

Oral health factors related to the quality of life in elderly urban residents of South-West Poland

Katarzyna Skośkiewicz-Malinowska (✉ katarzyna.skoskiewicz-malinowska@umed.wroc.pl)

Wroclaw Medical University Faculty of Dentistry: Uniwersytet Medyczny im Piastow Slaskich we Wroclawiu Wydział Lekarsko-Stomatologiczny <https://orcid.org/0000-0001-7108-2099>

Urszula Kaczmarek

Wroclaw Medical University: Uniwersytet Medyczny im Piastow Slaskich we Wroclawiu

Barbara Malicka

Wroclaw Medical University: Uniwersytet Medyczny im Piastow Slaskich we Wroclawiu

Research article

Keywords: OHIP, Oral Health-Related Quality of Life, OHRQoL, oral condition, oral health

Posted Date: April 5th, 2021

DOI: <https://doi.org/10.21203/rs.3.rs-381094/v1>

License: © ⓘ This work is licensed under a Creative Commons Attribution 4.0 International License.

[Read Full License](#)

Abstract

Background

The process of human body ageing is an inevitable phenomenon affecting all organs. Hence, the concept of Oral Health-Related Quality of Life (OHRQoL) was introduced, based on the definition of health developed by WHO. The study aimed to evaluate the impact of selected oral health parameters on oral health-related quality of life in elderly residents of South-West Poland.

Methods

The study involved 500 participants who were the citizens of South-West Poland aged 65 and more. There was an oral examination performed, including the assessment of coronal and root caries, periodontal disease, dental prosthetic status and xerostomia. The impact of oral health-related quality of life was measured using the Oral Health Impact Profile-14 (OHIP-14). Furthermore, socio-demographic questionnaires were obtained from participants. Logistic bivariate and multivariate regression analyses of dependent variables and independent variables were carried out as part of the study.

Results

The mean value of DMFT was 27.5 ± 5.0 . A higher number of DMF and extracted teeth resulted in increased values in all seven domains and exhibited a significant negative impact on the quality of life. Moreover, it enabled predicting values in individual domains of the OHIP-14 scale.

Conclusions

The number of missing teeth and teeth with caries constituted the predictors of poorer Oral Health-Related Quality of Life in all domains of the OHIP-14 scale. The impact of gingival bleeding on the quality of life was demonstrated. There was a decrease in the oral health-related quality of life in single individuals with several comorbidities and medications taken.

Background

In recent years, there was an increase in the number of the ageing population on a global scale, particularly in developed countries.[1]The process of human body ageing is an inevitable phenomenon affecting all organs. Age-related changes occurring in the oral cavity include teeth, periodontium, mucosa, maxillae, temporomandibular joints, as well as salivary secretion.[2] Oral health significantly affects the overall quality of life. It has been identified as an integral component of general health which, when compromised, deteriorates the overall health and quality of life. [3] The impact is extensive; it leads to decreased activity of daily life and results in poor physical and/or mental well-being. Therefore, the concept of Oral Health-Related Quality of Life (OHRQoL) was introduced, based on the WHO definition of health defined as a state of physical, mental, and social well-being and not merely the absence of diseases or disability. [4–7]

The relation between oral health and the quality of life may be determined by evaluating the extent to which oral health affects the said quality of life by fulfilling functions such as the ability to chew, bite, swallow, and speak, mental well-being (satisfaction with the appearance of one's own teeth, self-esteem), physical well-being (feeling comfortable eating, not feeling any discomfort or pain), and social well-being (feeling comfortable speaking to others). One of the most frequently applied international assessment instruments – the Oral Health Impact Profile (OHIP) scale – consists of 49 questions, while its shortened version includes 14 questions (OHIP-14). The shortened version addresses the issue of functioning, physical and psychological pain, as well as social and physical disabilities. [8]

The study aimed to evaluate the impact of selected oral health parameters on oral health-related quality of life in elderly residents of South-West Poland.

Methods

The presented observational study was carried out as part of the project “Oral health and quality of life within old ages – a cross sectioned study in Germany and Poland” in cooperation between Municipal Council and the University Hospital Carl Gustav Carus in Dresden, Germany. The study was supported with funds from the Municipal Council as part of the project "Stan zdrowotny jamy ustnej a jakość życia osób w wieku starszym z Wrocławia" (Oral Health and the Quality of Life of Elderly Residents of Wrocław) (financial agreement P/ZJU/1/2015–2017).

The STROBE guidelines (Strengthening the Reporting of Observational Studies in Epidemiology) were followed.[9]

The study involved randomly selected participants (n = 1338), both males and females, aged between 65 and 99. (Fig. 1). All participants were citizens of Wrocław - Poland's fourth-largest city and the capital of the Viovodship of Lower Silesia, the most urbanized region in Poland.

