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Oral Health and Quality of Life in Old Age: A Cross-Sectional Pilot Project in Germany and Poland*

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Abstract

Background. The process of ageing influences all dimensions of social life and personal well-being, but the influence of health on different dimensions of quality of life (QoL) among the elderly is rarely examined.
Objectives. The aim of the pilot study is to test the feasibility of a comprehensive study design to evaluate general and dental health as well as QoL in a bi-national sample. In addition, this pilot study should allow for the exploration of potential interactions between QoL, socioeconomic, health and oral health variables.
Material and Methods. Individuals aged 64 years and older (n = 100) from university dental clinics of the Wroclaw Medical University, Poland (n = 50) and of the University Hospital in Dresden, Germany (n = 50) were examined. The oral health status of participants was assessed by clinical examination. Socio-demographic, environmental and general health status were evaluated during the medical interview. General quality of life (GQoL) was assessed by an overall question with a visual analogue scale (VAS) from –5 (worst) to +5 (best). Health-related quality of life (HRQoL) and oral health-related quality of life (OHRQoL) were measured with the EQ-5D and OHIP-14 questionnaires. Statistical analyses comprised Pearson's χ^2 test, Wilcoxon test, linear regression model for statistical analysis and different multivariate linear regression analyses.
Results. For the GQoL-VAS-Score the results for QoL measurements were 1.22 ± 2.62 ($\bar{x}$ ± SD), for EQ-5D-Score 7.45 ± 2.25 ($\bar{x}$ ± SD), and for OHIP-14-ADD-Score 11.04 ± 13.56 ($\bar{x}$ ± SD). Differences between Polish and German populations were observed.
Conclusions. The study design proved to be feasible for a senior population. The overall GQoL question, EQ-5D and OHIP-14 were regarded as appropriate instruments. Subjective and objective (oral) health measures showed differences between Germany and Poland. For methodological reasons, these differences are not generalizable, but of value for study hypotheses in larger samples (**Adv Clin Exp Med 2016, 25, 5, 951–959**).

Key words: quality of life, geriatric dentistry, dental care for the aged, epidemiologic research design, feasibility studies.

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The increase in life expectancy over the past decades has led to dramatic demographic changes. With increased longevity, the population of the eldwerly increases. Accordingly, the countries of the European Union are and will be faced with the problem of considerable demographic changes within the next decades [1]. The ageing of societies influences all aspects of social life, economy, culture, and, most of all, healthcare. In this context, the prevention of dental diseases in this group of patients has gained importance. The expected high number of older people will be a significant challenge for healthcare providers.

Quality of life (QoL) is one of the most important outcome measures of healthcare. It can be assessed at different dimensions: general quality of life (GQoL), health-related quality of life (HRQoL), and oral health-related quality of life (OHRQoL).

OHRQoL can be assessed using either generic or specific measures [2]. Generic questionnaires cover a wide range of issues associated with QoL in large and diversified populations of healthy and unhealthy people since they analyze correlations between the patient's health condition and factors related to experiencing the disease. Specific questionnaires are used to evaluate quality of life in specific disease entities or in a group of conditions. Disease- and dimension-specific questionnaires focus on specific domains of the patient's activity or factors resulting from the disease [3, 4].

Oral health is an important aspect of QoL in the elderly. One of the main criteria of satisfaction and optimism defining QoL is the ability to maintain health and functional dentition that provides social and biological benefits in terms of aesthetics, comfort of chewing, taste and speech.

Within the field of dentistry, there is little knowledge about the specific needs in terms of dental care and dental treatment for participants aged 65 years and older. There is no evidence whether accepted treatment concepts are simply transferable into this age group. Many studies report how age-related changes affect the oral condition, e.g. root caries resulting from gingival recession [5, 6], decreased saliva secretion [7, 8], and physical disabilities leading to poor oral hygiene [9]. It is not known to what extent dental problems influence the overall state of these people's health.

In conclusion, specific knowledge about different dimensions of (oral) health and QoL for the older generation is sparse. The aim of this pilot project was to test the feasibility of a study design based on the assessment of oral health, general health and three dimensions of QoL in a bi-national study sample aged 64 years and older.

Methods

A cross-sectional pilot study was conducted at two university dental clinics: The Faculty of Medicine in Dresden ("Center Germany") and the Wroclaw Medical University ("Center Poland").

Study Population

Sample Selection

The study population consisted of 100 participants (50 for each center). The sample selection was conducted consecutively on a "walk-in" basis at the dental clinics (40 for each center) and by recruiting onsite in nursing homes (10 for each center).

Inclusion Criteria

Patients aged 64 and older who signed the informed consent were eligible.

