Acta Odontologica Scandinavica, 2009; 67: 85–93

informa
healthcare

ORIGINAL ARTICLE

Oral health impact on quality of life in an adult Swedish population

SUSANNE EINARSON[1], ELISABETH WÄRNBERG GERDIN[2] & ANDERS HUGOSON[1]

[1]*Department of Natural Science and Biomedicine, School of Health Sciences, Jönköping, Sweden and* [2]*Centre for Public Health Sciences, County of Östergötland, Linköping, Sweden*

Abstract

Objectives. Oral health has a major impact on general quality of life. The aspects of oral health that are most important for each individual vary, and quality of life is a construct and not a measurable variable. The aim of this study was to describe the impact of oral health on quality of life in an adult Swedish population. ***Material and methods.*** The study comprised a stratified random sample of 519 individuals. The OHIP-14 questionnaire was used and the answers were rated on a scale of 0–4. ***Results.*** Twenty-one percent of the respondents stated that they had no oral problems related to well-being, and 79% had some form of problem related to quality of life. The mean value for the entire population was 6.4 (SD = 7.1); 5.9 (SD = 7.1) for men and 6.8 (SD = 7.2) for women. Of individuals who stated that they had oral problems, the majority were women aged 20 years. Nineteen percent of 30-year-old men and 53% of 70-year-old women stated that they had had problems that had made life less satisfactory. Individuals who frequently experienced problems related to oral health, with scores of 16–41 points, accounted for 10%. ***Conclusion.*** In this Swedish population, a number of individuals, young and old, experienced oral problems that had an impact on their well-being.

Key Words: *Epidemiology, OHIP-14, oral health-related quality of life*

Introduction

Quality of life is an expression with many meanings and it creates positive associations for most people [1]. However, quality of life and the factors most important for each individual vary depending on age, gender, and cultural situation, among other things [2]. Quality of life is therefore not a directly measurable variable, but a construction of several independent factors based on the perception of the individual.

Oral health has a major impact on general health and well-being, both physical and mental; it therefore influences quality of life and reinforces self-confidence [3–10]. Individuals with good oral health have been found to age with enhanced quality of life and fewer illnesses compared to people with poor oral health [3,6].

During the past few decades, a number of instruments for measuring quality of life in relation to oral health have been designed (OHRQoL) [11–13]. Depending on the measures used, quality of life related to oral conditions has been described as problems related to eating, nutrition, social interaction, emotional and psychological function, and various problems in the oral cavity. Quality of life in this context is not therefore associated with a positive experience; instead, it is linked to problems in the oral cavity that have a negative effect on well-being.

One of the instruments frequently used to measure OHRQoL is the Oral Health Impact Profile (OHIP) questionnaire [14]. Questions measuring the impact of oral condition on everyday well-being are evenly distributed between the dimensions of functional limitations, physical pain, psychological discomfort, physical disability, psychological disability, social disability, and handicap [14].

The OHIP questionnaire has been translated into several languages [15,16]. Larsson et al. [15] evaluated a Swedish version of OHIP-49 (OHIP-S) and found good reliability and validity. The instrument could be recommended for determining how oral health impacts on chewing ability and psychosocial function.

OHRQoL has been studied in both cross-sectional and longitudinal studies. Most of these studies have been on elderly people [12,17–19], but other groups

Correspondence: Susanne Einarson, Department of Natural Sciences and Biomedicine, School of Health Sciences, Barnarpsgatan 39, SE-551 11 Jönköping, Sweden. Tel: +46 36 10 12 99. Fax: +46 36 10 13 00. E-mail: susanne.einarson@hhj.hj.se

(Received 13 February 2008; accepted 4 December 2008)

ISSN 0001-6357 print/ISSN 1502-3850 online © 2009 Informa UK Ltd. (Informa Healthcare, Taylor & Francis As)
DOI: 10.1080/00016350802665597

have been included. Immigrants, farm workers, seasonal workers, and groups with special illnesses have all been studied on a limited scale [20,21].

Only a few population studies have been conducted with OHRQoL as the starting point, covering a random sample of an adult population. In 1998 in the UK, oral health-related quality of life was studied among dentate individuals aged 16+ years using the OHIP-14 questionnaire [22]. And, in 1999, a similar population study was conducted in Australia, also using the OHIP-14 questionnaire [23].

Two population studies, one Swedish and one Finnish, have been reported from the Nordic countries. The Swedish study [24] included examination of the impact of oral health and prostheses on perceived quality of life. The study population comprised randomly selected individuals, aged 50–74 years, answering questions about their oral health and its impact on their social situation. The results revealed that dental and social conditions, and the cost of dental care, had an important impact on quality of life and health-care utilization. In the Finnish study [25], OHRQoL was studied in conjunction with Sense of Coherence (SOC) and socioeconomic, demographic factors and oral health variables. This investigation took the form of a population study with individuals aged 30–64 years. All the participants were dentate. The results showed that individuals with few problems in the oral cavity, measured according to OHIP-14, had a high SOC score compared to individuals with more extensive problems.