The inclusion criteria included: age – 65 and more, place of living (local resident), the ability to communicate and the provision of written consent to participate in the survey. The exclusion criteria included: concurrent systemic diseases in which periodontal probing, leading to transient bacteremia, might have posed a risk to the patient's overall health, failure to provide written consent to participate in the survey and the occurrence of mental disorders which render the completion of a questionnaire impossible. All participants involved were obliged to provide written informed consent and completed the questionnaire, as well as demonstrate cooperation during the clinical oral examinations. Participants who did not fulfil the inclusion criteria were excluded from the study.

The study protocol was approved by the Bioethics Committee of Wrocław Medical University (permission no. KB 420/2015) in accordance with the Declaration of Helsinki. Participation in the study was voluntary and anonymous, and the collected data were treated confidentially. The population was examined over 24 months.

Data on the total number of residents aged 65 and more were derived from Statistics Poland. [10] The sample size was calculated based on the data concerning the number of individuals in this age group who live in the city. With such an assumption, a 95% level of confidence and $\pm 5\%$ margin of error, a minimum sample size consisted of 384 participants.[11]

Participants provided demographic and personal information as well as their medical history. The collected data included: date of birth, gender, marital status, level of education, monthly income (based on the national average income per family member in the year of the study), as well as comorbid systemic diseases.

Evaluation of oral health was conducted by two examiners. Each examiner was asked to study the same group of 10 patients. The findings were then compared with those of the experienced supervisor. The value of inter-examiner kappa coefficient was 0.874 while the intra-examiner kappa coefficient was 0.870.

Oral examination was performed using the artificial light, a plane dental mirror and a ball-ended probe (WHO CPI probe). Coronal and root caries was evaluated according to the World Health Organisation criteria, DMFT values and their components.[12] Periodontal condition was assessed in individuals who had more than 2 natural teeth by measuring bleeding on probing (BoP) of 6 sites, gingival pocket depth (PD), clinical attachment loss (CAL)[12] and tooth mobility according to the Miller index.[13] Dental prosthetic status was assessed by taking into account the number of functional tooth units of natural and artificial teeth on implant-supported and fixed prostheses (non-functional tooth units), as well as the information on whether the participants wore partial or complete removable dentures. Moreover, oral dryness was examined as per the Challacombe scale (Clinical Oral Dryness Score, CODS)(12). The level of dryness was categorised based on the number of symptoms observed as mild (1–3), moderate (4–6), or severe.[14, 15]

The impact of OHRQoL was measured using the previously validated Polish version of the OHIP-14.[16] The questionnaire consisted of 14 questions related to problems that occurred with: 1) trouble with pronouncing words, 2) worsened taste, 3) pain, 4) discomfort while eating, 5) self-consciousness, 6) emotional tension, 7) unsatisfactory diet, 8) interrupted meals, 9) difficulty with relaxing, 10) embarrassments, 11) irritability, 12) inability to complete everyday tasks, 13) reduced satisfaction with life, 14) complete inability to function. The questions corresponded to 7 dimensions: functional limitation, pain, psychological discomfort, physical disability, psychological disability, social disability and handicap. Frequency of occurrence was assessed using the five-point Likert scale: 0 – never, 1 – rarely, 2 – occasionally, 3 – frequently, and 4 – very often. All values were summed up to calculate the total OHIP-14 score which could vary between 0 and 56; the higher the OHIP-14, the poorer the OHRQoL.

Compatibility of the obtained results with a normal distribution was verified using the Kolmogorov-Smirnov test. Continuous quantitative variables, distributed in a way not significantly different from the norm, were presented as a mean and standard deviation, while the qualitative variables were shown as numbers and percentages. Bivariate and multivariate logistic regression analyses of dependent variables (oral health parameters) and independent variables (OHIP-14 score) were also conducted. Correlation of

the independent variables (OHIP) was tested via multiple linear regression analysis using the forward stepwise method. For the independent variables, standardised coefficients and regression coefficients beta with a 95% CI were calculated. The results of all tests were rendered significant at the P -value of < 0.05 . All analyses were computed using Statistica 13 software (PL StatSoft).

Results

Out of 500 participants in the study, 64.0% were females and 36.0% were males, with the mean age of 74.4 ± 7.4 . The majority of participants reported to have secondary education (51.0%), live with family members (62.0%), stay at home without any help (90.8%), and belong to the middle economic class (45.2%). Most of the participants (35.4%) suffered from at least three comorbid systemic diseases (Table 1).

