Acta Odontologica Scandinavica, 2005; 63: 353–360

Taylor & Francis
Taylor & Francis Group

ORIGINAL ARTICLE

Dimensions of oral health-related quality of life in an adult Swedish population

INGRID COLLIN BAGEWITZ[1,2], BJÖRN SÖDERFELDT[2], KRISTER NILNER[1] & SIGVARD PALMQVIST[1,2]

[1]*Department of Prosthetic Dentistry and* [2]*Department of Oral Public Health, Centre for Oral Health Sciences, Malmö University, Malmö, Sweden*

Abstract
The concept of oral health-related quality of life (OHRQOL) is investigated in this study. The aim was to explore the dimensionality of variables measuring OHRQOL in an adult Swedish population and to discuss the findings in relation to existing indices. The study was based on responses to a 1998 questionnaire sent to a random sample of 1974 persons aged between 50 and 75 years. There were 22 variables based on questions concerning oral situation and the impact on 7 theoretically different dimensions of QOL. The majority were satisfied with their oral health situation. During the previous 12 months, 16% of the population had experienced problems with their mouth or teeth on at least one occasion per mouth. Principal components analysis was used to analyze the dimensionality of the variables. Three factors accounted for 59% of the variance: (1) Physical and social disability, (2) psychological discomfort and disability, and (3) functional limitation and physical pain. The perception of OHRQOL is multidimensional, but the dimensions are not equally important. The dimensions of OHRQOL found in the present study are similar to those of existing instruments.

Key Words: *Disability, factor analysis, physical, psychological, social*

Introduction

The concept of quality of life (QOL) has been investigated from several aspects. It was accepted as a scientific concept by Index Medicus in 1977 and later by the World Health Organization [1]. It has been described as a multidimensional concept including physical, emotional, social, and other factors [1–3]. It has been defined as the functional effect of an illness and its consequent therapy upon a patient as perceived by the patient [4], or as an individual's overall satisfaction with life and general sense of personal well-being [5]. There is also a model of the good life that includes four dimensions: the hedonist good life, the dialectical good life, the humanist good life, and the formalist good life [6]. The literature is abundant and is increasing. Different indices have been constructed in medical science to measure QOL, i.e. for assessing the outcome of clinical trials, comparing the efficacy of different treatments, evaluating the cost-utility and cost-effectiveness of health-care programs, assisting quality assurance, and the marketing and regulation of drugs [2].

QOL in relation to oral conditions has been described in the literature pertaining to problems with eating, nutrition, social interaction, emotional and psychological functioning, discomfort, and disability, and oral impairments of various kinds have social and economic impacts on QOL [7–13]. It has been determined that the oral impact on QOL can be important for both the individual and society [8,10,12]. Several instruments measuring oral health-related quality of life (OHRQOL) have been developed and evaluated [14–21].

OHRQOL has been studied in Sweden [22,23] in relation to evaluation of tooth loss [24,25], expectations, patient satisfaction, or treatment outcome of dental treatment [26–29], and also as an aspect of the importance of comfort and health for elderly or demented persons [30,31].

Correspondence: Ingrid Collin Bagewitz, Clinic of Prosthetic Dentistry, Spårvägsgatan 12, SE-214 27 Malmö, Sweden. Tel: +46 40 33 39 65. E-mail: Ingrid.Collin-Bagewitz@skane.se

(Received 24 March 2005; accepted 19 July 2005)

