFT Index given by Klein and Palmer (1938), gingivitis using the Loe and Silness gingival index (GI) by Loe and Silness (1963) and plaque levels using Silness and Loe Index by Silness and Loe (1964). The principal investigator conducted all the clinical examinations. Prior to this, an expert who was familiar with the various indices and examination protocols trained the examiner for the clinical examination. A subset of 20 dental patients were re-examined after 1 week to test for intra-examiner variability.

Table 1 Characteristics of the study population

Characteristics	Specifics	Number	Percentage
Sex	Male	174	42
	Female	240	58
Age	18 to 25	102	24.6
	26 to 35	94	22.7
	36 to 45	84	20.3
	46 to 55	76	18.3
	56 to 65	36	8.6
	65+	22	5.3
Anxiety	Not anxious (0)	180	43.4
	Slightly anxious (1)	150	36.2
	Very anxious (2)	84	20.2
Decayed teeth	Present	274	66.1
	Absent	140	33.8
Filled teeth	Present	224	54.1
	Absent	190	45.8
Missing teeth	Present	258	62.3
	Absent	156	37.6

Data analyses

A five-point Likert scale was used to measure the responses to the OHIP-14 items with the possible scores ranging from 0 to 56. Similarly, a Likert scale was used to measure the responses to the GHQ-12 items with the possible scores ranging from 0 to 36. A global rating was used for assessing dental anxiety, using the scores of 0 (not anxious), 1 (slightly anxious) and 2 (very anxious). Construct validity was assessed on the null hypothesis that OHIP-14 scores were not associated with the clinical oral health status. By measuring Cronbach's alpha and the inter-item correlations for the OHIP-14 items, the internal reliability was assessed. A group of 20 dental patients were asked to complete the questionnaires again after 1 week to examine test–retest reliability. Spearman's rank correlation analysis was later done to compare the first and the second responses. Spearman's correlation coefficient was used to correlate the OHRQoL with other variables including the clinical variables. Mann–Whitney and analysis of variance (ANOVA) tests were used to compare the mean scores of the OHIP-14 and individual subscales between the subjects. Multivariate analysis was also done to assess the effect of various factors on OHRQoL. Twenty dental patients were re-examined after 1 week and Cohen's kappa was used to test intra-examiner variability. All statistical analyses were carried out using the Statistical Package for the Social Sciences, version 10 software package (Chicago, IL, USA).

Table 2 Distribution of responses for the OHIP-14

Items		Responses					
		Never (0) n%	Hardly ever (1) n%	Occasionally (2) n%	Fairly often (3) n%	Very often (4) n%	Mean (*SD*)
1	Have you had trouble pronouncing any words because of problems with your teeth or mouth?	242 (68.1)	52 (12.6)	54 (13)	22 (5.3)	4 (1.0)	0.6 (0.9)
2	Have you felt that your sense of taste has worsened because of problems with your teeth or mouth?	300 (72.5)	54 (13.0)	34 (8.2)	24 (5.8)	2 (0.5)	0.5 (0.9)
3	Have you had painful aching in your mouth?	50 (12.1)	46 (11.1)	224 (54.1)	78 (18.8)	16 (3.9)	1.9 (1.0)
4	Have you found it uncomfortable to eat any food because of problems with your teeth or mouth?	108 (26.1)	78 (18.8)	162 (39.1)	44 (10.6)	22 (5.3)	1.5 (1.1)
5	Have you been self-conscious because of your teeth or mouth?	244 (58.9)	64 (15.5)	46 (13.5)	30 (7.2)	20 (4.8)	0.8 (1.2)
6	Have you felt tense because of problems with your teeth or mouth?	226 (54.6)	74 (17.9)	70 (16.9)	32 (7.7)	12 (2.9)	0.9 (1.1)
7	Has your diet been unsatisfactory because of problems with your teeth or mouth?	226 (54.6)	72 (17.4)	90 (21.7)	22 (5.3)	4 (1.0)	0.8 (1.0)
8	Have you had to interrupt meals because of problems with your teeth or mouth?	204 (49.3)	70 (16.9)	84 (20.3)	42 (10.1)	14 (3.4)	1.0 (1.2)
9	Have you found it difficult to relax because of problems with your teeth or mouth?	198 (47.8)	86 (20.8)	74 (17.9)	42 (10.1)	14 (3.4)	1.0 (1.2)
10	Have you been embarrassed because of problems with your teeth or mouth?	270 (65.2)	58 (14.0)	40 (9.7)	34 (8.2)	12 (2.9)	0.7 (1.1)

