# ORIGINAL PAPERS

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# Validation of the Polish Version
# of the Oral Health Impact Profile-14

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**A** – research concept and design; **B** – collection and/or assembly of data; **C** – data analysis and interpretation;
**D** – writing the article; **E** – critical revision of the article; **F** – final approval of article; **G** – other

## Abstract

**Background.** The Oral Health Impact Profile-14 (OHIP-14) is an example of a specific questionnaire used for assessing the quality of life in relation to oral health.
**Objectives.** The aim of this study was to validate the Polish version of the original English Short-Form OHIP-14 questionnaire.
**Material and Methods.** The Polish version of the OHIP-14 instrument had been prepared in accordance with generally accepted standards. The main study was conducted among a group of 150 subjects of both genders, aged from 35 to 91 who were randomly selected. Statistical analysis was made by STATISTICA software using the Cronbach alpha reliability test, Mann-Whitney $U$ test, multiple comparison *post-hoc* test – LSD and Spearman`s correlation coefficient.
**Results.** The total OHIP-14 score was 8.72 ± 13.39, out of which the highest value was for item 4 (uncomfortable to eat 0.89 ± 1.19). The value of the alpha Cronbach coefficient was above 0.9 for all 14 items of the OHIP-14 instrument indicating excellent internal consistency. Positive relationships between all items of the matrix of the inter-items correlation coefficients were found. The value of coefficients ranged from 0.56 to 0.90 at a significance level of $p < 0.01$. Construct validity was supported by the fact that oral health condition was correlated with total OHIP score. It was observed that there is a correlation between the quality of life evaluated with the OHIP-14 test and dental condition, dental needs, wearing removable dentures and self-assessment of general health and oral health condition.
**Conclusions.** The obtained data indicated the reliability and validity of OHIP-14 instrument for the assessment of oral health-related quality of life for in Polish adult population (**Adv Clin Exp Med 2015, 24, 1, 129–137**).

**Key words:** quality of life, elderly, validation, OHIP-14, oral health-related quality of life.

Quality of life is hard to define as it should encompass numerous aspects of life, including both subjective and objective factors, and be a manifestation of a holistic approach towards the human being [1]. The World Health Organization (WHO) defines health as "complete physical, mental and social well-being, and not merely the absence of disease or illnesses". Based on that definition, the WHO describes quality of life (QOL) as "individuals' perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns" [2, 3]. Other attempts at unifying and making the definition of quality of life more precise have led to the formulation of the concept of health related quality of life (HRQoL), which refers to quality of life dependent on general health condition, and takes into consideration the influence of coexisting systemic diseases and the natural ageing process. HRQOL is subjective and multidimensional, encompassing an occupational function, psychological state, social interaction and somatic sensation [4, 5].

The basic research tools used for evaluating quality of life are questionnaires that enable us to obtain a quantitative result that constitutes a basis

for comparison with other study results. The most common scales used in relation to quality of life are generic scales and disease or dimension specific scales. Generic questionnaires analyze correlations between the patient's health condition and factors related with experiencing disease, as well as other factors including family relations, emotional state and professional activity. Disease and dimension specific questionnaires focus on specific domains of the patient's activity or factors resulting from the disease. They are used to evaluate quality of life in specific disease entities or a group of conditions [6–8].

OHIP-14 (Oral Health Impact Profile by Slade 1997) is an example of a specific questionnaire used for assessing quality of life in relation to oral health. It is a short version of OHIP 49 (Oral Health Impact Profile by Slade 1994), initially devised by Slade and Spencer, based on a theoretical model developed by the WHO and adapted for oral health by Locker [9, 10]. The original version of the Oral Heath Impact Profile which includes 49 items is time-consuming and less respondent-friendly, whereas the short version is comparably reliable, valid and precise. This questionnaire has been used to show the relationship between QoL and oral health status of patients, and it is connected with Locker's theoretical model of oral health [10], which was used to define 7 conceptual dimensions of impact. Therefore, OHIP-14 consists of 7 conceptual domains, based on 2 questions (items) each: functional limitation, pain, psychological discomfort, physical disability, psychological disability, social disability, and handicap. Answers to the questions are rated according to Likert's scale: 0 – never, 1 – hardly ever, 2 – occasionally, 3 – fairly often, 4 – very often. Two different methods of scoring OHIP are used. First, the "simple count method" (OHIP-SC) in which the total score is calculated by summing up the number of impacts reported more frequently as occasionally. A negative impact of oral health on an individual's life is indicated by answers 3 and 4, and a positive impact is indicated by answers 2, 1, 0. Second, the "additive method" of scoring OHIP, in which the total score is calculated by summing up the item codes for the 14 items at whatever frequency, is used (OHIP-ADD). OHIP-14 score is calculated by adding up the answers of all 14 items, with the total score ranging from 0 to 56. The higher the value of score, the worse is the oral health [3, 9–13].