ISSN 0001-6357 print/ISSN 1502-3850 online
DOI: 10.1080/00016350500264271

Table I. Item frequencies response alternatives and intended dimensions

Question no.	Intended dimension	%	%	%	%	%	%	*n*
Questions about your mouth and teeth, and their impact on your quality of life:		Yes, very happy	Happy	Neither happy nor unhappy	Rather unhappy	No, very much happy		
1. Are you happy with your teeth?	Psychological discomfort	15	53	21	7	4		1280
2. Are you happy with the appearance of your teeth?	ditto	15	52	22	9	2		1280
		Always	Often	Sometimes	Seldom	Never		
3. Do you ever avoid smiling and laughing because of problems with your teeth?	Psychological disability	3	3	10	15	70		1280
		Yes, very well	Well	Quite well	No, not particularly well	No, poorly	No, very poorly	
4. Are you able to chew all kinds of food, including nuts and apples?	Functional limitation	48	28	15	6	2	2	1281
		No, never	Seldom	Sometimes	Yes, often	Yes, all the time		
5. Do you ever avoid some kinds of food because of your inability to chew them?	ditto	68	19	10	2	1		1280
6. Do you ever avoid other people because of problems with your mouth or teeth?	Social disability	87	8	3	1			1280
7. Do you feel that your oral health affects your ability to work or your everyday activities?	ditto	87	7	4	2	1		1281
			Hardly ever 1	2	3	4	Almost constantly 5	
8. Are you worried about what other people will think of the appearance of your teeth?	Psychological discomfort		80	12	6	1		1277
9. Do you have headaches because of problems with your mouth or teeth?	Physical pain		87	7	4	2	1	1270
10. Do you have pains in your stomach because of problems with your mouth or teeth?	-"-		92	5	2	1	1	1260
11. Do you have problems in any other part of your body because of problems with your mouth or teeth?	Physical pain and discomfort		91	5	2	1	1	1263
12. Do you have poor self-esteem because of problems with your mouth or teeth?	Psychological discomfort		85	9	4	1	2	1277

***Questions about any problems with your mouth or teeth and the impact these have on your life over the past 12 months*:** Have you . . . . . over the past 12 months?		No, has never happened 0	Less than once a month, or for max. 5 days in total 1	Once or twice a month or for max. 15 days in total 2	Once or twice a week or for max. 30 days in total 3	Three or four times a week, or for max. 3 months in total 4	Every day or almost every day, or for more than 3 months in total 5	
13. . . . experienced problems with your mouth or teeth. . .?	Functional limitation and physical pain	62	23	5	3	2	6	1261
14. . . . experienced chewing difficulties and/or difficulty enjoying food. . .?	Functional limitation	79	11	3	3	1	3	1264
15. . . . had speech or pronunciation problems?	Physical disability	94	3	1	1		1	1266
16. . . . had problems with maintaining oral hygiene. . .?	Physical disability	92	5	2	1		1	1252
17. . . . had sleep problems and/or problems relaxing. . .?	Psychological disability	84	8	3	2	1	3	1260
18. . . . felt embarrassed to laugh, smile or show your teeth. . .?	ditto	87	6	2	1	1	3	1268
19. . . . been easily irritable. . .?	Social disability	81	12	3	2	1	2	1248
20. . . . experienced problems managing your work or your everyday activities. . .?	ditto	94	3	1	1		1	1264
21. . . . experienced pain from your mouth or teeth. . .?	Physical pain	66	22	5	3	2	3	1266
22. . . . experienced difficulty enjoying contacts with other people. . .?	Social disability	93	4	1	1		1	1262

Several instruments measuring OHRQOL have been based on the well-known model of oral health created by Locker [32] in 1989. In that model, disease can lead to impairment, defined as any anatomical loss or abnormality that may lead to functional limitation, pain, or discomfort, either physical or psychological. Any one of these may lead to physical, psychological, or social disability, described by Locker as any limitation in or lack of ability to perform activities of daily living. A final consequence is handicap.

There is ongoing discussion about how many questions are necessary for an optimal instrument measuring OHRQOL, and formulation of the questions varies among the different instruments [15,19,20,33,34]. Already existing instruments also capture a different number of domains or dimensions of oral impact, and the interpretations of selected variables and their dimensions vary.

The aim of this study was: (1) to explore the dimensionality of variables aimed at measuring OHRQOL in an adult Swedish population based on Locker's theory and model of oral health in a Swedish context and (2) to discuss similarities found between these dimensions of OHRQOL in relation to two selected instruments.

Material and methods

Study population

In 1998, a questionnaire was sent to a random sample of 2000 persons, aged between 50 and 75 years, in the county of Skåne in southernmost Sweden including Malmö, the third largest city in Sweden. It was found that 26 individuals in the sample were dead, in poor health, unknown at their address, or impossible to reach, leaving a net sample of 1974 persons. The response rate was 66% after 2 reminders, the last one with a second copy of the questionnaire. During the past 20 years, there has been continuous foreign immigration, particularly to Malmö. An offer was therefore provided in English, Arabic, and Serbo-Croatian of help in interpreting the questionnaire. However, there were no requests for help, although three persons did not respond because of stated difficulties with the language. The study design has been presented in detail previously [35].