Exclusion Criteria

Patients with serious infectious diseases were excluded. Furthermore, conditions which did not allow for a risk-free dental examination led to exclusion. Participants who were not able to follow the study information and/or to understand the questionnaires were excluded.

Measuring Instruments

Oral Health Status

The oral status of the participants was measured by an oral examination conducted by calibrated dentists. Training and calibration of the dentists was performed prior to the clinical examinations. The oral status was documented according to the guidelines and documentation rules of the World Health Organization (WHO) [10]. Variables included the dentition status, periodontal status, dental erosions, trauma and mucosal lesions.

Some variables were added. The assessment of non-carious defects was categorized by the severity of the disorder and defined on a four-point scale, according to the progression of enamel, dentin and pulp wear. Additionally, the subject's denture status and the number of occluding teeth were documented.

General Health Status

The general health of the participants was assessed *via* an interview using a medical history form.

Socio-demographic and Environmental Aspects

Socio-demographic and environmental aspects were interviewed and documented on the case report form (CRF) which comprised data on

living circumstances, family status, education, income as well as availability and utilization of medical and dental care. Considering an average household income per month in Poland and Germany (€431 and €1630 respectively), the income was specified and classified as low, medium and high.

General Quality of Life

General quality of life (GQoL) was documented on a visual analogue scale (VAS) and patients were asked a general question regarding his/her GQoL: "How is your quality of life at the moment compared to the best and worst time in your life?" The respective scale ranged from –5 to +5. This assessment was part of the patient's questionnaire form (PQF).

Health-related Quality of Life

Health-related quality of life (HRQoL) was measured by the validated EQ-5D questionnaire available in both German and Polish. This questionnaire was part of the PQF.

Oral Health-related Quality of Life

Oral health-related quality of life (OHRQoL) was measured by the OHIP-14 questionnaire. Validated versions in German and Polish were available [11, 12]. The questionnaire was part of the PQF. For analysis, the OHIP-14 total score (OHIP-ADD) was used.

Language Aspects

Due to different languages spoken at the two study centers, documents and questionnaires were available in German and Polish. In order to allow data analysis to be gathered independently at both study centers, a case report form (CRF) in English was available for documenting all interviews and examination data. The data from the PQF was transferred to the CRF by the examiner.

This study was approved by the Ethics Committee of the Wroclaw Medical University (protocol No. KB 1/2014) and by the Ethics Committee of the University of Technology in Dresden (EK 153042014).

Data Analysis

Statistical analyses comprised Pearson's χ^2 test, Wilcoxon test, linear regression model for statistical analysis and different multivariate linear regression analyses. Statistical data analysis was carried out in the statistical environment R (http://www.r-project.org) as well as with SPSS v. 22 (IBM Corporation, Armonk, USA). Numbers are reported as mean ± standard deviation (SD), unless otherwise noted. The level of significance was set to $\alpha = 0.05$. Multivariate linear regression was performed by iteratively removing non-significant factors, using the *Im* function in R and/or SPSS v. 22.

Results

Feasibility

Recruiting Aspects

Recruitment of independently living study participants took place without problems at both centers. However, recruiting samples from nursing homes was very difficult for the German center, not in Poland. Contacting the nursing home administration and convincing them to allow researchers to approach the residents was the first barrier. Secondly, in a few homes, associated private dentists argued about the pure scientific interest of our study. Finally, most of the contacted residents were mentally incapable to follow our study approach. All in all, seven homes with more than 200 residents were contacted to reach the designated sample size in Germany.

Time Frame

The estimated time frame of 60 min per subject for collecting all data was sufficient in the majority of cases. However, the varying number of remaining teeth within the study population led to major differences between times needed for an oral examination. All included participants were able to co-operate and focus on the questionnaire, the interview and the oral examination within these 60 min.

Measuring Instruments

The use of an interview for collecting sociodemographic data was a successful method. Examiners explained details when necessary. This approach helped to minimize missing data. Asking for the average household income was somehow problematic. Some participants were reluctant to give the respective information while other participants were uncertain. Concerning the self-administered questionnaires, problems were observed only for the VAS. Many participants did not completely understand this method of data collection and would have preferred predefined answers to choose from. The collection of the clinical data showed no remarkable difficulties.