There are no comprehensive studies of oral health-related quality of life covering a representative age range of the Swedish adult population. Therefore, the aim of our study was to describe OHRQoL, using the OHIP-14, in an adult population, aged from 20 to 80 years, in Jönköping, Sweden.

Material and methods

Study population

Inhabitants in four parishes (all in the city of Jönköping, Sweden) who turned 20, 30, 40, 50, 60, 70 and 80 years of age in 2003 were randomly selected to participate in the study. There were 130 individuals in each group; in all, 910 individuals. Everyone selected for the study received a personal invitation by letter to take part in a dental health examination. They were informed of the purpose of the investigation and invited to answer a questionnaire, including OHIP-14. If a daytime appointment was inconvenient, the person was examined in the evening. Non-respondents were contacted by telephone and asked about their reason for not attending the examination. The reasons for not taking part in the study were registered. They included: "not interested" (10–22%), "had recently visited a dentist" (4–7%), "could not be reached by letter" (5–7%). Details regarding the sampling procedure, the number of non-respondents, and reasons for not taking part in the study are given elsewhere [26].

Of the total sample, 591 individuals participated and were examined clinically and radiographically and, of these, 573 answered the questionnaire. Four-hundred-and-twenty-five participants answered all 14 OHIP-14 questions and 94 answered 1 to 13 questions (18% 1–4 questions, 21% 5–8 questions, and 61% of the participants 9–13 questions). Fifty-four individuals answered questions with "*This question is not applicable to me*" or left the remaining questions unanswered. The answers to these questions have been regarded as an internal non-response. The number of respondents was therefore 519.

Throughout the study, the ethical rules for research as described in the Helsinki Declaration were followed. The study was approved by the Ethics Committee at the University of Linköping, Linköping, Sweden (reference no. 02-376).

Data collection

Oral health impact on quality of life was examined using the OHIP-14 questionnaire [27], which was part of a larger document with questions about socioeconomic variables, attitudes to and knowledge about dental care, dental visits, oral hygiene, and so on [26]. All the questions in the OHIP-14 questionnaire began in the same way: How often have you, as a result of your *oral cavity, teeth, jaw or prostheses*, during *the past year*, experienced the following situations? Each question could be answered using one of the alternative answers: *not applicable, never, hardly ever, occasionally, often* or *very often*. For the analyses, the answers were rated as follows: *not applicable to me* = non-response, *never* = 0, *hardly ever* = 1, *occasionally* = 2, *often* = 3, *very often* = 4. The total score for the OHIP-14 questionnaire (individual) was obtained by adding up the points for the individual questions (max. 56 points). The questions were organized in seven dimensions: functional limitations, physical pain, psychological discomfort, physical disability, psychological disability, social disability, and handicap, each of which contained two questions. The results have been reported as individual mean values, calculated on the basis of the number of questions answered, the individual total scores, and the number of individuals with problems.

Statistical methods

All the statistical analyses were performed using the SPSS software package (SPSS for Windows, v. 14.0, SPSS Inc, Chicago, Ill., USA). Descriptive data were reported for each age group and the sampling design

was therefore incorporated in the analysis. Mean values, standard deviation (SD), and frequency distributions are given. To examine the internal reliability of the OHIP-14 scale, Cronbach alpha values were calculated for the total scale, as well as for the seven subscales. Student's *t*-test was used to compare two groups on continuous normal variables and one-way ANOVA when comparing more than two groups. Chi-square test was used for categorical variables. Multiple linear regression analyses were performed to examine for each dimension the relationship between age and gender. A level of $p < 0.05$ was considered statistically significant.

Results

The stratified random sample differed statistically significant from the original population in two age groups. There were fewer participants among 20-year-olds ($p = 0.002$) and more among 70-year-olds ($p = 0.005$) compared to the age distribution in the city of Jönköping in 2003.

Internal reliability of the OHIP scale showed good internal consistency with a Cronbach alpha coefficient of 0.90. When comparing the OHIP score for the participants who had answered all 14 questions (OHIP score 6.3) with that of those who had answered 1–13 questions (OHIP score 6.6), no statistically significant difference in mean score could be found. Internal non-respondents were analyzed for age, gender, and socio-economic information. There was a statistically significant difference between non-respondents and respondents as regards age ($p = 0.016$) and gender ($p = 0.007$). The non-respondents were characterized by older participants and more women compared to the respondents. There were no differences according to socio-economic variables.