Table 1
Characteristics of the studied participants

Parameters		<i>n</i>	%
Gender	male	180	36,0
	female	320	64.0
Age (range)	65–69	328	65.6
	70+	172	34.4
Age (years)	mean SD	74,4 ± 7,4	
Education level	Low	81	16.2
	middle	255	51.0
	High	164	32.8
Lifestyle	alone	190	38.0
	family/children	310	62.0
Living condition	Home without help	454	90.8
	Home with help or residence	46	9.2
SES	low	128	25.6
	middle	226	45.2
	high	137	27.4
	No answer	9	0.8
Number of comorbid systematic diseases	none	70	14,0
	1	118	23,6
	2	135	27,0
	3+	177	35.4
SES – socioeconomic status			

All participants were diagnosed with dental caries. The mean value of DMFT was 27.5 ± 5.0 . The mean value of missing teeth (MT) was 19.0 ± 9.6 . Edentulism was found in 106 participants, i.e. 21.1% of the study group. Periodontal parameters were calculated for individuals with at least 2 natural teeth ($n = 394$). There were $55.0\% \pm 43.2$ of sites exhibiting bleeding on probing, gingival pocket depth was ≥ 4 mm $50.2\% \pm 26.6$ (mean of 3.7 ± 0.9 mm), while the attachment loss was $26.1\% \pm 27.1$ (4.3 ± 1.4 mm). A partial removable denture was worn in the maxilla by 30.8% of participants and in the mandible by 20.0% of examined seniors. A complete removable denture was worn by 25.0% and 22.6% of participants,

respectively. Xerostomia was found in 32.8% of participants, out of which 29.6% was mild, 3.0% moderate and 0.2% severe (Table 2).

Table 2
Oral health parameters

Oral health parameters		Mean ± SD	Me (Q1 – Q3)	Min – Max
DMFT		27.5 ± 5.0	29 (24–32)	12–32
DT		1.5 ± 2.7	0 (0–2)	0–2
MT		19.0 ± 9.6	18 (10–28)	0–32
FT		7.0 ± 6.3	6 (0–12)	0–27
BoP (%)		55.9 ± 43.0	64 (8–100)	0–100
PD (mm)		3.7 ± 0.9	3.4 (3.1–4.1)	2.1–10.7
CAL (mm)		4.2 ± 1.5	4.0 (3.3–5.0)	0.0–12.5
Number of movable teeth	no	11.7 ± 9.8	11 (0–21)	0–32
	yes	0.35 ± 0.76	0 (0–0)	0–14
Number of occluding teeth		4.7 ± 4.8	0 (0–9)	0–14
		n	%	
Denture upper jaw	no	221	44.2	
	yes	279	55,8	
Denture lower jaw	no	257	51.4	
	yes	243	48,6	
Oral dryness	no	336	67.2	
	mild	148	29.6	
	moderat, severe	16	3.2	
DMFT- Decayed Missing Filled teeth index				

DT- Number of Decayed Teeth

MT- Number of Missing Teeth

FT-Number of Filled Teeth

BoP – Bleeding on Probing

PD – gingival pocket depth

CAL - clinical attachment loss

The total OHIP-14 score amounted to 8.01 ± 13.59 and did not reveal any gender-related differences (7.20 ± 12.90 in men and 8.50 ± 14.00 in women, $p = 0.28$). Among the OHIP-14 items, "discomfort while eating" had the highest value (0.90 ± 1.43) while "inability to complete everyday tasks" and "complete inability to function" had the lowest value (0.31 ± 0.91 and 0.31 ± 0.92 , respectively). The results of the reliability analysis concerning the OHIP-14 items in the study group of 500 elderly citizens indicate very good psychometric properties (Cronbach's alpha = 0.964). In terms of domains, the participants most frequently reported physical pain (1.69 ± 2.51) and psychological discomfort (1.46 ± 2.53). (Table 3)

Table 3
Mean of the OHIP-14 items and domains.

Question OHIP-14	Mean SD	Me [Q1; Q3]	Min - Max	
1. Trouble with pronouncing words	0.47 ± 1.11	0 [0; 0]	0-4	
2. Worsened taste	0.50 ± 1.12	0 [0; 0]	0-4	
3. Pain	0.80 ± 1.33	0 [0; 1]	0-4	
4. Discomfort while eating	0.90 ± 1.43	0 [0; 2]	0-4	
5. Self-consciousness	0.78 ± 1.35	0 [0; 1]	0-4	
6. Emotional tension	0.67 ± 1.28	0 [0; 1]	0-4	
7. Unsatisfactory diet	0.69 ± 1.31	0 [0; 1]	0-4	
8. Interrupted meals	0.55 ± 1.18	0 [0; 0]	0-4	
9. Difficulty with relaxing	0.48 ± 1.13	0 [0; 0]	0-4	
10. Embarrassment	0.64 ± 1.26	0 [0; 0]	0-4	
11. Irritability	0.43 ± 1.05	0 [0; 0]	0-4	
12. Inability to complete everyday tasks	0.31 ± 0.91	0 [0; 0]	0-4	
13. Reduced satisfaction with life	0.49 ± 1.12	0 [0; 0]	0-4	
14. Complete inability to function	0.31 ± 0.92	0 [0; 0]	0-4	
Total OHIP-14	8.01 ± 13,59	1 [0; 9]	0-56	
Domains	Question	Mean ± SD	Me [Q1; Q3]	Min - Max
D1 functional limitations	1, 2	0,97 ± 2,05	0 [0; 1]	0-8
D2 pain (physical)	3,4	1,69 ± 2,51	0 [0; 3]	0-8
D3 psychological discomfort,	5,6	1,46 ± 2,53	0 [0; 2]	0-8
D4 physical disability,	7,8	1,24 ± 2,35	0 [0; 1]	0-8
D5 psychological disability,	9,10	1,12 ± 2,21	0 [0; 1]	0-8
D6 social disability	11,12	0,73 ± 1,86	0 [0; 0]	0-8
D7 handicap (infirmity).	13,14	0,80 ± 1,91	0 [0; 0]	0-8