The aim of this study was to develop and validate the Polish version of the original English short version of the OHIP-14 form.

# Material and Methods

## The Construction of the Polish Version of OHIP-14 (Linguistic and Cultural Adaptation)

Before the study, the Polish version of the OHIP-14 questionnaire had been prepared in accordance with generally accepted standards. The original English version of the OHIP-14 was translated into Polish by two independent bilingual dentists who were native Poles with professional proficiency in English and two separate translations of the form were obtained. The dentists discussed and agreed upon a single version of the translation. The first version was translated back into English by two independent translators who were native speakers of English and bilingual. The native English speakers were familiar with the original English version of the OHIP-14 after finishing their translation. After discussions between the translators the final version of the Polish OHIP-14 was obtained.

### Pilot Study

A pilot study was carried out among a group of 10 subjects based on the Polish version of the OHIP-14 questionnaire and additional questions concerning possible difficulties in understanding, or vagueness related to the questions included in the questionnaire. A pilot study was required to assess the face and content validity.

### Main Study

Reliability and construct validity were checked in the main study. The main study was conducted among outpatients of Academic Dental Clinic and involved 150 subjects of both genders, aged from 35 to 91, with the mean age 59.3 ± 15.3 years, 60 out of whom were males (40.0%). The exclusive

**Table 1.** Gender and age distribution of the sample

| Age (years) | Total | Women n % | | Men n % | |
|---|---|---|---|---|---|
| 35–44 | 30 | 18 | 60.0 | 12 | 40.0 |
| 45–54 | 30 | 21 | 70.0 | 9 | 30.0 |
| 55–64 | 30 | 16 | 53.3 | 14 | 46.7 |
| 65–74 | 30 | 14 | 46.7 | 16 | 53.3 |
| > 75 | 30 | 21 | 70.0 | 9 | 30.0 |
| Total | 150 | 90 | 60.0 | 60 | 40.0 |

criterion was the age under 34. Subjects' distribution related to age was presented in Table 1.

Each subject provided information on demographic, self-assessment of general health and oral health and perception of dental treatment needs as well as filled in the Polish version of the OHIP-14 questionnaire. Moreover, the subjects underwent an oral clinical examination with the use of a dental mirror and the WHO probe 621 by the calibrated dentists for DMFT.

This study was approved by the Ethics Committee of the Wroclaw Medical University (protocol No KB 1/2014) and the written consent was obtained by each subject.

## Data Analysis

The values of OHIP-14 (total score, particular items and domains) were calculating using the additive method. For statistical analysis (STATISTICA Pl 9.0) to test criterion and construct validity, the following tools were used: Cronbach alpha reliability test, Mann-Whitney $U$ test, analysis of variance (ANOVA), multiple comparison *post-hoc* test – LSD test (least significant difference test) and Spearman`s correlation coefficient. The obtained results were presented as mean, standard deviation median and range, with the assumed significant level of $p < 0.05$.

# Results

## Distribution of Items

The total OHIP-14 score was 8.72 ± 13.39 (Table 2), with the highest values obtained in item 4 (uncomfortable to eat – mean 0.98 ± 1.19, median 1), 3 (pain – mean 0.83 ± 1.11, median 0) and 5 (self-conscious – mean 0.75 ± 1.20, median 0). When considering OHIP-14 values in 7 domains (Table 3), the highest value for physical pain (mean 1.81 ± 2.12, median 1) the lowest for social disability was obtained (mean 0.93 ± 1.94, median 0).

