

Oral health-related quality of life and somatization in the elderly

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Abstract

Objective Somatization disorders are frequent in the elderly, and previous studies have revealed that psychological factors affect the outcome of measurement of oral health-related quality of life (OHRQoL). The objective of this study was, therefore, to investigate the correlation between OHRQoL and somatization. **Methods** One-hundred and twenty-five participants aged 60 years or older (mean age 76.6 years; 40 males) from a primary geriatric medical hospital participated in this cross-sectional study. OHRQoL was assessed by using the Oral Health Impact Profile (OHIP), somatization by using the somatization subscale of the Symptom Check List (SCL-90-R). To obtain dental data we performed a clinical dental examination. **Results** In bivariate analyses the most consistent correlation with somatization was found for overall OHIP sum score and the subscales *physical pain* and *functional limitation* ($r > 0.4$). Participants with high somatization scores had high OHIP sum scores. In multivariate analysis somatization led to additional explanation of the variance of the OHIP sum score and of all OHIP subscales. **Conclusions** There is consistent correlation between OHRQoL and somatization. When evaluating OHRQoL in the elderly (using the OHIP) further evaluation of somatization should be considered for thorough interpretation of the results.

Key words: Elderly, OHRQoL, Somatization

Abbreviations OHRQoL – oral health-related quality of life; OHIP – Oral Health Impact Profile; OHIP-SUM – OHIP sum score; SCL-90-R – Symptom Check List; SD – standard deviation

Introduction

Increasing physical impairment and mental disorder in the growing group of elderly is a matter of public concern [1–3]. A quarter to a third of the elderly are believed to have a psychological disorder [4]. Increasing occurrence of somatization symptoms with increasing age is frequently described [5–7]. A population-based study in Germany showed that 23% suffered from at least

eight somatoform symptoms [5]. The population sex ratio was found to be from 2:3 to 1:3 men to women [8].

Assuming the mind reacts to physical illness, all illnesses are partly psychosomatic. For some illnesses, however, psychological factors seem to be particularly important. Somatization is defined as the expression of psychological distress as physical symptoms. Somatoform symptoms often dramatically suggest a physical disorder but

cannot be explained physiologically. Somatization disorders are mental disorders characterized by multiple somatic complaints, occurring over several years, that cannot be fully attributed to any medical condition. Because of the difficulty of separating somatization from organic-based somatic disorders, somatization in the elderly has received little attention, although there has been increasing interest in recent years [9, 10].

In health care there has been a change from a disease-centred bio-medical approach to a patient-centred bio-psycho-social approach. Merely the absence of illness is no longer seen as the primary objective of therapy – self-perceived health and quality of life, which is related to health, must be increased. The tendency to somatization is believed to affect health-related quality of life (HRQoL) – significantly reduced HRQoL has been measured for patients with somatoform pain disorder in comparison with the general population [11], in patients with chronic lower-back pain [12], and in patients with self-reports of pain and disability [13]. The oral health-related quality of life (OHRQoL), which consists of different components – function (e.g. chewing), pain, psychological components (e.g. self-consciousness), and social aspects (e.g. communication) [14], can also be affected by psychological factors. Previous studies have shown that coping style, pain sensitivity, body consciousness, negative affectivity, and somatization are associated with OHRQoL [10, 15].

Study aim and research hypotheses

For the rapidly growing group of elderly it is a challenge for the individual health professional and for health systems to establish strategies for preserving good oral health up to great age, also bearing in mind the negative effects of bad oral conditions on general health. Measurement of OHRQoL is an important means of assessing the basic state of health and of evaluating the success of care strategies or clinical intervention in the opinion of the patients. Insufficient information is available on the correlation between OHRQoL and frequently observed somatization tendencies in the elderly. For thorough assessment of OHRQoL, and of the effect of dental treatment on improving OHRQoL, one must

bear in mind that impaired OHRQoL could be because of somatization.

The objective of this study was, therefore, to analyse the correlation between results from measurement of OHRQoL and a symptom checklist for screening for somatoform symptoms in the elderly. A positive correlation was expected, because both measures assess subjective complaints.