Table I gives the OHIP mean values and standard deviation (SD) for all participants distributed by age group and gender who answered all or parts of the questionnaire. The OHIP score varied among the age groups, with the highest mean value for 20-year-olds and the lowest for 30-year-olds. Twenty-year-old women had the highest mean values. Seventy-year-old men had the lowest values, statistically significant different from women in the same age groups.

The mean OHIP value for the entire population was 6.4 points (SD = 7.1); 5.9 (SD = 7.1) for men and 6.8 (SD = 7.2) for women. Figure 1 shows the frequency distribution of all individuals ($n = 519$) in terms of total OHIP-14 scores. Twenty-one percent of the participants had a score of 0. For those who reported some kind of problem that had an impact on quality of life, the scores varied between 1 point (9%) and 41 points (0.2%) for the total population. For example, 10% of the participants ($n = 47$) had scores between 16 and 41 points.

Table II gives the percentages of individuals who answered any question stating that they had never had problems that had an impact on quality of life (0 point), or hardly ever/very often had problems (1–4 points) and problems often/very often (3–4 points). The questions are sorted into the relevant question dimensions. For Question 1, for example, 79% had not experienced any problems during the previous year, 21% had experienced problems hardly ever to very often, including 3% who had problems often/very often in the form of *difficulty enunciating words*. Within the dimension of psychological disability, 45% of the participants had at some time experienced problems from their oral cavity that had made it *difficult for them to relax* (Question 9). Twelve percent of the participants said that they had had difficulties with oral health, difficulties severe enough for them to have been *totally unable to function* (dimension handicap, Question 14).

Table III presents the answers in detail for the different dimensions and questions of those who experienced problems (points 1–4). The percentages of men and women with problems are given for each age group. Twenty-eight percent of 20-year-old men stated that they had *problems enunciating words* (Functional limitation Question 1), 16% stated that they had been *somewhat irritated with other people* (Social disability, Question 11) as a result of problems in the oral cavity. Most of those who stated that they had experienced problems in the oral cavity that had impacted on their quality of life within the dimensions of psychological discomfort, physical disability, and psychological disability were found

Table I. Mean (SD) values for OHIP distributed by age groups and gender. (n, number of individuals)

Age	Total (n)	Mean (SD)	Male (n)	Mean (SD)	Female (n)	Mean (SD)
20	80	7.7 (8.2)	43	6.4 (8.0)	37	9.3 (8.2)
30	87	5.1 (6.5)	41	5.6 (6.9)	46	4.6 (6.2)
40	68	7.5 (7.7)	40	8.2 (8.5)	28	6.5 (6.6)
50	81	6.7 (7.9)	40	7.1 (8.6)	41	6.2 (7.2)
60	79	5.4 (5.9)	41	4.1 (5.2)	38	6.7 (6.1)*
70	76	5.9 (6.2)	38	4.1 (4.3)	38	7.7 (7.2)*
80	48	6.2 (7.2)	17	5.5 (5.4)	31	7.6 (8.0)
Total:	519	6.4 (7.1)	260	5.9 (7.1)	259	6.8 (7.2)

*$p < 0.05$ statistical difference between male and female in same age group

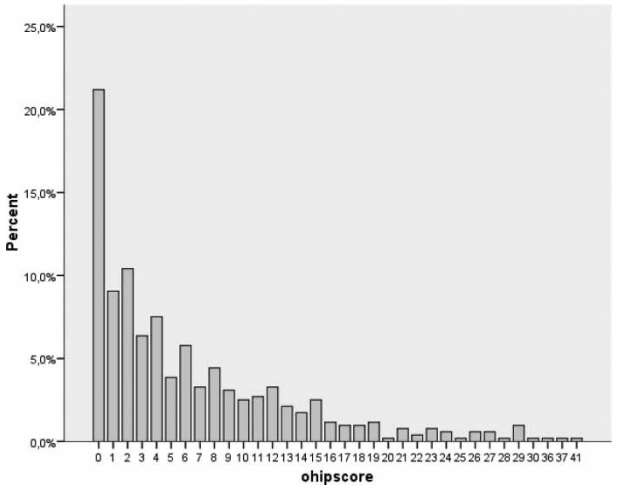

Figure 1. Frequency (%) distribution of individuals (n = 516) according to OHIP-14 scores.

among 20-year-old women Question 5 (*felt uncertain*) 54%, Question 7 (*have had an unsatisfactory diet*) 57%, and Question 9 (*have had difficulty relaxing*) 57%.