Description of the Study Population

As intended, 100 seniors formed the sample, 50 participants per center (Germany and Poland). The study population consisted of 80 independent-

ly living participants and 20 participants living in nursing homes (40 and 10 per center respectively). More women (63%) than men participated in the study. The overall mean age of the participants was 74.96 ± 7.77 (range 64–93 years). The mean age differed slightly with 76.56 ± 7.52 years in Germany compared to 73.36 ± 7.73 years in Poland. Ninety-one percent of the participants were retired; only 9% were still part or full time working. More than half of the German participants reported a high relative income (52%, n = 26) compared to Poland (20%, n = 10). The majority of Polish participants reported medium income (38%, n = 19). Concerning health care availability, 82% of the respondents reported that dental care was reachable for them while 18% reported problems. Details are shown in Table 1.

Oral Conditions

DMFT scores differed significantly between both centers being slightly lower in the German group ($p = 0.003$). The median DMF-T in Germany was 26 compared to 28 in Poland. 0.4% of the teeth were affected by root caries in Germany while 0.8% of the teeth were affected in Poland.

The mean percentage of periodontal pockets over 5 mm per patient was different in Germany (2.9%) compared to Poland (14.6%). The mean BOP-values differed with 55.9% and 80.6%. Both differences were not statistically significant.

The mean number of occluding teeth was 4.19 ± 4.04. Fourteen percent of the participants were edentulous. Regarding partially edentulous participants, more respondents wore removable dental prostheses with dental support compared to removable dental prostheses with mucosal support. Details of the participants' oral conditions are presented in Table 2.

Health Condition of Respondents

The majority of participants reported severe chronic diseases such as hypertension (64.64%), diabetes (21%), osteoporosis (21%) and depression (12%). The five drug limit of polypharmacy was reached by 27% of the participants (Table 1).

Quality of Life Measures

Concerning the GQoL-measure, the mean value was 1.22 ± 2.62 (median 2.0), while the mean values for Germany and Poland were 2.17 (± 2.36, median 3.0) and 0.26 (± 2.55, median 0.0). HRQoL-measures showed a similar difference, resulting in an EQ5D-score of 8.06 ± 2.24 in Poland and 6.84 ± 2.15 in Germany. The mean score was 7.45. Within the EQ5D, the subscale for pain was scored highest. Concerning OHRQoL, the mean value of the OHIP-14-ADD was 11.4 ± 13.56 (median 6.0, range 0–55). The OHIP-14-ADD value was much higher in Wrocław compared to Dresden (16.16 ± 15.17 vs. 6.64 ± 9.74). The differences between both centers for all three QoL-measures were statistically significant. All three dimensions of QoL-measures showed weak but significant correlations. The best correlation was found between GQoL and HRQoL. Spearman's rank correlation coefficient was –0.525 ($p < 0.001$). The weakest correlation was found between HRQoL and OHRQoL. Spearman's rank correlation coefficient was 0.266 ($p = 0.007$). In addition to the descriptive procedures, three forward multiple linear regression models were calculated – one for each dimension of QoL-measures. The center "Germany" was the only significant factor associated with increased QoL in all three dimensions. Furthermore, increased GQoL was associated with independently living and high income, increased HRQoL was associated with individually living and the number of diseases and increased OHRQoL was associated with high age and no wear of the partial removable dental prosthesis. The adjusted R^2 values were 0.218 (dependent variable: OHRQoL), 0.502 (dependent variable: HRQoL) and 0.227 (dependent variable: GQoL) for the three models. Details are shown in Table 3.

Discussion

The main aim of this study was to test our design for feasibility in a sample of seniors aged 64 years and older. Within this context, different dimensions of quality of life and their relationship to several socioeconomic and (oral) health-related factors were assessed in a bi-national sample.

Although not expected for the pilot project, our results revealed some major differences between the two study centers. However, they have to be interpreted with care because of some severe methodological shortcomings.

The study sampling on a "walk-in" basis at both departments can be seen as one of the major limitations. Because of different social and health care systems in Germany and Poland, the patients requesting treatment at a university dental clinic were much different. A comparison with representative samples is not possible. The mix of a majority of independently living people and some participants from nursing homes delivered some valuable results concerning feasibility but led to heterogeneous samples. A separate analysis of both groups did not make sense due to the small numbers.

