# Association between oral health-related and general health-related quality of life in subjects attending dental offices in Germany

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#### Abstract

**Objectives:** To evaluate the GHRQoL and OHRQoL of patients attending dental offices in Germany and to determine correlation coefficients between SF (Short Form)-12 and OHIP (Oral Health Impact Profile)-14 scores.

**Methods:** A total of 10,342 dental offices were randomly selected. Each of the 1,113 that consented to participate received 20 questionnaires to be filled in by a convenience sample of the patients. The questionnaire included the OHIP-14-form for OHRQoL as well as the SF-12-form for GHRQoL.

**Results:** A total of 12,392 completed questionnaires were analyzed. The mean age of the participants (64.9 percent female, 35.1 percent male) was 44.25 years. The mean summary score of OHIP-14 was 6.30 (SD 7.46). The mean physical component summary scale (PCS) of the SF-12 was 51.15 (SD 7.23) and the mental component summary scale (MCS) was 50.17 (SD 8.55). The variance of PCS and MCS could be explained to 10 percent each by oral health-related quality of life ( $r^2 = 0.095$  and 0.101, P < 0.001).

Conclusion: OHRQoL is considerably related to GHRQoL.

# Introduction

General health-related quality of life (GHRQoL) as well as oral health-related quality of life (OHRQoL) are multidimensional constructs which provide reliable data about

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Previous presentation: Poster discussion Annual Meeting International Association for Dental Research / Continental European Division Sept-29-2007 in Thessaloniki/Greece. patients' well-being. (1-3). An instrument to measure general health-related quality of life is the SF (Short Form)-36 health survey including 36 items of subjective health in eight dimensions which had been derived from the Medical Outcomes Study (4). The SF-36 was translated and validated in a German version (5). It was found that a 12-item short version including a physical component summary scale (PCS) and a mental component summary scale (MCS) could explain 80-85 percent of variance of the eight dimensions of the SF-36. Therefore, the SF-12 was developed and validated (6).

An instrument to measure oral health-related quality of life is the Oral Health Impact Profile (OHIP) which originally includes 49 items and was developed by Slade and Spencer in 1994 (3). In 1997, Slade developed and validated a short version of this questionnaire and could demonstrate that this OHIP-14 accounted for 94 percent of variance in the OHIP-49 and was highly reliable ( $\alpha = 0.88$ ) (2). The OHIP-14 was translated into a German version and validated by John *et al.* (7).

In order to estimate the influence of oral health on general well-being, it is of interest to know how much OHRQoL may contribute to GHRQoL. Therefore, it was the aim of the present study to evaluate the GHRQoL and OHRQoL of patients attending dental offices in Germany by using the SF-12 and OHIP-14 questionnaires and to calculate correlation coefficients between OHIP-14 and SF-12 scores in order to determine the influence of OHRQoL on GHRQoL.

#### Methods

Out of a data set of 45,000 dental offices representing 97.4 percent of all dental offices in Germany, 10,342 were randomly selected and asked to participate in the survey. A total of 1,113 dental offices agreed to participate and received 20 questionnaires. The questionnaire included the OHIP-14form (7) for OHRQoL as well as the German version of the SF-12-form (5) for GHRQoL. Sociodemographic patient data were also collected. The questionnaires were sent out in April 2006 to be completed by a convenience sample of patients of 14 years and older and sent back in a prefabricated closed envelope to the Department of Operative and Preventive Dentistry and Endodontics of the Heinrich-Heine-University Düsseldorf/Germany for analysis. If no answer was received 6 weeks later, the dentists received a reminder mail. A study office was established where a dentist (NB) was ready to answer questions. The deadline for participating was September 6, 2006. Since only questionnaires were filled out and anonymously analyzed, no approval by the ethics committee was requested. Based on the SF-12 data, physical (PCS) and mental (MCS) component scores were calculated as described by Bullinger and Kirchberger (5). The higher the physical and mental component scores are, the better is the quality of life. The data of the OHIP-14 questionnaire served for calculation of the OHRQoL score which is a simple summary score (7). Each of the 14 questions of the OHIP-14 about perceived oral health problems can be answered on a frequency scale between 0 (never) and 4 (very often). Consequently, the summary score extends from 0 (best condition, no complaints) to 56 (worst condition, maximum of complaints). Multiple comparisons of PCS-, MCS- as well as OHIP-14-results between age groups were performed with ANOVA/Bonferroni-test and comparisons between genders with Student's *t*-test (P < 0.05). To determine the correlation between OHRQoL and GHRQoL, Pearson's correlation coefficient r was calculated. Based on Pearson's correlation coefficient, the coefficient of determination  $(r^2)$  for the OHIP-14 score was calculated.