Quintessence Not for Publication by Copyright

Copyright by Quintessence Not for Publication

11	Have you been a bit irritable with other people because of problems with your teeth or mouth?	322 (77.8)	48 (11.6)	32 (7.7)	10 (2.4)	2 (0.5)	0.4 (0.8)
12	Have you had difficulty doing your usual job because of problems with your teeth or mouth?	244 (58.9)	80 (19.3)	64 (15.5)	18 (4.3)	8 (1.9)	0.7 (1.0)
13	Have you felt that life in general was less satisfying because of problems with your teeth or mouth?	296 (71.5)	56 (13.5)	48 (11.6)	8 (1.9)	6 (1.4)	0.5 (0.9)
14	Have you been totally unable to function because of problems with your teeth or mouth?	294 (71.0)	64 (15.5)	34 (8.2)	18 (4.3)	4 (1.0)	0.5 (0.8)

RESULTS

Characteristics of the patients

The characteristics of the study population are given in Table 1. Of the 600 patients who were approached to participate in the study, 414 agreed, indicating a participation rate of 69%. Of the 414 patients, 240 were females. This distribution is consistent with the fact that more females normally attend general dental practice and this has been well described in the literature. Age of the study population ranged from 18 to 80 with a mean of 38.5 ± 14.9. About 43.5% of the respondents reported no dental anxiety, whereas 20.5% of the respondents reported high anxiety. Cohen's kappa for measuring intra-examiner variability was found to range from 0.75 to 0.87 for the various clinical indicators. The mean DMFT of the study population was 6.9 ± 5.3. The mean GI and plaque index (PI) scores were 1.07 ± 0.42 and 1.06 ± 0.41, respectively.

Distribution of items

The distribution of responses to the OHIP-14 items is presented in Table 2, which shows that the majority of patients reported no problems in the previous year on most items. This was evident from the high percentage of respondents scoring zero for most of the OHIP-14 questions. There was generally a low percentage of patients reporting frequent problems in the previous year. Mean scores for items ranged from 0.4 for being irritable with people, to 1.9 for painful aching in the mouth.

Reliability

Cronbach's alpha for internal consistency for the OHIP-14 instrument and its subscales ranged from 0.5 to 0.85. Average inter-item correlations were between 0.34 and 0.47 (Table 3). Spearman's rank correlation was used to examine the test–retest reliability. The coefficient values were high, with the values for the domains ranging from 0.75 to 0.96.

Validity

Correlating the OHIP-14 scores with the clinical oral health status tested the construct validity of the instrument. The correlations have been described in Table 4. The overall OHIP scores and the

Copyright by Not for publication Quintessence

Table 3 Reliability analysis of the OHIP-14

Dimensions	Mean scores	Range	Internal consistency	Average inter-item correlation
Functional limitation	0.54 ± 0.77	0 to 3	0.50	0.34
Physical pain	1.71 ± 0.91	0 to 4	0.64	0.47
Psychological discomfort	0.85 ± 1.00	0 to 4	0.63	0.47
Physical disability	0.91 ± 0.94	0 to 4	0.62	0.45
Psychological disability	0.85 ± 0.95	0 to 4	0.54	0.37
Social handicap	0.54 ± 0.74	0 to 3	0.55	0.38
Handicap	0.49 ± 0.76	0 to 4	0.63	0.46
Overall OHIP	5.89 ± 8.45	0 to 45	0.85	–

'functional limitation' subscale were significantly correlated with the 'missing teeth' (MT), DMFT scores. The domain of 'physical pain' was positively correlated with the MT, DMFT scores, GI and PI scores and age. The 'psychological disability' subscale was also positively correlated with the MT and DMFT scores.

A comparison of the mean scores of the OHIP-14 and individual subscales between the subjects (Table 5) showed that the mean scores for the subscales of physical pain and physical disability were significantly greater among those with caries than those without, greater among those with MT than those without and also greater among those who reported dental anxiety than those who did not. The mean score for the 'social handicap' was higher among those with caries, MT and among females. The mean score for 'handicap' was found to be higher among those with caries and among females.