Table 1. Study population

Studied parameters		**Poland and Germany (n = 100)**		**Germany (n = 50)**		**Poland (n = 50)**	
Age	mean	74.96 ± 7.77		76.56 ± 7.52		73.36 ± 7.73	
	range (min–max)	64–93		64–93		64–93	
	median	74.96		76.50		71.0	
		n	**%**	**n**	**%**	**n**	**%**
Gender	male	37	37.0	19	38.0	18	36.0
	female	63	63.0	31	62.0	32	64.0
Education	≤ 8 years	26	26.0	19	38.0	7	14.0
	> 8 years	74	74.0	31	62.0	43	86.0
Living conditions	home without help	78	78.0	40	80.0	38	76.0
	home with help	2	2.0	0	0.0	2	4.0
	living in nursing home	20	20.0	10	20.0	10	20.0
Family status	married	52	52.0	31	62.0	21	42.0
	divorced	9	9.0	6	12.0	3	6.0
	widowed	31	31.0	11	22.0	20	40.0
	single	8	8.0	2	4.0	6	12.0
Occupation	retired	91	91.0	45	90.0	46	92.0
	still part-time working	8	8.0	5	10.0	3	6.0
	still full-time working	1	1.0	0	0	1	2.0
Income	low (€900–1500/€200–375)	25	25.0	14	28.0	11	22.0
	medium (€1500–2000/€375–750)	26	26.0	7	14.0	19	38.0
	high (€2000–18000/€750–1250)	36	36.0	26	52.0	10	20.0
	no answer	13	13.0	3	6.0	10	20.0
Use of health services (GP-general practitioner)	GP can be reached	82	82.0	43	86.0	39	78.0
	GP reached with help	18	18.0	7	14.0	11	22.0
	GP cannot be reached	0	0	0	0	0	0
Chronic illness	≤ 3 diseases	48	48.0	18	36.0	30	60.0
	> 3 diseases	52	52.0	32	64.0	20	40.0
	hypertension	64	64.0	31	62.0	33	66.0
	type 2 diabetes	21	21.0	12	24.0	9	18.0
	osteoporosis	21	21.0	10	20.0	11	22.0
	depression	12	12.0	8	16.0	4	8.0
Polypharmacy	≤ 5 medications	73	73.0	29	58.0	44	88.0
	> 5 medications	27	27.0	21	42.0	6	12.0

The heterogeneity, however, was similar in both countries.

The sample size of the pre-test was restricted due to the financial background of the study. It can be judged sufficient for testing feasibility and describing first trends but it does not allow for a comprehensive and reliable interpretation of the results from the statistical models.

Table 2. Oral status

Studied parameters		**Poland and Germany (n = 100)**		**Germany (n = 50)**		**Poland (n = 50)**	
Number of teeth	mean	13.07 ± 8.36		15.3 ± 8.10		10.84 ± 8.0	
	range (min–max)	(0–32)		(0–32)		(0–24)	
	median	14		16		11.5	
Number of occluding teeth	mean	4.19 ± 4.04		5.14 ± 4.28		3.24 ± 3.54	
	range (min–max)	(0–15)		(0–15)		(0–12)	
	median	4		4.5		2	
DMF-T	mean	26.35 ± 4.87		25.14 ± 4.38		27.56 ± 5.03	
	range (min–max)	(10–32)		(14–32)		(10–32)	
	median	27		26		28	
		n/N	**%**	**n/N**	**%**	**n/N**	**%**
Crown and root caries	≥ 1 coronal caries	37/86	43.0	12/46	26.1	25/40	62.5
	≥ 1 crown with filling	73/86	84.9	37/46	80.4	36/40	90.0
	≥ 1 root caries	26/86	30.2	10/46	21.7	16/40	40.0
	≥ 1 root with filling	41/86	47.7	26/46	56.5	15/40	37.5
Periodontal pockets	0–3 mm	871/1276	68.3	612/745	82.2	259/531	48.7
	4–5 mm	306/1276	23.9	111/745	14.9	195/531	36.7
	> 5 mm	99/1276	7.8	22/745	2.9	77/531	14.6
BOP	presence of bleeding	814/1276	63.8	416/745	55.9	427/531	80.6
	non-carious defects						
	≥ 1 tooth with non-carious defects	65/86	75.6	37/46	80.4	28/40	70.0
	enamel lesion	15/65	23.1	2/37	5.4	13/28	46.4
	dentinal lesion	45/65	69.2	33/37	89.2	12/28	42.9
	pulp involvement	5/65	7.7	2/37	5.4	3/28	10.7
Prosthetic status	partial upper denture	34/100	34.0	19/50	38.0	15/50	30.0
	partial upper denture with mucosal support	14/100	14.0	1/50	2.0	13/50	26.0
	partial upper denture with dental support	20/100	20.0	18/50	36.0	2/50	4.0
	partial lower denture	37/100	37.0	22/50	44.0	15/50	30.0
	partial lower denture with mucosal support	12/100	12.0	0/50	0	12/50	24.0
	partial lower denture with dental support	25/100	25.0	22/50	44.0	3/50	6.0
	complete lower and upper denture	14/100	14.0	4/50	8.0	10/50	20.0
	complete lower or upper denture	36/100	36.0	12/50	24.0	26/50	52.0

Two of the three QoL-measures used were validated instruments. The third over-all QoL-question was implemented in a simplified method according to [13]. All three instruments can be judged effective. This is underlined by a good correlation between all three QoL-measures themselves.