Mann-Whitney U test

A higher number of DMF and extracted teeth resulted in increased values of all seven domains (univariate regression) (Table 4). It exhibited a significant negative impact on the quality of life and enabled predicting values of individual domains of the OHIP-14 scale. The use of removable dentures increased

the functional limitation (domain 1), physical disability (domain 4), social disability (domain 6), and impairment/invalidity (domain 7). Xerostomia was found to be related to functional limitation (domain 1) and psychological disability (domain 5). Gingival bleeding was linked to domain 1 (functional limitation), domain 3 (psychological discomfort), domain 4 (physical disability), domain 5 (psychological disability), domain 6 (social disability) and domain 7 (impairment – invalidity). As the number of diseases and medications taken increased, so did the number of painful ailments (domain 2). Living alone resulted in increased functional limitation (domain 1), psychological discomfort (domain 3), physical disability (domain 4) and social disability (domain 6).

Table 4
Predictors of quality of life – values of linear regression coefficients

Domains	Predictors	Univariate regression		Multivariate regression	
		b	p	beta	p
OHIP-14 Functional limitation (Q1 and Q2)	Living alone	0.222	0.019	-	> 0.05
	MT	0.044	< 0.001	-	> 0.05
	FT	-0.052	< 0.001	-	> 0.05
	DMFT index	0.072	< 0.001	-	> 0.05
	Bleeding on probing (%)	0.005	0.010	0.005	0.022
	Denture wearing	0.410	0.021	0.289	0.027
	Oral dryness	0.232	0.002	0.213	0.005
Physical pain (Q3 and Q4)	MT	0.039	0.001	-	> 0.05
	FT	-0.050	0.005	-0.037	0.047
	DMFT index	0.071	0.002	0.057	0.015
	Number of diseases	0.166	0.032	-	> 0.05
Psychological discomfort (Q5 and Q6)	Living alone	0.245	0.036	-	> 0.05
	DT	0.154	< 0.001	-	> 0.05
	MT	0.038	0.001	-0.138	0.001
	FT	-0.075	< 0.001	-0.186	< 0.001
	DMFT index	0.064	0.005	0.180	< 0.001
	Bleeding on probing (%)	0.277	0.033	-	> 0.05

DMFT- Decayed Missing Filled teeth index
DT- Number of Decayed Teeth
MT- Number of Missing Teeth
FT-Number of Filled Teeth

Physical disability (Q7 and Q8)	Living alone	0.269	0.013	-	> 0.05
	MT	0.070	< 0.001	-	> 0.05
	FT	-0.100	< 0.001	-0.057	< 0.001
	DMFT index	0.099	< 0.001	-	> 0.05
	Bleeding on probing (%)	0.007	0.004	-	> 0.05
	Denture wearing	0.056	0.002	-	> 0.05
Predictors of psychological disability (Q9 and Q10)	DT	0.091	0.012	0.132	< 0.001
	MT	0.038	< 0.001	0.033	0.009
	FT	-0.069	< 0.001	-	> 0.05
	DMFT index	0.058	0.004	-	> 0.05
	Bleeding on probing (%)	0.007	0.003	-	> 0.05
	Oral dryness	0.178	0.028	0.232	0.006
Social disability (Q11 and Q12)	Living alone	0.240	0.005	-	> 0.05
	MT	0.039	< 0.001	-	> 0.05
	FT	-0.058	< 0.001	-	> 0.05
	DMFT index	0.050	0.003	-	> 0.05
	Bleeding on probing (%)	0.006	0.001	0.006	0.001
	Denture wearing	0.033	0.019	-	> 0.05
Handicap (Q13 and Q14)	MT	0.040	< 0.001	-	> 0.05
DMFT- Decayed Missing Filled teeth index					
DT- Number of Decayed Teeth					
MT- Number of Missing Teeth					
FT-Number of Filled Teeth					

FT	-0.051	< 0.001	-	> 0.05
DMFT index	0.058	0.001	-	> 0.05
Bleeding on probing (%)	0.005	0.006	0.005	0.006
Denture wearing	0.039	0.008	-	> 0.05
DMFT- Decayed Missing Filled teeth index				
DT- Number of Decayed Teeth				
MT- Number of Missing Teeth				
FT-Number of Filled Teeth				

Multivariate regression analysis revealed that xerostomia was an independent predictor of the number of points scored in domain 1 (functional limitations) and domain 5 (psychological disability), while the DMFT index value was an independent predictor of the number of points scored in domain 2 (physical pain) and domain 3 (psychological discomfort). Gingival bleeding determined the number of points scored in domain 1 (functional limitations), domain 6 (social disability) and domain 7 (impairment, invalidity).