Both the mean OHIP-14 and the GHQ-12 scores were significantly higher among those with MT. The mean OHIP-14 score was significantly higher among those who reported dental anxiety than those who did not. It was also seen that the OHIP items 3, 9 and 11 significantly correlated with the GHQ-12 scores ($P = 0.008$, 0.016 and 0.004) with the coefficient values being 0.18, 0.16 and 0.19, respectively. A multivariate analysis was done to assess the effect of age, DMFT score, GI and PI score on OHRQoL. The results showed MT ($P = 0.01$) and GI score ($P = 0.05$) to be significant impacting factors on OHRQoL (Table 6).

DISCUSSION

This study was performed to describe the OHRQoL in an Indian adult population and to describe possible factors that may have a bearing on the OHRQoL. It was seen that the majority of the respondents reported no problems in the previous year on most items of the OHIP-14. This may be explained by the fact that nearly half of the respondents were below 35 years of age and people of the younger age group are known to cite a low impact of oral health on the quality of life.

Sufficient indications about the reliability and validity of the OHIP-14 were obtained in this study. Cronbach's alpha values 0.5 to 0.7 are generally considered to indicate sufficient reliability for an instrument or scale to be used to make group comparisons; instruments or scales with coefficients above 0.85 are considered reliable enough for individual patient comparisons according to McDowell and Newell (1996). The internal consistency of OHIP-14 was assessed with Cronbach's alpha and an average inter-item correlation for all OHIP-14 items and the seven subscales. The results of this study showed that the OHIP-14 was very reliable with an alpha value of 0.85. The high correlation between the test–retest responses also pointed in this direction. The OHIP-14 scores were also found to be associated with the oral health status indicating its construct validity.

The perception of the OHRQoL has been shown in previous studies by investigators such as Locker and Miller (1994), Locker and Slade (1994), McGrath et al (2003a, b), John et al (2004) and Steele et al (2004) to be related to oral health status, especially the caries status. This association is especially true for the 'decayed' and 'missing' aspect of caries. A statistically significant correlation was observed between the OHIP-14 scores and DMFT scores in this study. The missing component of the DMFT was found to be associated with most of the OHIP-14 subscales. The results of the multivariate analysis also pointed out the association between MT and gingival bleeding and OHRQoL. Other authors such as John et al (2004) and Steele et al (2004) have reported similar results. Those patients who

Copyright by Quintessence Not for Distribution

Table 4 Correlation between the OHIP-14 domains and the other variables

Subgroup	Mean score (*SD*)	∝GHQ-12	∝DT	∝MT	∝FT	∝DMFT	∝GI	∝PI	∝Age
Functional limitation	0.5 (0.8)	0.14 ***P* = 0.05**	0.02	0.20 ***P* < 0.01**	−0.09	0.14 ***P* = 0.05**	−0.06	0.01	−0.02
Physical pain	1.7 (0.9)	0.12	0.08	0.23 ***P* < 0.01**	0.03	0.27 ***P* < 0.001**	0.17 ***P* < 0.05**	0.14 ***P* < 0.05**	0.21 ***P* < 0.01**
Psychological discomfort	0.9 (1.0)	0.05	0.05	0.16 ***P* < 0.05**	−0.01	0.10	0.08	0.05	0.04
Physical disability	0.9 (0.9)	0.11	0.11	0.22 ***P* < 0.01**	−0.1	0.19 ***P* < 0.01**	0.06	0.12	0.11
Psychological disability	0.9 (0.9)	0.15 ***P* < 0.05**	0.08	0.21 ***P* < 0.01**	−0.07	0.18 ***P* < 0.01**	−0.09	−0.08	0.07
Social handicap	0.5 (0.7)	0.10	0.09	0.14 ***P* = 0.05**	−0.09	0.10	−0.05	0.01	−0.01
Handicap	0.5 (0.8)	0.08	0.05	0.01	0.02	0.02	−0.02	0.01	−0.01
Total OHIP score	11.8 (8.4)	0.15 ***P* < 0.05**	0.08	0.24 ***P* < 0.001**	−0.06	0.21 ***P* < 0.01**	0.02	0.06	0.09

GHQ-12: general health questionnaire-12; DT: decayed teeth; MT: missing teeth; FT: filled teeth; GI: gingival index scores; PI: plaque index scores; $P \leq 0.05$: Significant.

reported high levels of dental anxiety had higher OHIP-14 scores and these results were in agreement with those of a previous study performed in the United Kingdom by McGrath and Bedi (2004). Females perceived a higher sense of social handicap and handicap due to their oral status compared with males. Although psychological well-being has been studied as a factor, affecting the oral health related to quality of life, it has been in mainly in the elderly population and with emphasis on edentulous patients and denture wearers.