The percentages of individuals with problems often or very often (score 3–4), distributed by age and gender, are presented in Table IV for each dimension and question. Men experiencing problems often or very often varied between 5% (50-year-olds, Question 7) and 67% (60-year-olds, Question 1). Within the dimension of handicap (Question 13), the percentage of men with severe problems in the 20 to 50-year-old age groups varied between 12% and 25%, but among the 60 to 80-year-olds there were no men with problems often or very often. The numbers of women who stated that they experienced problems often or very often varied between 5% (70-year-olds, Question 11) and 45% (80-year-olds, Question 5).

Each dimension was analyzed for association between OHIP score and age and gender. The dimensions social disability and handicap showed a statistically significant association between OHIP score and age ($p = 0.011$ and 0.020, respectively). For social disability, the highest percentages of participants with problems were found for 40- and 70-year-olds and for handicap for 20-, 70- and 80-year-olds (Table III).

Discussion

Data from epidemiological studies can be used to illustrate a number of important areas, such as the prevalence and severity of oral diseases, but also to identify and analyze disease determinants and groups at risk of deteriorating oral health. Sweden has a long tradition in odontologic, epidemiological studies. However, this is the first comprehensive epidemiological study covering a stratified random sample of selected adult ages in Sweden describing

Table II. Number (n) and percentage (%) of individuals without problems (0 points) and with problems (1-4 and 3-4 points).for each question.

	Never	hardly ever/occassionally	often/very often
	0 point	1–4 points	3–4 points
Functional limitations			
Question 1: *Difficulty enunciating words*	365 (79)	97 (21)	14 (3)
Question 2: *Feel my taste has deteriorated*	370 (78)	107 (22)	15 (3)
Physical pain			
Question 3: *Have had pain in my mouth*	278 (57)	211 (43)	16 (3)
Question 4: *Have had discomfort when eating*	340 (70)	148 (30)	21 (4)
Psychological discomfort			
Question 5: *I have felt uncertain*	297 (57)	289 (43)	33 (7)
Question 6: *I have felt tense*	281 (58)	206 (42)	34 (7)
Physical disability			
Question 7: *My diet has been unsatisfactory*	289 (56)	191 (44)	23 (5)
Question 8: *I have been forced to interrupt meals*	376 (77)	110 (23)	7 (1)
Psychological disability			
Question 9: *I have had difficulty relaxing*	269 (55)	217 (45)	39 (8)
Question 10: *I have felt embarrassed*	325 (67)	178 (33)	11 (2)
Social disability			
Question 11: *I have been somewhat irritated with other people*	315 (65)	172 (35)	18 (4)
Question 12: *I have had difficulty performing my daily tasks*	386 (79)	100 (21)	8 (2)
Handicap			
Question 13: *I have felt that life in general has been less satisfactory*	320 (66)	168 (34)	14 (3)
Question 14: *I have been totally incapable of functioning*	429 (88)	54 (12)	5 (1)

Table III. Number (n) of individuals and percentage (%) of male and female with problems, 1-4 points, distributed according to dimension, questions and age groups.