## Reliability

The reliability must be evaluated by testing the internal consistency. The internal consistency was calculated using standardized Cronbach's alpha, inter-item and item-total correlation coefficients. The alpha Cronbach coefficient value obtained was above 0.9 for all 14 items of the OHIP-14 indicating the excellent internal consistency (Table 4). Positive correlations between all items in the analysis of the matrix of the inter-items correlation coefficients were found. The value of coefficients

**Table 2.** OHIP-14 mean values of items

| | Items | Mean ± SD | Median (range) |
|---|---|---|---|
| Q1 | difficult to pronounce words | 0.62 ± 1.16 | 0 (0–4) |
| Q2 | worsened taste | 0.52 ± 1.08 | 0 (0–4) |
| Q3 | pain | 0.83 ± 1.11 | 0 (0–4) |
| Q4 | uncomfortable to eat | 0.98 ± 1.19 | 1 (0–4) |
| Q5 | self–conscious | 0.75 ± 1.20 | 0 (0–4) |
| Q6 | feel tensed | 0.69 ± 1.16 | 0 (0–4) |
| Q7 | diet unsatisfactory | 0.71 ± 1.20 | 0 (0–4) |
| Q8 | interrupted meals | 0.62 ± 1.12 | 0 (0–4) |
| Q9 | difficult to relax | 0.50 ± 1.01 | 0 (0–4) |
| Q10 | embarrassed | 0.59 ± 1.08 | 0 (0–4) |
| Q11 | irritable | 0.51 ± 1.11 | 0 (0–4) |
| Q12 | difficult to do jobs | 0.42 ± 0.95 | 0 (0–4) |
| Q13 | life less satisfying | 0.62 ± 1.15 | 0 (0–4) |
| Q14 | totally unable to function | 0.37 ± 0.91 | 0 (0–4) |
| | OHIP-14 total score | 8.72 ± 13.39 | 0 (0–56) |

**Table 3.** OHIP-14 mean values of domains

| | Subscales (domains) | Mean ± SD | Median (range) |
|---|---|---|---|
| Q1 Q2 | functional limitation | 1.13 ± 2.11 | 0 (0–8) |
| Q3 Q4 | physical pain | 1.81 ± 2.12 | 1 (0–8) |
| Q5 Q6 | psychological discomfort | 1.44 ± 2.30 | 0 (0–8) |
| Q7 Q8 | physical disability | 1.33 ± 2.25 | 0 (0–8) |
| Q9 Q10 | psychological disability | 1.09 ± 1.98 | 0 (0–8) |
| Q11 Q12 | social disability | 0.93 ± 1.99 | 0 (0–8) |
| Q13 Q14 | handicap | 0.99 ± 1.94 | 0 (0–8) |

ranged from 0.56 to 0.90 with the significance level at $p < 0.01$ (Table 5).

## Validity

The results of the assessment of construct validity is shown in Table 6. Construct validity was supported by the fact that oral health condition was correlated with total OHIP-14 score. A correlation between the quality of life evaluated with

**Table 4.** Reliability analysis based on the corrected item-total correlation and Cronbach's alpha coefficient if item deleted

| | Impact items | Spearman's rank correlation coefficients | Cronbach's alpha if item deleted |
|---|---|---|---|
| Q1 | difficult to pronounce words | 0.834 | 0.972 |
| Q2 | worsened taste | 0.784 | 0.973 |
| Q3 | pain | 0.739 | 0.974 |
| Q4 | uncomfortable to eat | 0.768 | 0.974 |
| Q5 | self-conscious | 0.838 | 0.972 |
| Q6 | feel tensed | 0.866 | 0.972 |
| Q7 | diet unsatisfactory | 0.897 | 0.971 |
| Q8 | interrupted meals | 0.878 | 0.971 |
| Q9 | difficult to relax | 0.886 | 0.971 |
| Q10 | embarrassed | 0.869 | 0.972 |
| Q11 | irritable | 0.902 | 0.971 |
| Q12 | difficult to do jobs | 0.886 | 0.972 |
| Q13 | life less satisfying | 0.904 | 0.971 |
| Q14 | totally unable to function | 0.767 | 0.973 |
| | OHIP-14 total score | 0.974 | |