Non-response

The study population comprised 47% men and 53% women. Non-response could be analyzed using three variables from the sampling frame: gender, age, and place of residence. The non-response rate was 37% for men and 32% for women ($p<0.05$). A significantly higher proportion ($p<0.01$) of non-respondents was found in Malmö, i.e. 41% compared to 33% in the rest of the material. In respect to age, there was no significant difference. From an analysis presented

previously [35], the non-response was concluded to be biased, with over-representation of edentulism.

Questionnaire

The questionnaire contained 63 questions. It was constructed from an analysis of the literature on conditions for oral health [36] and oral QOL [7,14,16,18,19], as well as from statements from patients within the authors' prosthodontic clinical practice. Questions taken from other studies were adjusted to suit a Swedish population from linguistic, social, and cultural aspects.

The questionnaire was first tested on a group of 25 selected middle-aged patients from various ethnic backgrounds (24% had not always lived in Sweden) in order to reveal problems with understanding or interpreting the questions or to find irrelevant questions. It was divided into four main sections: I. Opinions on own oral status and impact on social situation and QOL (17 questions); II. Oral health over the previous 12 months and its possible consequences for physical or mental health (12 questions); III. Oral health status and choice of and attitudes towards dental care (25 questions); IV. Social situation and general health (9 questions).

The present study encompasses 22 variables, based on 12 questions from the first and 10 questions from the second section, concerning opinions about the oral situation and its impact on 7 theoretically different dimensions of QOL. Four questions from the first section concerning worry about loose teeth were excluded because they were aimed exclusively at those wearing removable dentures. One other question from the first section concerning halitosis and two questions from the second section concerning sick listing were excluded because of poor discriminatory ability in the questions.

The questions were interpreted and grouped into dimensions according to the expected answers describing OHRQOL. The intended dimensions were: functional limitation, physical pain, physical discomfort, physical disability, psychological discomfort, psychological disability, and social disability. The response alternatives for each question and its intended dimension are presented in Table I.

Statistical methods

The selected questions were first analyzed in frequency tables and then using principal components analysis (PCA). The number of factors was determined by inspection of scree plots and by the Kaiser criterion. Variables with low communality (<0.20) were excluded in the final factor analysis. The communality (ranging between 0 and 1) indicates the extent to which the factor analysis as a whole exhausts the variation of the respective item. Various rotation methods were used for optimizing the factor solutions to facilitate interpretation. Varimax rotation was used assuming that the factors were uncorrelated. This assumption was relaxed in oblimin rotation [37]. All data analysis was done in SPSS.

Results

The frequency distribution of the responses to the 22 questions is given in Table I. Univariate analyses showed that a majority of the population were happy with their oral health situation and had no problems with the function or appearance of their teeth. About a quarter of the population reported oral problems during the previous 12 months, while 16% of the population had experienced oral problems once a month or more. There were reports of pain from 13% of the population, while about 10% reported chewing disabilities, sleep disturbance, irritability, and embarrassment due to their oral condition.

In PCA, 4 factors accounted for 64% of the variance of the 22 variables and 3 factors accounted for 59% of the variance. The three-factor solution was chosen from the shape of the scree plot. These factors gave satisfactory communalities on all variables and relatively unequivocal loading patterns (Table II). Factor 1 included a variety of variables concerning physical pain, problems with speaking or maintaining oral hygiene (physical disability) (variables 9,10,11,15,16), working ability, contacts with other people and irritability (social disability) (variables 7,19,20,22), and sleeping difficulties (psychological disability) (variable 17). Factor 2 included variables concerning the impact of oral health on worry about appearance and on self-esteem (psychological discomfort) (variables 1,2,8,12), on behavior when smiling and laughing (psychological disability) (variables 3,18), and on social disability in terms of avoiding people (variable 6). Factor 3 included only variables concerning functional limitations, i.e. chewing function or physical pain from mouth or teeth (variables 4,5,13,14,21).