Materials and methods

Participants

All participants received written information and gave informed consent. The study was approved by the university review board. Participants in the survey were patients hospitalized in one primarily geriatric hospital. All patients 60 years or older who did not suffer from dementia according to their medical report, or from severe disease or infection, were asked to participate. One-hundred and seventy-eight patients fulfilled the inclusion criteria. Of these, 129 (72.5%) agreed to participate in the study. Three OHIP questionnaires and one somatization scale were not complete, so the overall response-rate was 70%. Of the remaining 125 participants, 32% (n = 40) were males and 68% (n = 85) were females; the age range was from 60 to 94 years (mean 76.6 years, SD 8.8 years).

Questionnaires

We measured OHRQoL by use of the Oral Health Impact Profile (OHIP-G49; G for German version, 49 for 49-item version). This tool consists of seven subscales: functional limitation, physical pain, psychological discomfort, physical disability, psychological disability, social disability, and handicap [16]. The translation into German and the validation are described elsewhere [17]. Possible answers to the items were never, hardly ever, occasionally, often, and very often experienced in the last month – using a five-point Likert scale (0 = never, 4 = very often). The summary score (simple addition; minimum 0, maximum 196) was taken as an overview of OHRQoL [18]. We assessed somatization by using the somatization subscale of the Symptom Check List (SCL-90-R).

We evaluated twelve psychosomatic symptoms on a five-point Likert scale from 0 (not at all) to 4 (extremely) and calculated a mean score. The German version has been validated [19] and population-based standards are available [20].

Clinical examination

Medical reports were available for all the participants. We performed all dental examinations in the hospital sick rooms of the participants, where the participants also completed the questionnaires. We recorded dental status, including number of teeth, type of denture, and caries lesions. Depending on denture type we classified participants into four groups. We classified having natural teeth or a fixed partial denture only as the best dental status, wearing a removable partial denture (participants had own teeth remaining) as the next best, then wearing a completely removable denture (edentulous). We classified being edentulous and having no denture as the worst dental status. When the type of denture in each jaw was different we assigned the participant to the worse case.

Statistics

We calculated all statistics by use of SPSS Version 12.0.1 (SPSS Inc., Chicago, Ill., USA). In addition to descriptive analysis, we calculated bivariate correlations by use of Pearson correlation coefficients, phi coefficients, and eta coefficients where appropriate. In multiple linear regression models we conceptualized overall OHIP-SUM and the subscale scores as dependent variables. As explanatory variables, we used age in years, sex, living circumstances, and educational level as major sociodemographic variables, and number of remaining own teeth and type of denture as global dental factors. These data were available for all participants. We assessed educational level as low (under 10 years of education), middle (10 years of education), or high (over 10 years of education). We grouped living circumstances as living with partner, with family, or alone. We dummy-coded categorical variables for regression analysis.

In a forward selection process, we performed hierarchical regression analysis, with entry into the model depending on the significance of the F value ($p > .05$). In a first step we introduced sociode-

mographic variables. We followed this with clinical data. We introduced somatization in the last step and observed the change in adjusted R^2 when introducing somatization.

We judged the fit of the models using different strategies. We used the Durbin–Watson test to inspect the autocorrelation of the residuals; values of approximately 2 are indicative of no autocorrelation. We estimated multicollinearity by use of the tolerance of the explanatory variables. We also examined eigenvalues, condition indices, and normal p-p plots of regression-standardized residuals.

We achieved normality for the SCL-90-R somatization score, the OHIP-SUM, and the subscales *functional limitation* and *physical pain* by use of a Box–Cox transformation routine [21] with $\lambda = 0.6$. We also found normality in all subgroups of the categorical explanatory variables. We could not achieve this for the other dependent variables. Although normality could not be assumed for the other subscales, for comparability of results we used multiple linear regression models for these dependent variables also.

We set the level of probability for statistical significance at $\alpha = 0.05$. The hypothesis underlying the study is that somatization plays a major role in explaining the variance of the OHIP sum score and of all subscale scores. This hypothesis would not be supported by just one – maybe false – significant effect, but it is expected that all effects should be statistically significant. It was therefore decided not to correct for multiple testing because correction of type I error has the disadvantage of increasing type II error [22].