The WHO criteria for Oral Health Surveys [10] were applied to identify oral diseases which can be judged as appropriate. However, identifying health problems by using a standard questionnaire for assessing the medical history must be judged as quite ineffective. A new instrument, or even a short

Table 3. Results of multiple linear regression models

Model	Dependent variable	Independent variable	Standardized regression coefficient (Beta)	p-value
1	oral health-related quality of life	center "Germany" age wearing a removable dental prosthesis	–0.319 –0.335 0.264	0.001 0.001 0.007
2	health-related quality of life	living in residence center "Germany" number of disease groups	0.627 –0.347 0.193	0.000 0.000 0.015
3	general quality of life	high income center "Germany" living in residence	0.201 0.298 –0.228	0.047 0.002 0.017

medical examination, has to be taken into account for the main study because of the limited medical information we gathered from our collected data.

Only few socioeconomic variables – relative income, age and living conditions – initially showed trends towards correlations with at least one of the three QoL dimensions. This finding offers two possible conclusions of significance for the main study. Either the influence of socioeconomic variables on the different QoL-measures has been overestimated in advance or the large differences between the two centers somehow hide the respective influence in the statistical analysis.

The statistical methods applied for a first description of the study population can be judged adequate for the pre-test sample. The application of a multiple linear regression model was somehow experimental. It can be judged successful in terms of testing for feasibility. Some major trends were detected. However, the small sample size does not allow for a profound interpretation of these results.

Difficulties for recruiting participants in nursing homes have been previously described [14, 15]. Conducting a medical study, Zermansky identified three barriers for getting access to seniors in residences – the management and staff, the respective medical doctors and the seniors themselves. These barriers were also present in our study. However, the mental condition of most residents can be seen as the most significant challenge for data collection within this setting.

The 60-min time frame of the study was based on the experience from previous studies [16] and potential physical and mental impairments of seniors.

Measuring QoL in three dimensions was a challenging task. However, there is interest in comparing these different dimensions and testing them for relationships with clinical and sociodemographic findings. Undoubtedly, the OHIP-14 is an appropriate measure for OHRQoL. It is an internationally accepted and validated instrument [11, 12] regularly used in samples of seniors all over the world [17–22]. Some publications describe a higher sensitivity of the Geriatric Oral Health Assessment Index (GOHAI) compared to the OHIP in older populations [23, 24]. However, we chose to use the OHIP because of a higher international acceptance and comparability as well as the availability in German and Polish. Several validated instruments are available to measure HRQoL. For this study, we chose the EQ-5D [25, 26] because of the compactness of the instrument and the availability in both languages. In order not to disturb derange older participants longer than necessary, the EQ-5D seemed to be an appropriate measure. It has been widely used in older populations [27–29]. Measuring GQoL was challenging. Different experts in the fields of Psychology and Public Health advised the use of different instruments. However, all these instruments had a tendency to measure HRQoL rather than GQoL. Additionally, the assessment of all aspects of GQoL would have led to a very comprehensive and time-consuming instrument. For that reason, we agreed on using one overall question according to the theories of Bernheim & Buyse [13].

As expected, all three QoL measures showed significant correlations and reasonable results. They might be judged effective from that point of view. However, some older participants reported severe problems using the VAS-type scale from –5 to +5 used for the overall GQoL question. Therefore, further use of this measure cannot be straightforwardly recommended.

Differences in oral disease prevalence as well as in QoL measures were expected due to a different socioeconomic status and a different healthcare situation in Germany and Poland. However, a negative tendency for all major oral diseases as well as for all three QoL measures in Poland was not expected. There are many potential reasons for these differences. Listl reported a statistically sig-

nificant inequality in dental attendance between Germany and Poland for the age groups "56–65 yrs." and "75 yrs. and older" [30]. For specific patients, higher DMF-T scores and inferior periodontal health in Poland have been reported [31, 32]. Only one study measuring OHRQoL in Germany and Poland was found [33]. However, this study did not aim at revealing differences. It was only carried out among children and adult participants. Studies comparing QoL measures in older populations between Germany and Poland do not exist. Further research will be needed to explain the detected differences between both centers.

A comprehensive design which includes the assessment of major (oral) health status variables and different dimensions of QoL proved to be feasible for seniors in a bi-national study. The detected prevalence in oral disease as well as the differences in QoL measures between the German and the Polish samples are due to the different socioeconomic status and a different health care situation in Germany and Poland. However, these results cannot be generalized due to the limitations of this pilot project.

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