Discussions

Currently, there is a common, unanimous agreement that oral health is correlated with the QoL. [2–4, 15, 16] The OHIP-14 questionnaire, which Polish version was validated by our team prior is considered to be the tool of choice for evaluation of the OHRQoL among the population.[14] The tools used, together with the clinical examination and the questionnaire assessing the socio-economic status of the patients, allowed for a analysis and determination of factors and relationship affecting quality of life, as well as for finding limitations and problematic aspects. Another great advantage of our study was the possibility of reaching out to a significant population of elderly people with a view to promoting oral health and advising them on preventive measures and treatment options corresponding to their medical needs. The validation of the OHIP-14 questionnaire, gathering of data on oral health of Polish elderly population, as well as the chance to examine half a thousand citizens of Wrocław, one of the biggest city in Poland clearly indicates the purposefulness of the conducted research and its contribution in science, particularly because similar data regarding health condition and the quality of life of the elderly is barely available.

The present study findings indicated that all domains of OHIP-14 were positively correlated with DMFT and the number of extracted teeth. A study conducted in Spain in the same age group showed a slightly higher OHIP-14 value and it revealed a correlation with the number of missing teeth [17]. Similarly, in residents of Saudi Arabia aged over 60, the OHIP-14 value was similarly correlated with DMFT. [18] In the UK population in the same age group, OHIP-14 values were found to be significantly lower [19], contrary

to Iranian residents and a group of the Swedish elderly, where OHIP-14 values were found to be significantly higher than in the present study. [20] Inukai et al. also reported a significantly higher mean total OHIP-14 scores. It was found that higher chewing ability was correlated with lower OHIP-14 summary scores, which indicated better OHRQoL. The correlation between perceived chewing ability and OHRQoL was not substantially affected by age and number of teeth, but by gender, schooling years, treatment demand and denture status.[21]. Koistinen et al. also found that the factors associated with poor OHRQoL included female sex, oral problems and perception of poor physical, psychological and oral health. Women were more likely to report poor OHRQoL than men. [22] In the present study, however, the OHIP-14 value showed no differences related to the participants' gender

The analysis of the present study results using linear regression showed that the number of missing teeth allowed to predict values in all domains of the OHIP-14 scale. Unfortunately, although there are advances in conservative dental treatment, the loss of many natural teeth still occurs in the elderly. It should be emphasised that tooth loss is not an inevitable result of the normal ageing process, but a consequence of untreated or ineffectively treated caries, periodontal disease, traumatic injury, and thus it is a negative indicator of both the patient's health-seeking behaviour and the effectiveness of dental care. According to Jain et al.'s study conducted among the residents of two major cities in India, both age and tooth loss were correlated, however, they had different effects on the OHRQoL. Tooth loss, which was correlated with the increase in age, was associated with a negative impact on the perception of the QoL, whereas the increase in age of the participants had less impact on the perception of QoL.[23]

As much as 32.8% of xerostomia cases were reported among the Polish elderly participants. Xerostomia correlated with functional limitation and psychological disability. Paredes-Rodríguez et al. also observed a significant correlation between a higher level of xerostomia and a poorer QoL. [24] According to their study results, however, QoL was not related to the number of remaining teeth nor the number of ingested drugs.

The maintenance and reconstruction of tooth structure are of great importance in terms of maintaining proper chewing function. The loss of natural teeth prevents the proper functioning of the masticatory organ and it necessitates the use of prosthetic restorations. In the present study, the use of removable dentures increased functional limitation, physical disability, social disability, and handicap. Parea et al. focused on the overall satisfaction of edentulous patients treated with conventional dentures. The obtained data enabled the conclusion that the use of conventional complete dentures adversely affected OHRQoL of elderly patients, mainly in the case of lower dentures that required repair and replacement, with removable complete dentures as antagonists. [25]

The implementation of the term OHRQoL created new perspectives for the estimation of the extent to which oral health or oral diseases affect a patient's life in general. It changed the perception of the problem from a dental-oriented perspective to a biopsychosocial-dental, thus patient-centred, approach. In the study by Brennan et al.,[15] both the objective (income) and the subjective socioeconomic status were associated with OHIP scores. Mean OHIP scores were higher for those born overseas and speaking a

language other than English, as well as for smokers and those brushing their teeth less frequently. In the present study, the socioeconomic status did not affect the OHIP score. Living alone resulted in higher functional limitation, psychological discomfort, physical disability and social disability.