Results

Study sample characteristics (Table 1)

The most frequent main diagnosis and reason for hospitalization was cardiovascular disease. An average of six additional diagnoses were under therapy. Participants took an average of eight different drugs. Participants had 9.5 ± 10.0 (mean \pm SD) own teeth remaining. On average, participants had caries lesions in 16.1 % (SD 28 %) of own teeth. Only 16.8 % had plaque-free teeth and/or dentures.

Table 1 Demographic and dental variables

Variable	N	(%)
<i>Living circumstances</i>		
Living with partner	62	49.6
Living with family	52	41.6
Living alone	11	8.8
<i>Education level</i>		
Low	91	72.8
Middle	17	13.6
High	17	13.6
<i>Denture status</i>		
Edentulous with no denture	6	4.8
Complete removable denture	66	52.8
Partial removable denture	19	15.2
Natural teeth/partial fixed denture	34	27.2

The median OHIP-SUM was 15 (Table 2). We obtained the lowest frequencies of the answer “never” for the OHIP subscales *functional limitation* and *physical pain*. *Social disability* was reported most often without any limitation. The mean somatization score was 1.09 (SD = 0.75). Five participants had a somatization score of 0. In the items of SCL-90-R only 25% of the participants reported no problems with *pain in the back*. Feeling of *cold/hot flush* was reported less frequently.

Bivariate analysis

We showed that all scores in the different OHIP subscales and the OHIP-SUM correlated with the somatization score (Table 3). This was the most consistent ($r > 0.4$; $p < 0.001$) for the OHIP-

Table 2 Percentiles of OHIP-SUM¹ and OHIP-subscale scores, N = 125

Subscale	25 Percentile	Median	75 Percentile
OHIP-SUM	6	15	30.5
Functional limitation ²	2	4	8
Pain ²	1	3	8
Psychological discomfort ²	0	0	2
Physical disability ²	0	2	5.5
Psychological disability ²	0	1	4
Social disability ²	0	0	3
Handicap ²	0	1	5

¹OHIP-SUM: Oral Health Impact Profile – sum score.

²OHIP-subscores.

SUM and the *physical pain* and *functional limitation* subscales. The correlation with OHIP-SUM was weaker with increasing age (age group 61–70 $r = 0.49$, age group 71–80 $r = 0.44$, age group 81 or older $r = 0.35$, but the correlation coefficients did not differ significantly among age groups). With the sole exception of the SCL-90-R item *cardiac/chest pain* ($r = 0.14$) all items correlated significantly with OHIP-SUM ($r = 0.20$ to $r = 0.39$).

Multiple linear regression models (table 4)

In all models, *somatization* stayed in the final model with significant impact. Models including the variable *somatization* always explained a greater amount of variance in the OHIP scales (greater R^2 values), from 0.04 to 0.16. With the exception of OHIP subscale *handicap*, *somatization* exhibited most substantial p-value of all variables.

Fit of the models: The autocorrelation of the residuals was 2.08 for the model with the OHIP sum score. For the other models this value differed from 2 by a maximum of 0.25 (*psychological discomfort*). In the model with the OHIP sum score as dependent variable, the tolerance was 0.85 for age, 0.88 for number of teeth, and 0.95 for somatization. In the other models, tolerance values for the dependent variables differed from 0.85 to 0.96.

The normal p-p plots of regression-standardized residuals revealed a good fit for the OHIP-SUM, *functional limitation* and *pain*. The fit was worse for the other scales; low OHIP scores and scores above the mean, especially, were predicted less well.

Discussion

Study population

We restricted the sample in this study to the short-term hospitalized elderly. Because sample characteristics affect measurement of OHRQoL, the results cannot be regarded as representative of all different groups of elderly. An advantage of this sample was the random distribution of the participants among the non-institutionalized elderly population seeking treatment in the hospital. Because the sample has a wide range for OHIP

Table 4 Regression models, N = 125. Variables exceeding $p < 0.05$ were displayed only.