In analogy with these results, the three factors were interpreted as: Factor 1: Physical and social disability; Factor 2: Psychological discomfort and disability; Factor 3: Functional limitation and physical pain (Table III). Factor 1 included almost half (44.4%) of the variance explanation. Oblimin rotation showed that factors 1 and 2 correlated negatively with each other.

The intended dimensions are also presented in Table III. There was 91% agreement (20 out of 22 items) between intended and found dimensions of items aimed to measure OHRQOL.

Discussion

The aim was to explore the dimensionality of variables measuring OHRQOL in an adult Swedish population, based on Locker's theory [32] in a Swedish context. Another aim was to discuss similarities between these

Table II. Principal components analysis (PCA), loadings $\geqslant 0.20$, varimax rotation. Major loadings in boldface

Variable. Question no.	Factor 1	Factor 2	Factor 3	Communality h^2
9. Do you have headaches because of problems with your mouth or teeth?	**0.70**			0.54
11. Do you have problems in any other part of your body because of problems with your mouth or teeth?	**0.69**			0.51
20. Have you experienced problems managing your work or your everyday activities over the past 12 months?	**0.67**		0.33	0.56
17. Have you had sleep problems and/or problems relaxing over the past 12 months?	**0.66**		0.39	0.58
10. Do you have pains in your stomach because of problems with your mouth or teeth?	**0.65**	0.39		0.58
22. Have you experienced difficulty enjoying contacts with other people over the past 12 months?	**0.60**	0.31	0.33	0.69
19. Have you been easily irritable over the past 12 months?	**0.58**	0.21	0.43	0.57
7. Do you feel that your oral health affects your ability to work or your everyday activities?	**0.53**	0.42	0.25	0.52
15. Have you had speech or pronunciation problems over the past 12 months?	**0.52**	0.22	0.33	0.42
16. Have you had problems maintaining oral hygiene over the past 12 months?	**0.50**		0.42	0.44
8. Are you worried about what other people will think of the appearance of your teeth?	0.25	**0.79**		0.70
12. Do you have poor self-esteem because of problems with your teeth?	0.38	**0.75**		0.71
3. Do you ever avoid smiling and laughing because of problems with your teeth?		**0.72**		0.55
18. Have you felt embarrassed to laugh, smile or show your teeth over the past 12 months?	0.35	**0.69**	0.30	0.69
6. Do you ever avoid other people because of problems with your mouth or teeth?	0.43	**0.65**		0.63
1. Are you happy with your teeth?		**0.64**	0.46	0.63
2. Are you happy with the appearance of your teeth?		**0.64**	0.31	0.51
13. Have you experienced problems with your mouth or teeth over the past 12 months?	0.36		**0.73**	0.70
14. Have you experienced chewing difficulties and/or difficulty enjoying food over the past 12 months?	0.36	0.30	**0.73**	0.74
21. Have you experienced pain from your mouth or teeth over the past 12 months?	0.42		**0.71**	0.69
4. Are you able to chew all kinds of food, including nuts and apples?		0.49	**0.63**	0.64
5. Do you ever avoid some kinds of food because of your inability to chew it?		0.50	**0.54**	0.57
Eigenvalue	9.77	2.00	1.20	
Variance explanation (%)	44.4	9.1	5.8	Sum: 59.3

dimensions of OHRQOL in relation to two selected instruments.

Factor analysis was used and three factors were found to represent various aspects of OHRQOL. Three dimensions of oral impact on daily performance were found: "physical and social disability", "psychological discomfort and disability", and "functional limitation and physical pain".

When developing OHIP (Oral Health Impact Profile), Slade & Spencer [18] developed measures for seven domains related to Locker's model [32]: functional limitation, physical pain, psychological discomfort, physical disability, psychological disability, social disability, and handicap. The study population was interviewed and the prevalence and severity of OHIP scores were analyzed. Nearly one-third of the statements related to physical disability, while statements about functional limitation, physical discomfort, and psychological disability were also common [18]. In the present study, the factor "physical and social disability" organized the variation of almost half of the variables, explaining 44.4% of the variance.