McGrath et al. found that the elderly perceived oral health as a significant QoL factor in a variety of ways. The majority of them (73%) considered it important for physical, social and psychological QoL. It was most frequently perceived as the impact affecting eating function and comfort. [26] It should be emphasised that both general and oral health were strongly associated with the elderly, while the general health of seniors with more severe health problems had a significant effect on their oral health – participants with worse health status suffered more oral health problems.[3] According to the present study, the experience of pain exacerbates when there is an increase in the number of comorbidities and taken medications.

Changes in the oral cavity, which accompany the ageing process, affect all the oral cavity structures. Although overall health status deteriorates with age, there are many ways to manage it so that a person can continue to lead an independent life. Hence, active ageing is about ageing in good health, active participation in society, fulfilment in professional life, and independence in daily life. The assessment of OHRQoL has multiple important clinical implications. It represents a multidimensional construct that includes the patient's subjective assessment of their own health, functional and emotional well-being, treatment-related expectations and satisfaction as well as general well-being.

Several limitations have to be taken into consideration in a discussion concerning the results of this study. Firstly, this study was conducted using a self-reported questionnaire to report data such as OHIP-14 which could lead to identification bias. However, it was proved by some studies that the questionnaire can be used as a valid and reliable method. Secondly, the use of survey data did not allow us to explain temporal relationships nor to show inferences on causality. Thirdly, when analysing the obtained results, it is essential to bear in mind a possible self-selection error of the study participants – those who joined the study were concerned about their dental problems or they were aware of those problems and were looking for help. Moreover, some persons may have refused to participate in the study due to dental fear. Another interfering factor was related to the use of exclusion criteria. The study was limited by the exclusion of patients with coexisting systemic diseases in whom pocket probing leading to transient bacteremia might have posed a risk for their overall health status. That exclusion criterion involved many patients in this age group. Finally, the exclusion of patients with a mental disorder might have constituted another interfering factor.

Conclusions

According to our study, the number of missing teeth and teeth with caries constituted strong and consistent predictors of OHRQoL in all domains of the OHIP-14 scale. Among the measurable parameters of periodontal status, a significant relationship with OHRQoL can be assigned to bleeding on probing, as the marker concerned was a predictor of six out of seven domains of the OHIP-14 scale. OHRQoL was

poorer among the seniors living alone as well as it decreases with the number of comorbidities and number of taken medications. This highlights the importance of tailoring regular contacts with dental healthcare services in old age and their influence on QoL.

Abbreviations

QoL - Quality of Life

OHRQoL - Oral Health-Related Quality of Life

OHIP-14 - Oral Health Impact Profile 14

DMFT- Decayed Missing Filled teeth index

DT- Number of Decayed Teeth

MT- Number of Missing Teeth

FT-Number of Filled TeethBoP- bleeding on probing

PD- gingival pocket depth

CAL- clinical attachment loss

SES – socioeconomic status

Declarations

Ethics approval

The study protocol was approved by the Bioethics Committee of Wroclaw Medical University (permission no. KB 420/2015) in accordance with the Declaration of Helsinki.

Consent to participate

All participants involved were obliged to provide written informed consent. Participants who did not fulfil the inclusion criteria were excluded from the study.

Consent for publication

Not applicable

Availability of data material

The datasets used and analysed during the current study is available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests.

Funding

The study was supported with funds from the Municipal Council as part of the project Oral Health and the Quality of Life of Elderly Residents of Wrocław (financial agreement P/ZJU/1/2015-2017).

Author contributions

K S-M designed the study, analysed and interpreted the data, gathered and reviewed literature, drafted the work and approved the final version. U K revised the work critically for important intellectual content, and contributed to final approval of the version to be published. B M contributed to the acquisition, analysis and interpretation of data and final approval of the version to be published.

Acknowledgements

The presented observational study was carried out as part of the project “Oral health and quality of life within old ages – a cross sectioned study in Germany and Poland” in cooperation between Municipal Council and the University Hospital Carl Gustav Carus in Dresden, Germany.

References

1. World report on Ageing And Health . 2015. Available from: www.who.int [Accessed 2020 Dec 17]
2. Lauritano D, Moreo G, Vella F Della, Stasio D Di, Carinci F, Lucchese A, et al. Oral health status and need for oral care in an aging population: A systematic review. Vol. 16, International Journal of Environmental Research and Public Health. MDPI AG; 2019.
3. Brennan DS, Singh KA. General health and oral health self-ratings, and impact of oral problems among older adults. *Eur J Oral Sci* . 2011 Dec 1;119(6):469–73. Available from: <http://doi.wiley.com/10.1111/j.1600-0722.2011.00873>. [Accessed 2021 Jan 5]
4. Haag DG, Peres KG, Balasubramanian M, Brennan DS. Oral Conditions and Health-Related Quality of Life: A Systematic Review. Vol. 96, *Journal of Dental Research*. SAGE Publications Inc.; 2017. p. 864–74. Available from: <http://journals.sagepub.com/doi/10.1177/0022034517709737>[Accessed 2020 Dec 17]
5. Allen PF, McMillan AS, Walshaw D LD. *j.1600-0528.1999.tb02031*. *Community Dent Oral Epidemiol*. 1999;27:344–52.
6. Slade GD. Derivation and validation of a short-form oral health impact profile. *Community Dent Oral Epidemiol*. 1997;25(4):284–90. Available from: <http://doi.wiley.com/10.1111/j.1600-0528.1997.tb00941>. [Accessed 2020 Dec 17]