## Results

A total of 12,392 completed questionnaires were received from 720 dental offices. The OHIP-14 questions were completely answered in 10,447 cases (84.3 percent) and the SF-12 questionnaires in 9,377 cases (75.7 percent). Only completely answered questionnaires were included in the data analysis. The mean age of the participants (64.9 percent female) was 44.25 (SD 15.64) years.

Subjects who did not completely answer the questionnaire were significantly older than those who did (SF-12: 53.4 years versus 41.4; OHIP: 48.3 versus 43.5, P < 0.001, *t*-test). Moreover, with respect to SF-12, more females (32.9 percent) did not completely fill in the questionnaires than males (30.1 percent; P < 0.05,  $\chi^2$ ).

Pearson's correlation coefficients *r* between the OHIP-14 and the SF-12 scores were 0.309 (PCS) and 0.318 (MCS) (P < 0.001). The variance of PCS and MCS could be explained to 10 percent each by oral health-related quality of life ( $r^2 = 0.095$  and 0.101, P < 0.001).

OHRQoL decreased from 5.39 in 14- to 20-year-old subjects to 8.21 in >70-year-olds (P < 0.001) (Table 1). Differences between genders were small [female 6.22 (SD 7.48) versus male 6.46 (SD 7.39), n.s.].

PCS decreased from 53.66 in 14- to 20-year-olds to 43.47 in >70-year-olds (P < 0.05) (Table 2). The overall mean value was 49.49 (SD 8.83) for females and 51.36 (SD 7.92) for males (P < 0.05). The MCS increased from 49.06 to 52.31 (P < 0.05) between the age groups (Table 2). The overall mean MCS was 51.27 (SD 7.25) for females and 50.88 (SD 7.21) for males (P < 0.05).

## Discussion

The 10,342 dental offices that were asked for participation in the study were selected by a random generator from a data set representing 97.4 percent of all dental offices in

 Table 1
 Mean Values and Standard Deviations of the OHIP-14-Score

 Stratified by Age Groups
 Standard Deviations of the OHIP-14-Score

	Age in years	Mean (SD)	Statistical significance*
OHIP-14	Overall	6.30 (7.46)	
	14-20	5.39 (7.21)	а
	21-30	5.61 (7.01)	b
	31-40	5.84 (7.35)	С
	41-50	6.26 (7.65)	d
	51-60	7.16 (7.78)	a,b,c,d
	61-70	6.90 (7.24)	a,b,c,e
	>70	8.21 (7.91)	a,b,c,d,e

\* If letters for compared age groups are identical, the difference is statistically significant at *P* < 0.05.

OHIP, Oral Health Impact Profile.

Oral health-related quality of life

 Table 2
 Mean Values and Standard Deviations of the SF-12 MCS as Well as for PCS Stratified by Age Groups

	Age in years	Mean (SD)	Statistical significance*
SF-12 MCS	Overall	50.17 (8.55)	
	14-20	49.06 (8.23)	а
	21-30	48.85 (8.66)	b
	31-40	49.66 (8.69)	С
	41-50	50.02 (8.46)	b,d
	51-60	51.15 (8.53)	a,b,c,d,e
	61-70	53.25 (7.45)	a,b,c,d,e
	>70	52.31 (8.76)	a,b,c,d
SF-12 PCS	Overall	51.15 (7.23)	
	14-20	53.66 (5.09)	а
	21-30	53.12 (5.47)	b
	31-40	52.34 (6.09)	a,b,c
	41-50	51.06 (7.11)	a,b,c,d
	51-60	48.84 (8.36)	a,b,c,d,e
	61-70	48.15 (8.44)	a,b,c,d,f
	>70	43.47 (10.25)	a,b,c,d,e,f

\* If letters for compared age groups are identical, the difference is statistically significant at P < 0.05.

SF, short form; MCS, mental component summary; PCS, physical component summary.

Germany. Therefore, this sample can be regarded as representative. However, there was no possibility to guarantee that the 1,113 dental offices, that finally participated, were representative as well. The non-response rate regarding dental offices was 89.2 percent, that means that only 10.8 percent of the questioned dental offices were participating in the study. Due to limited resources, it was not possible to take any measures in this first step such as phone calls to not responding offices. With respect to representativeness, this has to be seen as a bias.

From these 1,113 offices, 720 sent back completed questionnaires resulting in a secondary response rate of 64.7 percent. In order to improve the response rate, the following measures were taken: a) A reminder was sent if the office had not sent the questionnaires after 6 weeks; b) Each participating dental office received a set of oral hygiene products that could be distributed to participating patients and - after completing the study - another set of oral hygiene products as a gift for the staff; c) After completing the study, each dental office received an individual analysis including data on satisfaction of patients with their dentist. These data were gathered with the questionnaire. This secondary response rate can be regarded as satisfactory. Since the time frame of the study included summer school break, several participants did not send back the requested 20 questionnaires. Instead of 14,400 possible questionnaires, a total of 12,392 could be gathered (86.1 percent). However, not all questionnaires were fully completed. It was obvious that not the content of the questions but their arrangement within the questionnaire had primarily caused an inhomogeneity of notanswered questions. If at least one question was not answered in the respective field (OHIP-14, SF-12), the data set was excluded from analysis.