When developing OIDP (oral impact on daily performance) Adulyanon & Sheiham [7,14] used both interviews and a proposed questionnaire. Incidence, frequency, and severity of oral impacts on daily performance over a 6-month period were registered. Of all subjects in that study, 74% had at least one daily performance affected by an oral impact in the previous 6 months. In the present study, 38% of the population had experienced problems with their mouth or teeth in the previous 12 months; the present population was thus healthier. In the study by

Table III. Variable dimensions of QOL measures and intended dimensions

Variable, question no.	Current factor solution	Intended dimension
9. Do you have headaches because of problems with your mouth or teeth?	Physical and social disability	Physical pain
11. Do you have problems in any other part of your body because of problems with your mouth or teeth?	ditto	Physical pain and discomfort
20. Have you experienced problems managing your work or your everyday activities over the past 12 months?	ditto	Social disability
17. Have you had sleep problems and/or problems relaxing over the past 12 months?	ditto	Psychological disability
10. Do you have pains in your stomach because of problems with your mouth or teeth?	ditto	Physical pain
22. Have you experienced difficulty enjoying contacts with other people over the past 12 months?	ditto	Social disability
19. Have you been easily irritable over the past 12 months?	ditto	ditto
7. Do you feel that your oral health affects your ability to work or your everyday activities?	ditto	ditto
15. Have you had speech or pronunciation problems over the past 12 months?	ditto	Physical disability
16. Have you had problems maintaining oral hygiene over the past 12 months?	ditto	ditto
8. Are you worried about what other people will think of the appearance of your teeth?	Psychological discomfort and disability	Psychological discomfort
12. Do you have poor self-esteem because of problems with your teeth?	ditto	Psychological discomfort
3. Do you ever avoid smiling and laughing because of problems with your teeth?	ditto	Psychological disability
18. Have you felt embarrassed to laugh, smile or show your teeth over the past 12 months?	ditto	ditto
6. Do you ever avoid other people because of problems with your mouth or teeth?	ditto	Social disability
1. Are you happy with your teeth?	ditto	Psychological discomfort
2. Are you happy with the appearance of your teeth?	ditto	ditto
13. Have you experienced problems with your mouth or teeth over the past 12 months?	Functional limitation and physical pain	Functional limitation and physical pain
14. Have you experienced chewing difficulties and/or difficulty enjoying food over the past 12 months?	ditto	Functional limitation
21. Have you experienced pain from your mouth or teeth over the past 12 months?	ditto	Physical pain
4. Are you able to chew all kinds of food, including nuts and apples?	ditto	Functional limitation
5. Do you ever avoid some kinds of food because of your inability to chew it?	ditto	ditto

Adulyanon & Sheiham, the high frequency impacts concerned "eating" and "speaking" performances, which were interpreted as physical performances. Subjects with affected performance were asked what caused the change in performance and the condition that caused the symptom. Pain and discomfort were the main causal factors behind impacts on almost every daily performance, except "Smiling". Toothache was a major impairment for almost all performance aspects [7,14]. In the present study, the factor functional limitation and physical pain only explained 5.8% of the variance. The final eight dimensions of OIDP, together representing the three daily physical, psychological and social performances, were: "eating and enjoying food", "speaking and pronouncing clearly", "cleaning teeth", "sleeping and relaxing", "smiling, laughing and showing teeth without embarrassment", "maintaining usual emotional state without being irritable", "carrying out major work or social role", and "enjoying contact with people" [7,14].

It is obvious that the three dimensions of OHRQOL, "physical and social disability", "psychological discomfort and disability", and "functional limitation and physical pain", found in the present study, are similar to the dimensions and daily performances of the already existing indices OHIP and OIDP. However, there were differences in frequencies of the actual populations for the respective dimensions which could be explained by differences in the material and methods.

In the present study, there was 91% agreement between intended and found dimensions of variables aimed at measuring OHRQOL. There are different

ways of interpreting variables for intended dimension-belonging and there is most likely no right nor wrong in any interpretation of items. It is not unambiguous whether a variable belongs to the psychological or the social dimension or whether an impact is functional or physical in character. One interpretation is that the result can be due to covariation of more than one impact on QOL. For example "worry about what people will think about the appearance of one's teeth" can be described as psychological discomfort with social implications and to chew can be described as a physical activity but also as a kind of oral function.