7. Editors TPM. Observational studies: Getting clear about transparency. Vol. 11, PLoS Medicine. 2014. Available from: <http://www.plosmedicine.org/static/>[Accessed 2021 Feb 15]
8. Statistics Poland / Topics / Statistical yearbooks / Demographic Yearbook of Poland 2015.. Available from: <https://stat.gov.pl/en/topics/statistical-yearbooks/statistical-yearbooks/demographic-yearbook-of-poland-2015,3,9.html?pdf=1>[Accessed 2021 Feb 15]
9. Standard Deviation Calculator. Available from: <https://www.calculator.net/standard-deviation-calculator.html>[Accessed 2021 Feb 15]
10. WHO. Oral Health Surveys Basic Methods 5th Edition.
11. Wu CP, Tu YK, Lu SL, Chang JH, Lu HK. Quantitative analysis of Miller mobility index for the diagnosis of moderate to severe periodontitis - A cross-sectional study. *J Dent Sci.* 2018;13(1):43–7. Available from: <https://doi.org/10.1016/j.jds.2017.11.001>
12. Challacombe S. The Challacombe Scale. Available from: www.aspharma.co.uk[Accessed 2020 Dec 17]
13. Das P, Challacombe SJ. Dry Mouth and Clinical Oral Dryness Scoring Systems. *Prim Dent J.* 2016 Feb 1;5(1):77–9.
14. Skoškiewicz-Malinowska K, Kaczmarek U, Ziętek M, Malicka B. Validation of the Polish version of the oral health impact profile-14. *Adv Clin Exp Med.* 2015;24(1):129–37.
15. Brennan DS, Spencer AJ, Roberts-Thomson KF, Roberts-Thomson KF. Socioeconomic and psychosocial associations with oral health impact and general health. *Community Dent Oral Epidemiol.* 2019 Feb 1;47(1):32–9. Available from: <https://onlinelibrary-wiley-com-100324bvn0273.han.bg.umed.wroc.pl/doi/epdf/10.1111/cdoe.12419>[Accessed 2021 Jan 5]
16. Brennan DS, Teusner DN. Oral health impacts on self-rated general and oral health in a cross-sectional study of working age adults. *Community Dent Oral Epidemiol.* 2015 Jun 1;43(3):282–8. Available from: <https://onlinelibrary-wiley-com-100324bvn027a.han.bg.umed.wroc.pl/doi/epdf/10.1111/cdoe.12152> [Accessed 2021 Jan 5]
17. Sáez-Prado B, Haya-Fernández M-C, Sanz-García M-T. *Med Oral Patol Oral Cir Bucal.* 2016;21(6):672–80. Available from: <http://dx.doi.org/doi:10.4317/medoral.21305>[Accessed 2020 Dec 17]
18. Ahmad MS, Bhayat A, Zafar MS, Al-Samadani KH. The impact of hyposalivation on quality of life (QOL) and oral health in the aging population of Al madinah Al munawarrah. *Int J Environ Res Public Health.* 2017 Apr 20;14(4).
19. Masood M, Newton T, Bakri NN, Khalid T, Masood Y. The relationship between oral health and oral health related quality of life among elderly people in United Kingdom. *J Dent.* 2017 Jan 1;56:78–83. Available from: <https://pubmed.ncbi.nlm.nih.gov/27825838/>[Accessed 2020 Dec 17]
20. Motallebnejad M, Mehdizadeh S, Najafi N, Sayyadi F. The evaluation of oral health-related factors on the quality of life of the elderly in Babol. *Contemp Clin Dent.* 2015 Jul 1;6(3):313–7. Available from: <https://pubmed.ncbi.nlm.nih.gov/26321827/>[Accessed 2020 Dec 17]