Whereas the longer versions of the GHQ are normally considered multidimensional, the GHQ-12 is often regarded as measuring only a single dimension of psychological health. For example, Corti (1994) analysed the GHQ-12 data in the British household panel survey and maintained that the high Cronbach's alpha value indicated the unidimensional nature of this instrument. However, several authors suggested that the GHQ-12 contained two or three clinically meaningful factors. In a multi-centre study carried out by Werneke et al (2000), although considerable between-centre variation was found, the final solution tended to have either two or three factors. Kalliath et al (2004) used confirmatory factor analysis to compare various models and found that Graetz's three-factor model gave the best goodness-of-fit. The three factors in the model proposed by Graetz (1991) were found to be strongly correlated with one another. Such strong correlations suggested that, even if there were indeed three different factors, in practice it is quite difficult to differentiate between them. The study by French and Tait (2004) demonstrated a strong correlation between the factors that was difficult to discern. This led the authors to recommend that it may be prudent to use the overall score rather than over-interpret the factors within the GHQ-12. As such, from a pragmatic point of view it was considered acceptable to use this instrument as a one-dimensional measure.

The results of this study showed that components of the OHRQoL, such as functional limitation and psychological disability were correlated with GHQ-12 scores. Those with MT were found to have higher GHQ-12 scores than those without. It was also shown that there was an association between GHQ-12 scores and perception of oral pain, inability to relax and problems in inter-personal interactions. Psychological distress was found to be associated with a poor OHRQoL.

Previous studies by authors such as Ng and Leung (2006) and Needleman et al (2004) have reported on periodontal disease and its relationship with OHRQoL. The author also found that the domain

Copyright Not for distribution

Table 5 Effects of variables on the OHIP-14 and the GHQ-12 scores

Variables		Functional limitation mean (*SD*)	Physical pain	Psychological discomfort mean (*SD*)	Physical disability mean (*SD*)	Psychological disability mean (*SD*)	Social handicap mean (*SD*)	Handicap mean (*SD*)	OHIP-14 Score mean (*SD*)	Mean GHQ-12 scores (*SD*)
Decayed teeth	Absent	0.5 (0.8)	1.6 (1.0)	0.9 (1.1)	0.9 (1.0)	0.8 (0.9)	0.4 (0.7)	0.4 (0.7)	10.8 (8.3)	16.4 (5.0)
	Present	0.6 (0.8)	1.8 (0.9)	0.8 (1.0)	0.9 (0.9)	0.9 (1.0)	0.6 (0.8)	0.6 (0.8)	12.3 (8.5)	15.9 (4.7)
	P value	0.49	0.22	0.63	0.31	0.20	0.14	**0.04 Sig**	0.22	0.99
Missing teeth	Absent	0.5 (0.8)	1.4 (0.9)	0.7 (0.8)	0.7 (0.8)	0.7 (0.7)	0.4 (0.6)	0.4 (0.6)	9.3 (7.2)	14.7 (5.0)
	Present	0.6 (0.8)	1.9 (0.8)	0.9 (1.1)	1.1 (1.0)	0.9 (1.0)	0.6 (0.8)	0.6 (0.8)	13.2 (8.9)	16.9 (4.6)
	P value	0.28	< **0.001 Sig**	0.20	**0.007 Sig**	0.14	**0.04 Sig**	**0.05 Sig**	**0.001 Sig**	< **0.001 Sig**
Filled teeth	Absent	0.6 (0.8)	1.7 (1.0)	0.9 (1.0)	1.0 (1.0)	0.9 (0.7)	0.6 (0.7)	0.5 (0.8)	12.1 (8.3)	15.8 (4.3)
	Present	0.5 (0.8)	1.7 (0.9)	0.8 (1.0)	0.9 (0.9)	0.8 (0.9)	0.5 (0.8)	0.5 (0.8)	11.5 (8.6)	16.3 (4.8)
	P value	0.6	0.8	0.74	0.72	0.84	0.14	0.63	0.43	0.30
Sex	Male	0.6 (0.8)	1.6 (0.9)	0.8 (0.9)	0.9 (0.9)	0.8 (0.7)	0.4 (0.5)	0.4 (0.7)	10.9 (7.8)	16.1 (4.9)
	Female	0.5 (0.8)	1.8 (0.9)	0.9 (1.1)	0.9 (0.9)	0.9 (1.0)	0.7 (0.8)	0.6 (0.8)	12.4 (8.9)	16.1 (4.8)
	P value	0.29	0.25	0.71	0.67	0.33	**0.03 Sig**	**0.04 Sig**	0.32	0.47
Anxiety	0 (Not anxious)	0.5 (0.7)	1.5 (0.9)	0.8 (1.0)	0.8 (0.8)	0.7 (0.8)	0.5 (0.7)	0.5 (0.8)	10.5 (8.4)	16.4 (4.9)
	1 (Slightly anxious)	0.5 (0.8)	1.8 (0.8)	0.8 (0.8)	0.8 (0.9)	0.9 (0.9)	0.5 (0.7)	0.4 (0.7)	11.4 (7.1)	15.8 (4.4)
	2 (Highly anxious)	0.6 (0.8)	2.0 (1.0)	1.2 (1.1)	1.3 (1.2)	1.1 (1.1)	0.7 (0.9)	0.6 (0.2)	15.0 (10.0)	15.8 (5.3)
	ANOVA *P*	0.81	< **0.01 Sig**	0.06	< **0.05 Sig**	**0.05 Sig**	0.35	0.27	< **0.05 Sig**	0.60