	20		30		40		50		60		70		80	
Agegroup	**male**	female	**male**	female	**male**	female	**male**	female	**male**	female	**male**	female	**male**	female
n	**43**	37	**41**	46	**39**	28	**40**	41	**41**	38	**37**	38	**16**	31
Functional limitations														
Question 1:	**12 (28)**	7 (19)	**5 (13)**	2 (4)	**9 (23)**	4 (14)	**7 (17)**	6 (15)	**3 (7)**	8 (21)	**8 (21)**	14 (37)	**4 (23)**	8 (26)
Question 2:	**9 (21)**	5 (14)	**10 (24)**	1 (2)	**8 (21)**	3 (11)	**9 (22)**	9 (22)	**4 (10)**	7 (18)	**8 (21)**	15 (39)	**8 (47)**	11 (35)
Physical pain														
Question 3:	**15 (35)**	16 (43)	**21 (51)**	19 (41)	**20 (51)**	12 (43)	**18 (45)**	15 (37)	**14 (34)**	17 (45)	**11 (30)**	18 (47)	**3 (19)**	11 (35)
Question 4:	**14 (33)**	15 (41)	**13 (32)**	10 (22)	**12 (31)**	9 (32)	**12 (30)**	14 (34)	**6 (15)**	10 (26)	**6 (16)**	15 (39)	**2 (12)**	9 (29)
Psychological discomfort														
Question 5:	**16 (37)**	20 (54)	**14 (34)**	13 (28)	**16 (41)**	13 (46)	**14 (35)**	13 (32)	**11 (27)**	17 (45)	**10 (27)**	14 (37)	**7 (43)**	11 (35)
Question 6:	**11 (26)**	22 (59)	**14 (34)**	17 (37)	**15 (38)**	14 (50)	**16 (40)**	15 (37)	**13 (32)**	20 (53)	**10 (27)**	18 (47)	**9 (52)**	13 (42)
Physical disability														
Question 7:	**17 (40)**	21 (57)	**19 (46)**	9 (20)	**16 (41)**	12 (43)	**19 (47)**	19 (46)	**12 (29)**	18 (47)	**9 (24)**	11 (29)	**3 (19)**	5 (16)
Question 8:	**14 (33)**	13 (35)	**11 (27)**	4 (9)	**10 (26)**	8 (29)	**9 (22)**	12 (29)	**7 (17)**	11 (29)	**3 (8)**	5 (13)	**2 (12)**	1 (3)
Psychological disability														
Question 9:	**17 (40)**	21 (57)	**16 (39)**	15 (33)	**16 (41)**	15 (54)	**19 (47)**	19 (46)	**13 (32)**	21 (55)	**12 (32)**	18 (47)	**5 (31)**	10 (32)
Question 10:	**12 (19)**	13 (35)	**7 (17)**	14 (30)	**15 (38)**	8 (29)	**13 (32)**	14 (34)	**9 (22)**	13 (34)	**8 (22)**	16 (42)	**5 (29)**	11 (35)
Social disability														
Question 11:	**7 (16)**	14 (38)	**8 (19)**	11 (24)	**17 (44)**	10 (36)	**13 (32)**	9 (22)	**12 (29)**	13 (34)	**13 (35)**	19 (50)	**2 (12)**	9 (29)
Question 12:	**8 (19)**	9 (24)	**6 (15)**	3 (7)	**11 (28)**	7 (25)	**8 (20)**	7 (17)	**8 (19)**	8 (21)	**8 (22)**	7 (18)	**4 (25)**	6 (19)
Handicap														
Question 13:	**12 (28)**	13 (35)	**8 (19)**	11 (24)	**16 (41)**	9 (3)	**13 (32)**	11 (27)	**13 (32)**	14 (37)	**10 (27)**	20 (53)	**6 (37)**	13 (42)
Question 14:	**8 (19)**	6 (16)	**3 (7)**	1 (2)	**6 (15)**	3 (11)	**5 (12)**	3 (7)	**5 (13)**	2 (5)	**3 (8)**	3 (8)	**2 (12)**	7 (23)

Table IV. Number (n) and percentage, (%) of male and female with problems, often and very often, 3-4 points, of those individuals with problems (1-4 points) distributed according to dimension, questions, age groups and gender.

	20		30		40		50		60		70		80	
Agegroup	**male**	female	**male**	female	**male**	female	**male**	female	**male**	female	**male**	female	**male**	female
Functional limitations														
Question 1:	**0**	2 (29)	**1 (20)**	0	**0**	1 (25)	**1 (14)**	1 (17)	**2 (67)**	1 (13)	**0**	2 (14)	**0**	3 (37)
Question 2:	**0**	2 (40)	**0**	0	**1 (13)**	0	**1 (22)**	1 (11)	**0**	0	**1 (12)**	4 (27)	**1 (14)**	3 (28)
Physical Pain														
Question 3:	**0**	1 (6)	**1 (5)**	1 (5)	**3 (15)**	3 (25)	**1 (11)**	0	**0**	1 (6)	**0**	2 (11)	**0**	2 (18)
Question 4:	**0**	0	**0**	3 (30)	**1 (8)**	3 (33)	**3 (25)**	1 (7)	**1 (17)**	2 (20)	**0**	2 (13)	**1 (50)**	3 (33)
Psychological discomfort														
Question 5:	**2 (13)**	5 (25)	**2 (7)**	3 (23)	**4 (25)**	2 (15)	**0**	4 (31)	**2 (9)**	2 (12)	**1 (10)**	2 (14)	**0**	5 (45)
Question 6:	**1 (9)**	1 (32)	**3 (21)**	4 (24)	**4 (27)**	1 (7)	**3 (19)**	0	**1 (8)**	3 (15)	**1 (10)**	2 (11)	**0**	4 (31)
Physical disability														
Question 7:	**2 (12)**	4 (19)	**3 (16)**	2 (11)	**2 (12)**	0	**1 (5)**	3 (16)	**0**	3 (17)	**1 (11)**	2 (18)	**1 (33)**	0
Question 8:	**1 (7)**	0	**1 (9)**	0	**0**	0	**1 (11)**	3 (25)	**0**	0	**1 (33)**	0	**0**	0
Psychological disability														
Question 9:	**4 (24)**	7 (33)	**4 (25)**	2 (13)	**6 (38)**	1 (7)	**3 (16)**	2 (11)	**1 (8)**	2 (10)	**1 (8)**	2 (11)	**1 (20)**	3 (30)
Question 10:	**1 (8)**	3 (23)	**1 (14)**	1 (7)	**1 (7)**	0	**0**	2 (14)	**0**	0	**0**	1 (6)	**0**	1 (9)
Social Disability														
Question 11:	**3 (18)**	5 (36)	**1 (13)**	0	**2 (12)**	2 (10)	**3 (23)**	2 (22)	**0**	0	**0**	1 (5)	**0**	0
Question 12:	**1 (13)**	0	**0**	0	**0**	0	**2 (25)**	2 (14)	**1 (13)**	1 (13)	**0**	1 (14)	**0**	1 (17)
Handicap														
Question 13:	**3 (25)**	1 (8)	**2 (13)**	0	**2 (12)**	0	**2 (15)**	2 (18)	**0**	0	**0**	0	**0**	3 (23)
Question 14:	**2 (25)**	0	**1 (33)**	0	**0**	0	**1 (20)**	1 (33)	**0**	0	**0**	0	**0**	0