A performance, on the other hand, can be interpreted literally, but it can also be interpreted according to the consequences it may lead to. For example, "loss of a tooth" is an acquired defect which may lead to functional limitation affecting chewing and speaking, but it may also lead to psychological discomfort when the loss is in a region affecting the appearance. A further effect might be social disability, as tooth loss may result in difficulties in enjoying contacts with other people, which in turn may result in being unable to work or function in everyday activities. From being a functional limitation, it could finally become a handicap in accordance with Locker's model [32].

There is a risk of overinterpreting variables and dimensions when using methods that are too sophisticated. One also has to consider that the opinion of the respondents reflects an interpretation in general, affected by for example psychological mechanisms, attitudes, age, education, ethnic background, and general health. There is most likely a wide range of attitudes concerning the impact of chewing function, comfort, and esthetics on the concept of OHRQOL. The results are only generalizable to the age range of the study subjects.

Factor analysis was used in the present study to lend quantitative support to a qualitative interpretation, and one strength of the results is that the first factor dominates strongly in the solution. Minor factors tend to be unstable in such cases [37]. Indeed, using only the first factor could be a strategy in further analysis in the light of its explanatory power. The perception of OHRQOL is multidimensional, but the dimensions are not equally important.

There is an ongoing discussion about how many questions are necessary for an optimal instrument measuring OHRQOL. Another interesting question to discuss, based on the results of this study, is the importance of having different dimensions. Is this necessary in order to find evidence for OHRQOL or is it a result of our ambition as scientists to be able to measure everything in detail?

No "true" interpretation can be found through statistical analysis – it is often a question of the meaning ascribed to a word, and that meaning can vary between people. Neither is there an "essence" of OHRQOL out there to be discovered by researchers. What probably can be found, though, is whether there are different mechanisms behind the various factors and if different processes can be discerned behind the three factors. This will be investigated in future studies of this material.

Conclusion

From the results of the present study it is concluded that:

- Three factors, physical and social disability, psychological discomfort and disability, and functional limitation and physical pain can explain seven dimensions of OHRQOL in an adult Swedish population.
- Physical disability and social disability can be linked in the same dimension of OHRQOL.
- The perception of OHRQOL is multidimensional, but the dimensions are not equally important.
- The dimensions of OHRQOL in the present study were similar to those in OHIP and OIDP.

References

[1] Bech P. Measuring quality of life: the medical perspective. Nord J Psychiatry 1992;46:85–9.
[2] Parmenter TR. Quality of life as a concept and measurable entity. Soc Indic Res 1994;33:9–46.
[3] Sorensen T, Naess S. To measure quality of life: relevance and use in the psychiatric domain. Nord J Psychiatry 1996;50:29–39.
[4] Schipper H, Clinch J, Powell W. Definitions and conceptual issues. In: Spilker B, editor. Quality of life assessments in clinical trials. New York: Raven Press; 1990. p. 11–24.
[5] Shumaker SA, Anderson RT, Czajkowski SM. Psychological tests and scales. In: Spilker B, editor. Quality of life assessments in clinical trials. New York: Raven Press; 1990. p. 95–113.
[6] Cheung CK. Towards a theoretically based measurement model of the good life. J Genet Psychol 1997;158:200–15.
[7] Adulyanon S, Vourapukjaru J, Sheiham A. Oral impacts affecting daily performances in a low dental disease Thai population. Community Dent Oral Epidemiol 1996;24:385–9.
[8] Ettinger RL. Oral disease and its effect on the quality of life. Gerodontics 1987;3:103–6.
[9] Fiske J, Davis DM, Frances C, Gelbier S. The emotional effects of tooth loss in edentulous people. Br Dent J 1998;184:90–3.
[10] Hollister CM, Weintraub JA. The association of oral status with systemic health, quality of life, and economic productivity. J Dent Educ 1993;57:901–12.
[11] Locker D. The social and psychological consequences of oral disease. In: An introduction to behavioural science and dentistry. London: Tavistock/Routledge; 1989. p. 88–101.
[12] Reisine ST, Miller J. A longitudinal study of work loss related to dental diseases. Soc Sci Med 1986;22:1309–14.
[13] 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.
[14] Adulyanon S, Sheiham A. Oral impacts on daily performances. In: Slade GD, editor. Measuring oral health and quality of life. Chapel Hill, NC: University of North Carolina-Chapel Hill; 1997. p. 151–60.