$P \leq 0.05$: Significant; Sig: significant.

Table 6 Multivariate analysis to assess the effect of variables on OHRQoL

Dependent variable	df	Mean square	*F*	*P* value
Age	35	201.086	0.888	0.650
DT	35	4.348	0.795	0.786
MT	35	41.211	2.031	0.002 (Sig)
FT	35	7.735	0.897	0.636
DMFT	35	35.086	1.278	0.155
GI score	35	0.249	1.752	0.051 (Sig)
PI score	35	0.210	1.286	0.149

$P \leq 0.05$: Significant; Sig: significant.

of physical pain of the OHIP-14 was associated with gingivitis, plaque levels and caries. Physical pain has been cited as the most important factor affecting the QoL by a majority of the respondents in this study. This may be because a majority of Indians still visit a clinician only for relief of pain as and when it occurs. This may account for the strong association between the domain of physical pain and many of the clinical parameters.

It was observed that although statistically significant associations were found between various aspects of QoL and clinical oral health status in this study, they were not very strong. A possible use of subjective health status instruments is to predict treatment need. However, according to authors such as Leao and Sheiham (1996) and Locker and Jokovic (1996), at the present time, predictive validity of the various available measures tried were found to be weak. Whereas statistically significant associations between clinical indicators and subjective measures were found in these studies, the associations were, at best, moderate to weak. Similar findings were reported by Atchison and Dolan (1990) and Locker and Slade (1994), who reported weak correlation scores between clinical indices (e.g. caries and periodontal pockets) and summary scores derived from geriatric oral health assessment index and OHIP, respectively. Locker and Jokovic (1996) suggest that such findings should not be unexpected, as health status measures were not derived specifically as predictive indices. They recommend that health status measures should be used to complement objective needs assessment and may help identify patients who are likely to benefit most from dental treatment. Reisine and Locker (1995) suggest that further research is required to help refine use of health status measures for this purpose.

Some of the possible limitations of this study were that a convenience sample of dental patients

Copyright by Quintessenz Not for Publication

was used and it was possible that dental patients would perceive a greater impact of their oral health on their QoL compared with a non-patient. Another possible limitation would be the response and social desirability bias. This may be one of the reasons for a high percentage of respondents scoring zero for most of the OHIP-14 items.

The results of this study demonstrated a high prevalence of oral diseases in the study population, which, in turn, impacted their QoL. This study also showed that psychological distress played an important role in influencing OHRQoL, and was not limited to the elderly or medically compromised populations, but was also seen in younger populations.