an individual's own perception of the impact of oral status on quality of life.

The work should be seen as the first report in a series of studies designed to measure the impact of oral health on quality of life from an epidemiological perspective. The concept of oral health-related quality of life is based on the assumption that these functional and psychosocial impacts affect quality of life. According to Locker & Allen [28], all measures document the frequency of the impacts that emanate from oral disorders, but they do not establish the meaning and significance of those impacts. Therefore, verifying the claim that oral disorders affect quality of life requires further studies [28].

When it comes to epidemiological studies, one important question is always whether the results can be regarded as representative of populations other than the one being studied. In this study, a stratified randomly selected group of individuals from Jönköping, a medium-sized Swedish town of some 120,000 inhabitants aged between 20 and 80 years, was examined. The majority of the population were born in Sweden, but around 10% were born outside Sweden. As a result, the ethnic composition of the population was basically the same as that in the rest of Sweden. The results for a large number of odontological variables relating to attitudes to dental care, or oral behavior, as well as clinical variables, are similar to results from other Swedish epidemiological studies [29]. Therefore, it can be concluded that the results for the OHIP presented from this part of Sweden apply in other parts of the country as well [26].

In all epidemiological studies, there are a certain number of individuals who do not wish to participate. The non-response rate in this study was 29–36% for the 20 to 70-year-old age group and 53% for the 80-year-old age group. The main reason given for not being able, or not wishing, to take part was a lack of time or interest, but a number of other different reasons were also given. This indicates that the non-responders would probably not have had a major impact on the results. When it comes to the 80-year-olds, however, conclusions relating to the results must be made with care, because of the large number of non-responders. Individuals participating in the clinical examination and answering questions in the larger questionnaire, but who did not answer any questions in the OHIP questionnaire, were statistically significantly different as regards age and gender from responding participants. The highest frequency of non-respondents was found among 40-, 70- and 80-year-olds. Older participants may have found the questionnaire too difficult to answer, but the reasons why 40-year-olds and women did not answer is more difficult to explain.

This study was based on an internationally well-known measurement instrument, the OHIP-14, for assessing oral health impact on quality of life. Reliability and validity of the instrument have been tested previously in a number of studies, and with good results. For example, the OHIP-14 has been shown to be a valid and reliable instrument for measuring oral health-related quality of life in general practice [30] and in a number of studies relating to partially dentate and elderly edentulous patients [31]. However, the OHIP-14 is a self-rating questionnaire with a limited number of alternative answers and with only limited opportunity for respondents to give their own views and comments. This design is a prerequisite for statistical analysis of the results, but, at the same time, it restricts the potential for detailed answers. Some questions can be misunderstood, resulting in incorrect conclusions. However, this questionnaire was answered at the clinical examination and it was therefore possible to consult the examiner if and when necessary.

While there is ongoing discussion about the different instruments used to measure the social impact of oral diseases on quality of life [11,28], only a few authors have discussed how to treat individual questions left blank, or with the statement "not applicable to me" [10,20]. People who had 10 or more such responses (OHIP-49) or 5 missing items overall (OHIP-G) were excluded from the studies. However, no motive for the exclusion was given and no reasons were discussed. As the future aim for our studies is to analyze the reasons behind answers with one or more OHIP points, it was decided in this study to treat all questions left blank or answered with "not applicable to me" as missing values. An important experience from the study is use of the answer "not applicable to me", which is impossible to interpret and therefore should be excluded in future questionnaires.

The given score indicates how frequently an individual feels that he/she experiences a problem that impacted on his/her well-being. The total score for each individual makes it possible to exclude individuals without problems (score 0) and to identify those experiencing problems at some time (score 1–4). In the event of problems/points, the analysis must continue in order to identify the relevant question dimension(s) that is (are) being rated. In an analysis of this kind, all the question dimensions may be rated, but it can happen that only one question in a dimension is given a score of 4 points, which means that the problem occurs very frequently within this one dimension. In this sense, the instrument is blunt at the mean value level but sharp at the question level, and the individual question must therefore be analyzed to find the reason for the individual assessment.