**Table 5.** Reliability analysis: OHIP-14 inter-item correlation between all items in all subjects

| | Q1 | Q2 | Q3 | Q4 | Q5 | Q6 | Q7 | Q8 | Q9 | Q10 | Q11 | Q12 | Q13 | Q14 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Q1 | 1 | | | | | | | | | | | | | |
| Q2 | 0.78* | 1 | | | | | | | | | | | | |
| Q3 | 0.60* | 0.67* | 1 | | | | | | | | | | | |
| Q4 | 0.68* | 0.67* | 0.71* | 1 | | | | | | | | | | |
| Q5 | 0.65* | 0.58* | 0.58* | 0.67* | 1 | | | | | | | | | |
| Q6 | 0.71* | 0.63* | 0.60* | 0.68* | 0.90* | 1 | | | | | | | | |
| Q7 | 0.75* | 0.68* | 0.66* | 0.74* | 0.84* | 0.84* | 1 | | | | | | | |
| Q8 | 0.76* | 0.73* | 0.72* | 0.68* | 0.73* | 0.74* | 0.87* | 1 | | | | | | |
| Q9 | 0.72* | 0.72* | 0.73* | 0.63* | 0.76* | 0.78* | 0.78* | 0.85* | 1 | | | | | |
| Q10 | 0.70* | 0.69* | 0.63* | 0.62* | 0.80* | 0.84* | 0.80* | 0.77* | 0.81* | 1 | | | | |
| Q11 | 0.81* | 0.70* | 0.61* | 0.67* | 0.78* | 0.81* | 0.79* | 0.79* | 0.85* | 0.82* | 1 | | | |
| Q12 | 0.77* | 0.72* | 0.65* | 0.69* | 0.74* | 0.75* | 0.76* | 0.77* | 0.83* | 0.79* | 0.88* | 1 | | |
| Q13 | 0.77* | 0.68* | 0.66* | 0.69* | 0.78* | 0.83* | 0.83* | 0.78* | 0.83* | 0.83* | 0.90* | 0.83* | 1 | |
| Q14 | 0.72* | 0.66* | 0.60* | 0.56* | 0.60* | 0.61* | 0.67* | 0.68* | 0.67* | 0.68* | 0.73* | 0.81* | 0.76* | 1 |

* Correlation significant at the 0.01 level (2-tailed), Q1 – difficult to pronounce words, Q2 – worsened taste, Q3 – pain, Q4 – uncomfortable to eat, Q5 – self-conscious, Q6 – feel tensed, Q7 – diet unsatisfactory, Q8 – interrupted meals, Q9 – difficult to relax, Q10 – embarrassed, Q11 – irritable, Q12 – difficult to do jobs, Q13 – life less satisfying, Q14 – totally unable to function.

the OHIP-14 and dental condition, dental treatment needs, wearing removable dentures and self-assessment of general health and oral health condition was observed. The mean DMFT values and the average number of missing teeth showed a positive correlation with the total OHIP-14 score

**Table 6.** Correlation between decayed teeth, missing teeth, DMFT and scores for domains of OHIP-14

| OHIP-14 subscales and total score | DT | MT | DMFT |
|---|---|---|---|
| Q1 Q2 functional limitation | r = –0.086 p = 0.296 | r = 0.665 p < 0.001 | r = 0.525 p < 0.001 |
| Q3 Q4 physical pain | r = 0.008 p = 0.920 | r = 0.545 p < 0.001 | r = 0.463 p < 0.001 |
| Q5 Q6 psychological discomfort | r = 0.006 p = 0.945 | r = 0.518 p < 0.001 | r = 0.462 p < 0.001 |
| Q7 Q8 physical disability | r = 0.021 p = 0.798 | r = 0.543 p < 0.001 | r = 0.510 p < 0.001 |
| Q9 Q10 psychological disability | r = –0.014 p = 0.868 | r = 0.540 p < 0.001 | r = 0.448 p < 0.001 |
| Q11 Q12 social disability | r = –0.005 p = 0.949 | r = 0.504 p < 0.001 | r = 0.415 p < 0.001 |
| Q13 Q14 Handicap | r = 0.025 p = 0.765 | r = 0.536 p < 0.001 | r = 0.460 p < 0.001 |
| Total score OHIP-14 | r = –0.007 p = 0.932 | r = 0.605 p < 0.001 | r = 0.516 p < 0.001 |

as well as with its 7 domains at a $p < 0.001$ significance level.