REFERENCES

1. Adulyanon S, Vourapukjaru J, Sheiham A. Oral impacts affecting daily performances in a low dental disease Thai population. Community Dent Oral Epidemiol 1996;24:385–389.
2. Allen F, Locker D. A modified short version of the oral health impact profile for assessing health-related quality of life in edentulous adults. Int J Prosthodont 2002; 15:446–450.
3. Atchison KA, Dolan TA. Development of the Geriatric Oral Health Assessment Index. 4. J Dent Educ 1990;54: 680–687.
4. Beaton DE, Bombardier C, Guillemin F, Bosi Ferraz M. Guidelines for the process of cross-cultural adaptation of self report measures. Spine 2000;25:3186–3191.
5. Bech P. Measuring quality of life: the medical perspective. Nord J Psychiatry 1992;46:85–89.
6. Cooper CL (ed). Handbook of Stress, Medicine and Health. USA: CRC Press, 1996.
7. Corti L. For better or worse? Annual change in smoking, self assessed health and subjective well-being. In: Buck N, Gershuny J, Rose D, Scott J (eds). Changing Households: The British Household Panel Survey 1990–1992. Colchester: University of Essex, 1994:199–219.
8. Ekanayake L, Perera I. Validation of a Sinhalese translation of the oral health impact profile-14 for use with older adults. Gerodontology 2003;20:95–99.
9. Freeman R, Goss S. Stress measures as predictors of periodontal disease – a preliminary communication. Community Dent Oral Epidemiol 1993;21:176–177.
10. French DJ, Tait RJ. Measurement invariance in the general health questionnaire-12 in young Australian adolescents. Eur Child Adolesc Psychiatry 2004;13:1–7.
11. Goldberg DP, Blackwell B. Psychiatric illness in general practice. A detailed study using a new method of case identification. Br Med J 1970;1:439–443.
12. Graetz B. Multidimensional properties of the general health questionnaire. Soc Psychiatry Psychiatr Epidemiol 1991;26:132–138.
13. Hegarty AM, McGrath C, Hodgston TA, Porter SR. Patient-centred outcome measures in oral medicine: are they valid and reliable? Int J Oral Maxillofac Surg 2002; 31:670–674.
14. John MT, Patrick DL, Slade GD. The German version of the oral health impact profile – translation and psychometric properties. Eur J Oral Sci 2002;110:425–433.
15. John MT, Koepsell TD, Hujoel P, Miglioretti DL, Leresche L, Micheelis W. Demographic factors, denture status and oral health-related quality of life. Community Dent Oral Epidemiol 2004;32:125–132.
16. Kalliath TJ, O'Driscoll MP, Brough P. A confirmatory factor analysis of the general health questionnaire-12. Stress and Health 2004;20:11–20.
17. Klein H, Palmer C. Studies on dental caries vs familial resemblance in the caries experience of siblings. Public Health Rep 1938;53:1353–1364.
18. Larsson P, List T, Lundström I, Marcusson A, Ohrbach R. Reliability and validity of a Swedish version of the Oral Health Impact Profile (OHIP-S). Acta Odontol Scand 2004;62:147–152.
19. Leao A, Sheiham A. The development of a socio-dental measure of dental impacts on daily living. Community Dent Health 1996;13:22–26.
20. Locker D. Measuring oral health: a conceptual framework. Community Dent Health 1988;5:3–18.
21. Locker D. The social and psychological consequences of oral disease. In: An Introduction to Behavioural Science and Dentistry. London: Tavistock/Routledge, 1989:88–101.
22. Locker D, Miller Y. Subjectively reported oral health status in an adult population. Community Dent Oral Epidemiol 1994;22:425–430.
23. Locker D, Slade G. Association between clinical and subjective indicators of oral health status in an older population. Gerodontology 1994;11:108–114.
24. Locker D, Jokovic A. Using subjective oral health status indicators to screen for dental care in older adults. Community Dent Oral Epidemiol 1996;24:398–402.
25. Locker D, Matear D, Stephens M, Lawrence H, Payne B. Comparison of the GOHAI and the OHIP-14 as measures of the oral health-related quality of life of the elderly. Community Dent Oral Epidemiol 2001;29:373–381.
26. Loe H, Silness J. Periodontal disease in pregnancy. I. Prevalence and severity. Acta Odontol Scand 1963;21: 533–551.
27. Marcenes WS, Sheiham A. The relationship between work stress and oral health status. Soc Sci Med 1992;35: 1511–1520.
28. Marcenes WS, Croucher R, Sheiham A, Marmot MG. The relationship between self-reported oral symptoms and life-events. Psychol Health 1993;8:123–124.
29. McDowell I, Newell C. Measuring Health. A Guide to Rating Scales and Questionnaires. Oxford: Oxford University Press, 1996.
30. McGrath C, Bedi R. An evaluation of a new measure of oral health related quality of life – OHQoL – UK(W). Community Dent Health 2001;18:144–149.
31. McGrath C, Alkhatib MN, Al-Munif M, Bedi R, Zaki AS. Translation and validation of an Arabic version of the UK-oral health related quality of life measure (OHQoL-UK) in Syria, Egypt and Saudi Arabia. Community Dent Health 2003a;20:241–245.
32. McGrath C, Comfort M, Lo C, Luo Y. Patient-centred outcome measures in oral surgery: validity and sensitivity. Br J Oral Maxillofac Surg 2003b;41:43–47.
33. McGrath C, Bedi R. The association between dental anxiety and oral health-related quality of life in Britain. Community Dent Oral Epidemiol 2004;32(1):67–72.
34. National Oral Health Survey and Fluoride mapping. New Delhi: Dental Council of India, 2002–2003:107–121.
35. Needleman I, McGrath C, Floyd P, Biddle A. Impact of oral health on the life quality of periodontal patients. J Clin Periodontol 2004;31(6):454–457.