There was a statistically significant difference in the number of participants among 20- and 70-year-olds in the stratified random sample compared with the number of inhabitants living in the city of Jönköping in 2003. This difference can be explained

mainly by a higher, respectively lower, number of non-respondents in these two age groups.

When comparing the total mean OHIP sum in the stratified random sample (6.4) with the adjusted corresponding value for a distribution equal to the population (6.7), only a minor non-significant difference could be found. The study population could therefore be dealt with statistically either as a stratified sample or just as a simple random sample.

The mean value for the OHIP-14 for the entire population in this study was 6.4 (5.9 for men and 6.8 for women), which is in good agreement with the mean values reported in previous studies [19,23,31].

It may seem strange that only 21% of the participants did not report any kind of problem. In contrast, even though dental health has improved in Sweden during the past 30 years [29], it is surprising that as many as 79% of the population sometimes have problems relating to any one of the dimensions. However, the problems were mostly of minor frequency; problems of higher degree (often/very often) were only found, depending on dimension, in 2–8% of all individuals with problems. These results can be compared with the results from the study by Brennan & Spencer [32], who examined patients treated by a random sample of south Australian dentists. Among those individuals, 4–46%, depending on item, reported problems often and very often. This is an interesting comparison and points to the necessity of epidemiological studies covering a random sample of the population rather than specific groups of individuals, such as dental patients, in order to find out the overall importance of the impact of oral health on quality of life.

Altered quality of life may be an effect of changes in oral conditions, but may also be dependent on other events; for example, changes in perception and values may occur with increasing age. In this study, however, with one exception the OHIP score was not statistically significant associated with age. Within the dimension physical disability, 20-year-olds showed a higher score than older people. This is in agreement with the results presented by Steele et al. in 2004 [33]. However, the worst OHIP score was found as an effect of severe tooth loss. Twenty-year-old women obtained a higher mean score than both men and women in other age groups. There was no difference between men and women for oral health-related quality of life, except in the case of 70-year-old women, who had a statistically significant higher mean value than men in the corresponding age groups.

On average, 79% of the population reported some kind of problem from the oral cavity (1–4 points) that had an impact on their general quality of life and well-being. However, there is a clear bias among participants when it comes to the scores that were given (Figure 1). The total score obtained by 26% of the participants was only 1–3 points, but 10% had a score of 16–41 points. Describing oral health-related quality of life using only a total score is therefore impossible.

Conclusions

The results of this study reveal that the population, when described as mean values, has a burden related to oral problems that affects quality of life. Further analyses at question level, however, show that there are a large number of individuals with oral problems that impact on their everyday well-being to varying degrees. They include both 20-year-olds and elderly people of both sexes. To study the causes of the stated problems, additional epidemiological analyses of the relationships between the responses relating to oral health-related quality of life are needed, registered in the form of clinical variables.

Acknowledgments

The study was supported by the Medical Research Council of Southeast Sweden. We express our sincere gratitude to Dr Birgit Ljungqvist for statistical advice.

Declaration of interest: The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

References

[1] Nordenfelt L. Towards a theory of happiness: a subjectivist notion of quality of life. In: Nordenfelt L, editor. Concepts and measurement of quality of life in health care. Dordrecht: Kluwer Academic; 1994. p. 35–58.

[2] McGrath C, Bedi R. Measuring the impact of oral health in life quality in two national surveys – functionalist versus hermeneutic approaches. Community Dent Oral Epidemiol 2002;30:254–9.

[3] Ghezzi EM, Ship JA. Dementia and oral health. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2000;89:2–5.

[4] Kressin NR, Reisine S, Spiro A, Jones JA. Is negative affectivity associated with oral quality of life? Community Dent Oral Epidemiol 2001;29:412–23.

[5] Locker D, Matear D, Stephens M, Jokovic A. Oral health-related quality of life of a population of medically compromised elderly people. Community Dent Health 2002;19: 90–7.

[6] Loesche WJ, Abrams J, Terpenning MS, Bretz WA, Dominguez BL, Grossman NS, et al. Dental findings in geriatric populations with diverse medical backgrounds. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 1995;80:43–54.

[7] MacEntee MI, Hole R, Stolar E. The significance of the mouth in old age. Soc Sci Med 1997;45:1449–58.

[8] McGrath C, Bedi R. The importance of oral health to older people's quality of life. Gerodontology 1999;16:59–63.