[15] 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;15:446–50.
[16] Leao A, Sheiham A. The development of a socio-dental measure of dental impacts on daily living. Community Dent Health 1996;13:22–6.
[17] McGrath C, Bedi R. An evaluation of a new measure of oral health related quality of life – OHQoL – UK(W). Community Dent Health 2001;18:144–9.
[18] Slade GD, Spencer AJ. Development and evaluation of oral health impact profile. Community Dent Health 1994;11:3–11.
[19] Slade GD. Derivation and validation of a short-form oral health impact profile. Community Dent Oral Epidemiol 1997; 25:284–90.
[20] 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.
[21] Tsakos G, Marcenes W, Sheiham A. Evaluation of a modified version of the index of oral impacts on daily performances (OIDP) in elderly populations in two European countries. Gerodontology 2001;18:121–30.
[22] 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;62:147–52.
[23] Ohrn KE, Sjoden PO, Wahlin YB, Elf M. Oral health and quality of life among patients with head and neck cancer or haematological malignancies. Support Care Cancer 2001; 9:528–38.
[24] Bergendal B. The relative importance of tooth loss and denture wearing in Swedish adults. Community Dent Health 1989; 6:103–11.
[25] Trulsson U, Engstrand P, Berggren U, Nannmark U, Brånemark P-I. Edentulousness and oral rehabilitation: experiences from the patients' perspective. Eur J Oral Sci 2002; 110:417–24.
[26] Gunne J, Nystrom E, Kahnberg KE. Bone grafts and implants in the treatment of severely resorbed maxillae: a 3-year follow-up of the prosthetic restoration. Int J Prosthodont 1995; 8:38–45.
[27] Hakestam U, Söderfeldt B, Rydén O, Glantz E, Glantz PO. Dimensions of satisfaction among, prosthodontic patients. Eur J Prosthodont Rest Dent 1997;3:111–17.
[28] Karlsson G, Teiwik A, Lundstrom A, Ravald N. Costs of periodontal and prosthodontic treatment and evaluation of oral health in patients after treatment of advanced periodontal disease. Community Dent Oral Epidemiol 1995;23:159–64.
[29] Kronström M, Trulsson M, Söderfeldt B. Patient evaluation of treatment with fixed prostheses supported by implants or a combination of teeth and implants. J Prosthodont 2004; 13:160–5.
[30] Heyden G. Health profile of the ageing population: the Swedish experience. Int Dent J 1998;48:167–72.
[31] Nordenram G, Ronnberg L, Winblad B. The perceived importance of appearance and oral function, comfort and health for severely demented persons rated by relatives, nursing staff and hospital dentists. Gerodontology 1994;11:18–24.
[32] Locker D. Measuring oral health: socio-dental indicators. In: An introduction to behavioural science and dentistry. London: Tavistock/Routledge; 1989. p. 73–87.
[33] Slade GD. Assessment of oral health-related quality of life. In: Inglehart MR, Bagramian RA. Oral health-related quality of life. Carol Stream, IL: Quintessence Publishing Inc; 2002. p. 29–45.
[34] Allen F. Assessment of oral health related quality of life. Health and quality of life outcomes (BioMed Central) 2003;1 : 40:1–8. Available at: www.hqol.com/1/1/40
[35] Bagewitz IC, Söderfeldt B, Palmqvist S, Nilner K. Social equality and dental conditions – a study of an adult population in Southern Sweden. Swed Dent J 2000;24:155–64.
[36] Unell L, Söderfeldt B, Halling A, Solén G, Paulander J, Birkhed D. Equality in satisfaction, perceived need and utilisation of dental care in a 50 year old Swedish population. Community Dent Oral Epidemiol 1996;24:191–5.
[37] Kim JO, Mueller CW. Introduction to factor analysis. Quantitative applications in the social sciences, vol. 13. New York: SAGE University Papers; 1978.