The patients were selected by convenience. No special advices were given to the dental offices participating in the study. This procedure was chosen since it was not possible to control any other selection procedure.

OHIP-14 is an instrument to measure that part of quality of life which is related to oral health. SF-12 is measuring the health-related quality of life in total. Since health and therefore the quality of life is influenced by physical and mental components, these are analyzed separately with the statistical procedure described for SF-12 (PCS, MCS) while they are analyzed together within the OHIP-14. Consequently, the OHRQoL may have an influence on the physical well-being as well as on the mental well-being of the patients as expressed by PCS and MCS. Therefore, it was the aim of the present study to analyze the association of OHRQoL on both components of general well-being as expressed by PCS and MCS.

The main result of the present study is the statistically significant positive correlation between OHRQoL and GHRQoL. Pearson's correlation coefficients r were 0.309 (PCS) and 0.318 (MCS) (P < 0.001). Consequently,  $r^2$  was approximately 0.1 for both scores, indicating that the variation of both subscores of general health-related quality of life (PCS and MCS) can be explained by 10 percent each by oral health-related quality of life. In other words: General health-related quality of life can be explained by 10 percent in both components by dental conditions. This shows that oral well-being has an impact on general well-being.

The overall physical component score (PCS) in the present study was higher (= better) when compared with the German norm value in 1994 (51.13 versus 49.03) (5). The opposite was true for the mental component score (MCS) (50.15 versus 52.24) (5). A look at the age-related analysis however shows that this only applies for subjects up to 50 years of age. For the subjects older than 50 years, the mean MCS from the present study is approximately the same as in the norm sample (51-60 years: 51.15 versus 51.71; 61-70 years: 53.25 versus 53.35; 70 years and older: 52.31 versus 52.47) while the PCS is improving with increasing age when compared with the norm values (51-60 years: 48.84 versus 47.10; 61-70 years: 48.15 versus 44.34; 70 years and older: 43.47 versus 39.84). Interestingly, in the present study the MCS remains at least stable whereas the PCS is strongly decreasing with age. The decreasing PCS values could be expected, since physical human performance is decreasing with age. In contrast, the mental quality of life does not seem to be age related in the same manner since it is better in older people than in younger ones. While the mean MCS is below 50 for subjects up to 40 years, it is above 50 for elderly people and still at 52.31 in subjects of 70 years and

older. In comparison, the mean MCS in 21- to 30-year-olds is 48.85. Comparing the norm values however shows that this difference between "young" and "old" is not caused by high mean values in elderly people, but by low values in the younger subjects. As documented by the MCS-values for the elderly, the mental well-being of subjects attending a dental office should not be worse than in the general population. Therefore, it may be speculated that the changing general social circumstances in Germany, which are mainly concerning the future prospects of younger people, may have influenced the present results. For example, danger of unemployment, rapidly increasing health care costs, the risk of needing professional care and poverty in seniority are increasing burdens for the future prospects of younger people in Germany.

From the results of the OHIP-14, a mean value of 6.30 (SD 7.4) was calculated for oral health-related quality of life. This is worse than the German norm value in 2001 (4.46) (8). It is however still a good result. As an example, a mean value of 6.3 means that approximately 8 of the 14 questions were answered with "never complaints" [0] and 6 with "very rarely complaints" [1]. This example shows that the mean value which was found in the present study may be associated with a high level of oral well-being. Theoretically, the summary score extends from 0 to a maximum of 56. A summary score of 0 expressing a maximum of oral well-being was reached by 2,288 subjects (18.5 percent). For 24 subjects only (0.1 percent), a score >40 was found. No statistically significant difference was found in the age-related analysis between the age groups 14-20 years, 21-30 years, 31-40 years, and 41-50 years. This finding demonstrates that the subjective oral wellbeing remains stable at a high level over a long period of life. This seems to be in contrast to the epidemiological fact that oral health problems such as caries, periodontitis and tooth loss are increasing with age (9). One reason for this might be the high level of dental health care in Germany. From the 51- to 60-year-olds on, a statistically significant difference to the younger age groups could be detected for the OHIP-14 summary score (P < 0.05). The mean value however for the age group 70 years and older still is 8.21 which means that on average nearly 6 of the 14 questions were answered with "never complaints" [0] and 8 with "very rarely complaints" [1].

## Conclusions

The present study provides data of OHRQoL as well as GHRQoL for subjects attending dental offices. It was shown that OHRQoL has some impact on GHRQoL.

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