Copyright by Quintessence Not for Publication

36. Ng SK, Leung WK. Oral health-related quality of life and periodontal status. Community Dent Oral Epidemiol 2006;34(2):114–122.
37. Parmenter TR. Quality of life as a concept and measurable entity. Soc Indic Res 1994;33:9–46.
38. Reisine ST, Miller J. A longitudinal study of work loss related to dental diseases. Soc Sci Med 1986;22:1309–1314.
39. Reisine ST, Fertig J, Weber J, Leder S. Impact of dental conditions on patients' quality of life. Community Dent Oral Epidemiol 1989;17:7–10.
40. Reisine ST, Locker D. Social, psychological and economic impacts of oral conditions and treatments. In: Cohen LK, Gift HC (eds). Disease Prevention and Oral Health Promotion, ed 1. Copenhagen: Munksgaard, 1995:33–72.
41. Schipper H, Clinch J, Powell W. Definitions and conceptual issues. In: Spilker B (ed). Quality of Life Assessments in Clinical Trials. New York: Raven Press, 1990:11–24.
42. Scientific Advisory Committee of the Medical Outcomes Trust. Assessing health status and quality-of-life instruments: attributes and review criteria. Qual Life Res 2002;11:193–205.
43. Shumaker SA, Anderson RT, Czajkowski SM. Psychological tests and scales. In: Spilker B (ed). Quality of Life Assessments in Clinical Trials. New York: Raven Press, 1990:95–113.
44. Silness J, Loe H. Periodontal disease in pregnancy. II. Correlation between oral hygiene and periodontal conditions. Acta Odontol Scand 1964;22(1):121–135.
45. Slade GD, Spencer AJ. Development and evaluation of the oral health impact profile. Community Dent Health 1994;11:3–11.
46. Slade GD. Derivation and validation of a short-form oral health impact profile. Community Dent Oral Epidemiol 1997;25:284–290.
47. Slade GD, Strauss R, Atchison KA, Kressin NR, Locker D, Reisine ST. Conference summary: assessing oral health outcomes – measuring health status and quality of life. Community Dent Health 1998;15:8–12.
48. Sorensen T, Naess S. To measure quality of life: relevance and use in the psychiatric domain. Nord J Psychiatry 1996;50:29–39.
49. Steele JG, Sanders AE, Slade GD, Allen PF, Lahti S, Nuttal N, et al. How do age and tooth loss affect oral impacts and quality of life? A study comparing two national samples. Community Dent Oral Epidemiol 2004;32:107–114.
50. Werneke U, Goldberg DP, Yalcin I, Ustun BT. The stability of the factor structure of the general health questionnaire. Psy Med 2000;30:823–829.
51. World Health Organization. International Classification of Impairments, Disabilities and Handicaps. Geneva: World Health Organization, 1980.
52. Wong MC, Lo EC, McMillan AS. Validation of a Chinese version of the oral health impact profile (OHIP). Community Dent Oral Epidemiol 2002;30:423–430.