21. Inukai M, John MT, Igarashi Y, Baba K. Association between perceived chewing ability and oral health-related quality of life in partially dentate patients. *Health Qual Life Outcomes*. 2010 Oct 19;8(1):118. Available from: <http://www.hqlo.com/content/8/1/118>[Accessed 2020 Dec 17]
22. Koistinen S, Olai L, Ståhlacke K, Fält A, Ehrenberg A. Oral health-related quality of life and associated factors among older people in short-term care. *Int J Dent Hyg*. 2020;18(2):163–72.
23. Jain M, Kaira LS, Sikka G, Singh S, Gupta A, Sharma R, et al. How do age and tooth loss affect oral health impacts and quality of life? A study comparing two state samples of gujarat and rajasthan. *J Dent Tehran Univ Med Sci*. 2012;9(2):135–44.
24. Paredes-Rodríguez VM, Torrijos-Gómez G, González-Serrano J, López-Pintor-Muñoz RM, López-Bermejo M ángel, Hernández-Vallejo G. Quality of life and oral health in elderly. *J Clin Exp Dent*. 2016;8(5):e590–6.
25. Perea C, Suárez-García MJ, Del Río J, Torres-Lagares D, Montero J, Castillo-Oyagüe R. Oral health-related quality of life in complete denture wearers depending on their socio-demographic background, prosthetic-related factors and clinical condition. *Med Oral Patol Oral Cir Bucal*. 2013;18(3).
26. McGrath C, Bedi R. The importance of oral health to older people's quality of life. *Gerodontology*. 1999;16(1):59–63. Available from: <https://pubmed.ncbi.nlm.nih.gov/10687509/>[Accessed 2020 Dec 17]

Figures

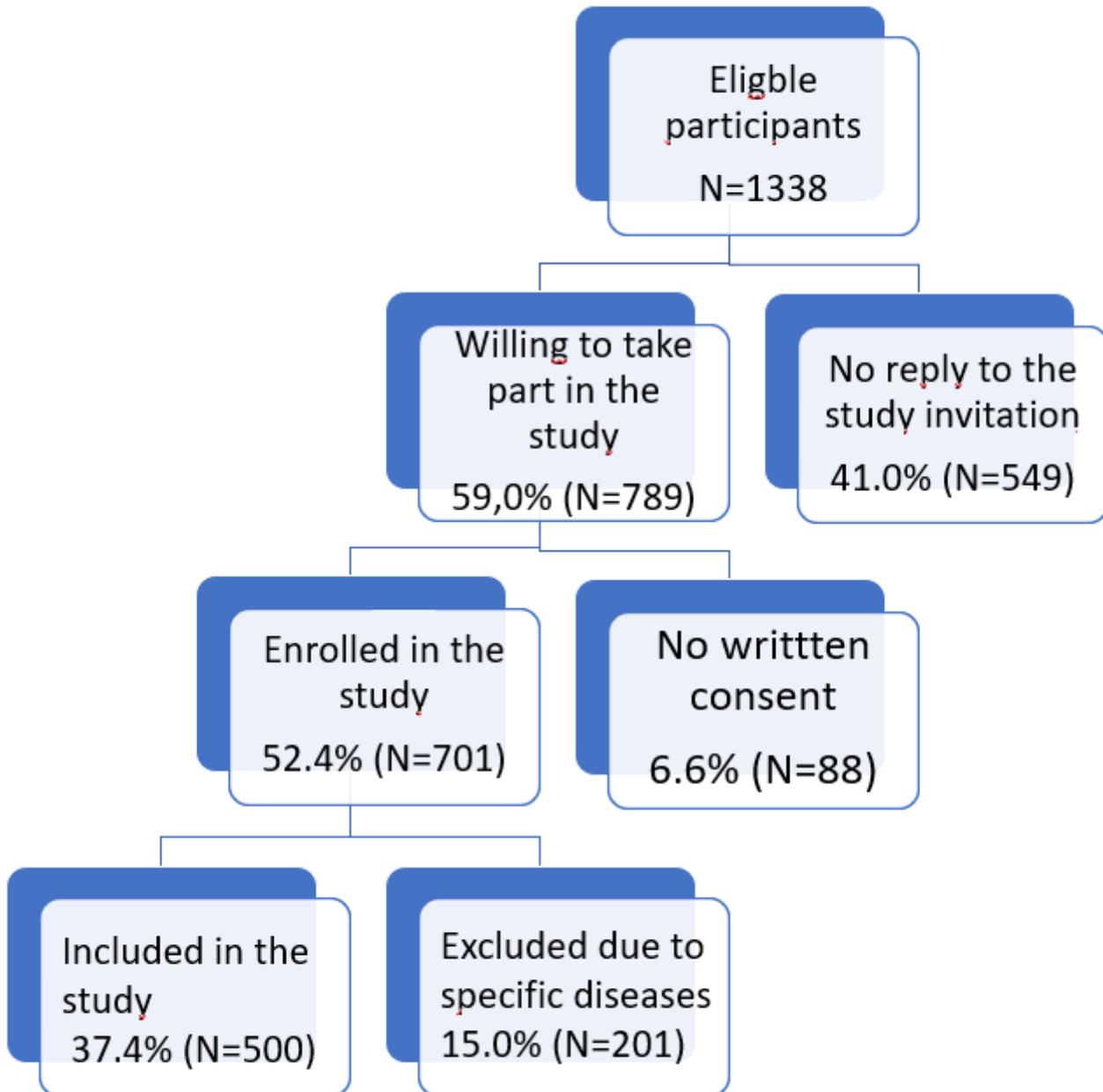


Figure 1

Flow of patricipants

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [STROBEchecklistcrosssectional.docx](#)