Dependent variable OHIP-SUM ¹					
Independent variables	Unstandardized B	SD	Standardized beta	<i>t</i>	Sig.
Age	-.828	.295	-.237	-2.805	.006
Number of teeth	-.558	.253	-.182	-2.203	.029
Somatization	16.874	3.354	.403	3.031	.000
Adjusted $R^2 = 0.238$ (change in adjusted R^2 for last step introducing somatization: $\Delta R^2 = 0.151$)					
Dependent variable OHIP subscale "functional limitation"					
Independent variables	Unstandardized B	SD	Standardized beta	<i>t</i>	Sig.
Age	-.079	.029	-.230	-2.706	.008
Education level	1.915	.696	.218	2.752	.007
Number of teeth	-.067	.025	-.221	-2.648	.009
Somatization	1.440	.331	.350	4.344	.000
Adjusted $R^2 = 0.238$ (change in adjusted R^2 for last step introducing somatization: $\Delta R^2 = 0.113$)					
Dependent variable OHIP subscale "physical pain"					
Independent variables	Unstandardized B	SD	Standardized beta	<i>t</i>	Sig.
Education level	1.652	.754	.176	2.190	.030
Somatization	1.859	.354	.421	5.248	.000
Adjusted $R^2 = 0.206$ (change in adjusted R^2 for last step introducing somatization: $\Delta R^2 = 0.163$)					
Dependent variable OHIP subscale "psychological discomfort"					
Independent variables	Unstandardized B	SD	Standardized beta	<i>t</i>	Sig.
Age	-.105	.039	-.236	-2.680	.008
Number of teeth	-.077	.034	-.197	-2.284	.024
Somatization	1.743	.444	.327	3.924	.000
Adjusted $R^2 = 0.177$ (change in adjusted R^2 for last step introducing somatization: $\Delta R^2 = 0.097$)					
Dependent variable OHIP subscale "physical disability"					
Independent variables	Unstandardized B	SD	Standardized beta	<i>t</i>	Sig.
Age	-.147	.060	-.211	-2.452	.016
Number of teeth	-.145	.052	-.237	-2.801	.006
Somatization	3.071	.683	.368	4.498	.000
Adjusted $R^2 = 0.208$ (change in adjusted R^2 for last step introducing somatization: $\Delta R^2 = 0.125$)					
Dependent variable OHIP subscale "psychological disability"					
Independent variables	Unstandardized B	SD	Standardized beta	<i>t</i>	Sig.
Age	-.109	.041	-.223	-2.692	.008
Somatization	2.052	.488	.348	4.207	.000
Adjusted $R^2 = 0.190$ (change in adjusted R^2 for last step introducing somatization: $\Delta R^2 = 0.110$)					
Dependent variable OHIP subscale "social disability"					
Independent variables	Unstandardized B	SD	Standardized beta	<i>t</i>	Sig.
Age	-.070	.028	-.213	-2.472	.015
Somatization	1.035	.342	.261	3.030	.003
Adjusted $R^2 = 0.122$ (change in adjusted R^2 for last step introducing somatization: $\Delta R^2 = 0.058$)					
Dependent variable OHIP subscale "handicap"					
Independent variables	Unstandardized B	SD	Standardized beta	<i>t</i>	Sig.
Age	-.136	.038	-.301	-3.570	.001
Somatization	1.202	.458	.221	2.622	.010
Adjusted $R^2 = 0.154$ (change in adjusted R^2 for last step introducing somatization: $\Delta R^2 = 0.04$)					

¹ OHIP – SUM: Oral Health Impact Profile – sum score

scores and SCL-90 somatization scores, from no impairment up to high values, these main target variables are not representative of an extreme group only.

Statistical methods

The OHIP scores were not normally distributed and we were not always able to achieve normality by transformation. We took possible distortion of the regression models into account. A possible alternative would have been a logistic regression model with better/worse OHIP subscale scores compared with the median as dependent variable, but this would have led to substantial loss of information and the measurement error of the tool would have had a decisive effect for participants with OHIP subscale scores near the median.

Questionnaires

Several questionnaires emphasising different aspects have been developed for assessing OHR-QoL [16, 23, 24]. In this study we chose the OHIP, the only tool in the German language for which reliability and validity are proven [17]. The OHIP sum score for participants wearing removable dentures tended to be lower than for the German population (median of 14 in our study compared with a median of 15 for partial removable dentures and 23 for complete dentures [25]) but participants with fixed dentures only had a higher OHIP-SUM (median 15 in our study compared with a median of 5). A possible explanation of this could be the different age structure of the studies. The extent to which the different OHIP scores are clinically relevant is still unclear; substantially different OHRQoL are apparent from comparison of a median of 23 for complete denture wearers with a median of 5 for subjects without dentures, as described for the representative collective.