When considering the number of natural teeth in the oral cavity, it was observed that among subjects with fewer teeth in the oral cavity (20 and lover teeth), the total OHIP-14 score was significantly higher than among subjects with a higher number of natural teeth in the oral cavity (mean 17.00 ± 17.32 vs 3.97 ± 7.07, median 10 vs 1, $p < 0.001$) indicating a lower quality of life. The same dependencies were observed in all 7 domains (Table 7). In all the OHIP-14 domains, subjects wearing removable dentures reported lower quality of life (higher values) in comparison with subjects who did not need to wear dentures (mean 23.57 ± 19.62 vs 5.33 ± 8.54, median 20 vs 2, $p < 0.001$). Among the subjects who perceived dental treatment needs, quality of life was significantly worse than among those without such needs (total OHIP-14 score mean 6.55 ± 11.18 vs 10.64 ± 14.40, median 0 vs 4, $p < 0.012$). Moreover, a statistically significant dependency between the perception of oral and general health condition by the subjects and total OHIP-14 score and all domains was observed. Among subjects with poor self-assessment of oral health condition, the value of quality of life was significantly lower (total OHIP score mean 17.71 ± 16.20 vs 2.27 ± 4.62, median 12 vs 0, $p < 0.001$). Similarly, among subjects with poor self-assessment of general health condition, quality

of life expressed by total OHIP-14 score was significantly worse (mean 21.43 ± 17.61 vs 4.88 ± 8.83, median 18 vs 1.5, $p < 0.001$) (Table 7).

## Discussion

Questionnaires that evaluate quality of life are available in various languages; most of them were originally created in English and require a translation into other languages. Before implementing a new language version, it is necessary to carry out the so-called questionnaire validation, which is a process that consists of precisely defined, standardized stages [14].

The Polish version of the OHIP-14 version was prepared in 3 steps: linguistic and cultural adaptation, pilot study to assess face and content validity and main study to assess the reliability and construct validity. The reliability was assessed with α-Cronbach coefficient of internal consistency, which is the most frequently applied method of analyzing scales reliability. It determines whether the positions included in a given scale are similar, and whether they investigate the same phenomenon. Cronbach`s alpha coefficient above 0.7 is considered acceptable. For good internal consistency, the value should be above 0.8 and for excellent internal consistency – above 0.9 [15]. The result above 0.9 obtained in our study for all 14 items of OHIP-14 (excellent internal consistency), is also confirmed by reports from other research centers. Similar results were obtained in Italy (0.90), Greece (0.90) and Sri Lanka (0.93) [16–18]. The results of our study were slightly better than those reported by Ostberg et al., whose results showed that internal consistency measured with Cronbach's alpha was 0.86 for 7 subscales and 0.88 for 14 separate items; similar results were published by Slade who reported high reliability (0.88) [19]. A slightly lower result, but still on a level considered as good or excellent internal consistency, was obtained by Rener-Sitar et al. (0.77–0.91), Montero-Martin et al. (0.89), Slusanschi et al. (0.88), Navabi et al. (0.85), and Israeli (0.88) [13, 20–23]. Substantial internal consistency of the instrument in our study was also supported by findings regarding inter-item and item-total correlations. Positive correlations between all items in the analysis of the matrix of inter-items correlation coefficients were found and the value of coefficients ranged from 0.56 to 0.90 (average 0.74) and item-total (correlation between an item and the rest of the scale) was 0.74–0.90. All the inter-item correlations were positive, and none was high enough for any item to be redundant, while the item-total correlations coefficients were above the recommended threshold (0.20) for