[9] McNaugher GA, Benington IC, Freeman R. Assessing expressed need and satisfaction in complete denture wearers. Gerodontology 2001;18:51–7.

[10] John MT, Le Resche L, Koepsell TD, Hujoel P, Miglioretti DL, Micheelis W. Oral health-related quality of life in Germany. Eur J Oral Sci 2003;111:483–91.

[11] Allen PF. Assessment of oral health related quality of life. Health Qual Life Outcomes 2003;8:40.
[12] Hägglin C, Berggren U, Lundgren J. A Swedish version of the GOHAI index. Swed Dent J 2005;29:113–24.
[13] Locker D, Allen PF. Developing short-form measures of oral health-related quality of life. J Public Health Dent 2002;62: 13–20.
[14] Slade G, Spencer AJ. Development and evaluation of the oral health impact profile. Community Dent Health 1994; 11:3–11.
[15] 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.
[16] Al-Jundi MA, Szentpetery A, John MT. An Arabic version of the Oral Health Impact Profile: translation and psychometric properties. Int Dent J 2007;57:84–92.
[17] Wärnberg Gerdin E, Einarson S, Jonssson M, Aronsson K, Johansson I. Impact of dry mouth on oral health-related quality of life in older people. Gerodontology 2005;22: 219–26.
[18] Slade G, Spencer AJ, Locker D, Hunt RJ, Strauss RP, Beck JD. Variations in the social impact of oral conditions among older adults in South Australia, Ontario and North Carolina. J Dent Res 1996;7:1439–50.
[19] Locker D, Matear D, Stephens M, Lawrence H, Payned B. Comparison of the GOHAI and the OHIP-14 as measures of the oral health-related quality of life of the elederly. Community Dent Oral Epidemiol 2001;29:373–81.
[20] Quandt SA, Hiott AE, Grzywacz JG, Davis SW, Arcury TA. Oral health and quality of life of migrant and seasonal farmworkers in North Carolina. J Agric Saf Health 2007;13: 45–55.
[21] Hägglin C, Berggren U, Hakeberg M, Edvardsson A, Eriksson M. Evaluation of a Swedish version of the OHIP-14 among patients in general and specialist care. Swed Dent J 2007;31:91–101.
[22] Nuttall NM, Steele JG, Pine CD, White D, Pitts NB. The impact of oral health on people in the UK in 1998. Br Dent J 2001;190:121–6.
[23] Slade GD, Nuttall N, Sanders AE, Steele JG, Allen PF, Lahti S. Impacts of oral disorders in the United Kingdom and Australia. Br Dent J 2005;198:489–93.
[24] Bagewitz IC, Söderfeldt B, Nilner K, Palmqvist S. Dimensions of oral health-related quality of life in an adult Swedish population. Acta Odontol Scand 2005;63:353–60.
[25] Savolainen J, Suominen-Taipale A-L, Hausen H, Harju P, Martelin T, Kuuttila M. Sense of coherence as a determinant of the oral health-related quality of life: a national study in Finnish adults. Eur J Oral Sci 2005;113:121–7.
[26] Hugoson A, Koch G, Göthberg C, Helkimo AN, Lundin SÅ, Norderyd O, et al. Oral health of individuals aged 3–80 years in Jonkoping, Sweden during 30 years (1973–2003). II. Review of clinical and radiographic findings. Swed Dent J 2005;29:139–55.
[27] Slade G. Derivation and validation of a short-form oral health impact profile. Community Dent Oral Epidemiol 1997;25:284–90.
[28] Locker D, Allen F. What do measures of oral health-related quality of life measure? Community Dent Oral Epidemiol 2007;35:401–11.
[29] Unell L, Söderfeldt B, Halling A, Birkhed D. Attitudes to and experience of dental care among 50-year-olds in two Swedish counties. Swed Dent J 1999;23:87–96.
[30] Fernandes MJ, Ruta DA, Ogden GR, Pitts MB, Ogston SA. Assessing oral health-related quality of life in general dental practice in Scotland: validation of the OHIP-14. Community Dent Oral Epidemiol 2006;34:53–62.
[31] Nuttall NM, Slade GD, Sanders AE, Steele JG, Allen PF, Lahti S. An empirically derived population-response model of the short form of the Oral Health Impact Profile. Community Dent Oral Epidemiol 2006;34:18–24.
[32] Brennan DS, Spencer AJ. Comparison of a generic and specific measure of oral health related quality of life. Community Dental Health 2005;22:11–8.
[33] Steele JG, Sanders AE, Slade GD, Allen PF, Lahti, Nuttall N, Spencer AJ. How do age and tooth loss affect oral health impacts and quality of life? A study comparing two national samples. Community Dent Oral Epidemiol 2004;32:107–14.