We measured the level of somatization using the somatization subscale of the SCL-90-R. For our study population there were more somatization complaints than is normal for the elderly German population [20]. We obtained a mean score of 1.09 in our study; the normal average for people over 60 years old is 0.63 (men over

75 years 0.70, women 0.83). This might be related to multimorbidity and acute illness in our study sample.

Bivariate correlation between OHIP and SCL-90-somatization

Because the OHIP scales and the SCL-90-R somatization score measure complaints and pain, we expected a high positive correlation; this was confirmed by the large amount of common variance, although the correlation weakened with increasing age. We also observed that greater age was associated with lower somatization and impairment of OHRQoL. This could be related to the age structure of the study. We examined a group of participants all of great age. Studies reporting higher somatization at greater ages included participants with a wider age range.

At the level of the single symptom of the SCL-90-R somatization scale, with one exception only all symptoms correlated significantly with OHIP. Somatization is characterized by a lack of specific symptoms and it is, therefore, plausible that the symptoms all correlate with the OHIP. The only symptom that did not significantly correlate with the OHIP was *cardiac/chest pain*. Because this was associated with the main diagnosis for hospitalization in our sample, cardiovascular disease, it was possibly mainly related to somatic complaints and does not, therefore, correlate with OHRQoL.

Multivariate analysis

Although the fit of the models was good, weakness in predicting low OHIP scores and scores above the mean appeared in some models. In contrast with sociodemographic and clinical variables, somatization had significant explanatory power in all OHIP scores models. The variance explained by the models always increased when the variable somatization was included – up to 16% additional variance. We therefore found somatization to be closely associated with all dimensions of the OHIP from functional aspects to psychological and social aspects. We observed the largest amount of additional explainable variance in the subscale *physical pain*. This was expected, because both measures capture complaints about pain.

In the group of clinical variables, only the number of teeth remained in some models. This affects not only functional and physical aspects, but also psychological discomfort. More severe psychological or social limitations and handicap were not affected. Compared with other cross-sectional studies, the impact of clinical data differs from strong predictor [25] to only weak, as reported by Ekanayake [26].

In accordance with our results, a study of somatization, pain sensitivity, and body consciousness, including patients of 45 years of age or older wearing removable prostheses, revealed that these factors correlated significantly with all OHIP subscales (with the exception of *handicap*, which was excluded) [10]. In a study with two samples (mean ages 62 and 70 years), Kressin et al. [15] showed that in both bivariate and multivariate analysis three different measures of OHRQoL were significantly associated with negative affectivity. Most additional explanation of the summary scores was achieved when the OHIP was used to assess OHRQoL. They supposed that because OHIP was a detailed and extensive measure, there were many possibilities of complaining in comparison with shorter tools, and advised careful consideration of which tool should be used.

Relevance of the findings

We recommend additional screening for somatoform symptoms when evaluating OHRQoL in the elderly by use of the OHIP. This applies both to dentists planning dental therapy or evaluating the success of therapy and to researchers in epidemiological or clinical studies.

For individual patients with high OHIP and somatization scores, the less the somatic clinical findings explained the impairments of OHRQoL the more these could be related to somatization tendencies, followed by limited improvement of the OHRQoL as a result of dental therapy, when disregarding psychological aspects. Screening for somatization by dentists could not, of course, enable reliable diagnosis or verification of a diagnosis. When dentists have evidence of the occurrence of somatoforme disorders assessment by a professional psychologist should be taken into account.

In epidemiological studies, impairment of OHRQoL could be overestimated because of

somatization tendencies in the population which should be assessed and reported in the study to enable correct interpretation of the data. For community health, OHRQoL measures are important instruments for appraising self-perceived oral health in populations. It is important to know if impaired self-perceived oral health is because of personal traits or psychological disorders or because of bad oral conditions which then had to have consequences for oral health-care policy and oral health-care strategies.

As shown in previous studies and by our results, there is strong evidence that psychological aspects are correlated with the outcome of self-perceived oral health measurements. In most studies these aspects were assessed by dentists with the help of screening instruments. Research should be conducted to prove these findings with results based on reliable diagnosis of different psychological disorders by professional psychologists for the different groups of elderly.

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