**Table 7.** Mean values of OHIP-14 subscales and total score means regarding to health variables

| OHIP-14 subscales | Number of natural teeth | | Wearing removable prosthesis | | Perception of treatment needs | | Self-rated oral health | | Self-rated general health | |
|---|---|---|---|---|---|---|---|---|---|---|
| | ≤ 20, n = 54 mean ± SD median (range) | > 20, n = 96 mean ± SD median (range) | no, n = 122 mean ± SD median (range) | yes, n = 28 mean ± SD median (range) | no, n = 79 mean ± SD median (range) | yes, n = 71 mean ± SD median (range) | bad, n = 62 mean ± SD median (range) | good, n = 88 mean ± SD median (range) | bad, n = 34 mean ± SD median (range) | good, n = 116 mean ± SD median (range) |
| Q1Q2 | 2.60 ± 2.76 1,5 (0–8) | 0.29 ± 0.87 0 (0–6) | 0.54 ± 1.24 0 (0–6) | 3.71 ± 3.05 4 (0–8) | 1.10 ± 2.09 0 (0–8) | 1.16 ± 2.14 0 (0–8) | 2.37 ± 2.71 1 (0–8) | 0.25 ± 0.75 0 (0–4) | 3.29 ± 3.01 4 (0–8) | 0.48 ± 1.15 0 (0–5) |
| Q3Q4 | 2.93 ± 2.43 3 (0–8) | 1.17 ± 1.62 0 (0–6) | 1.36 ± 1.71 0 (0–6) | 3.79 ± 2.60 4 (0–8) | 1.45 ± 2.05 0 (0–8) | 2.13 ± 2.15 0 (0–8) | 3.41 ± 2.15 4 (0–8) | 0.66 ± 1.13 0 (0–4) | 3.83 ± 2.42 4 (0–8) | 1.20 ± 1.59 0 (0–6) |
| Q5Q6 | 2.62 ± 2.80 2 (0–8) | 0.76 ± 1.6 0 (0–8) | 1.02 ± 1.90 0 (0–8) | 3.25 ± 2.99 4 (0–8) | 1.03 ± 1.96 0 (0–8) | 1.80 ± 2.52 0 (0–8) | 2.87 ± 2.83 2 (0–8) | 0.41 ± 0.94 0 (0–4) | 3.17 ± 2.84 2 (0–8) | 0.91 ± 1.83 0 (0–8) |
| Q7Q8 | 2.58 ± 2.88 1 (0–8) | 0.61 ± 1.37 0 (0–8) | 0.79 ± 1.55 0 (0–6) | 3.71 ± 3.18 4 (0–8) | 0.94 ± 1.94 0 (0–8) | 1.68 ± 2.46 0 (0–8) | 2.70 ± 2.7 2 (0–8) | 0.35 ± 1.06 0 (0–5) | 3.34 ± 2.82 4 (0–8) | 0.72 ± 1.63 0 (0–8) |
| Q9Q10 | 2.20 ± 2.50 1 (0–8) | 0.46 ± 1.24 0 (0–8) | 0.65 ± 1.36 0 (0–8) | 3.04 ± 2.95 2.5 (0–8) | 0.68 ± 1.57 0 (0–7) | 1.46 ± 2.23 0 (0–8) | 2.35 ± 2.52 2 (0–8) | 0.19 ± 0.54 0 (0–3) | 2.66 ± 2.68 2 (0–8) | 0.62 ± 1.43 0 (0–8) |
| Q11Q12 | 1.98 ± 2.75 0 (0–8) | 0.32 ± 0.98 0 (0–8) | 0.42 ± 1.19 0 (0–6) | 3.14 ± 3.06 2 (0–8) | 0.66 ± 1.66 0 (0–7) | 1.16 ± 2.24 0 (0–8) | 2.05 ± 2.63 0 (0–8) | 0.13 ± 0.60 0 (0–5) | 2.46 ± 2.89 2 (0–8) | 0.47 ± 1.33 0 (0–7) |
| Q13Q14 | 2.09 ± 2.60 0.5 (0–7) | 0.35 ± 0.99 0 (0–7) | 0.54 ± 1.28 0 (0–6) | 2.93 ± 2.96 3.5 (0–8) | 0.69 ± 1.70 0 (0–8) | 1.25 ± 2.11 0 (0–8) | 1.97 ± 2.46 1 (0–8) | 0.25 ± 0.98 0 (0–6) | 2.69 ± 2.71 3 (0–8) | 0.47 ± 1.26 0 (0–6) |
| OHIP-14 | 17.00 ± 17.32 10 (0–56) | 3.97 ± 7.07 1 (0–49) | 5.33 ± 8.54 2 (0–38) | 23.57 ± 19.62 20 (0–56) | 6.55 ± 11.88 0 (0–48) | 10.64 ± 14.40 4 (0–56) | 17.71 ± 16.20 12 (0–56) | 2.27 ± 4.62 0 (0–30) | 21.43 ± 17.61 18 (0–56) | 4.88 ± 8.83 1,5 (0–44) |

<--> $p < 0.05$, <—> $p < 0.001$.

including an item in a scale, which was also confirmed by research done among Iranians [22]. Consistently with our results, a positive correlation between all items was observed by Montero-Martin et al. and Papagiannopoulou et al. in Greek research, inter-item correlations coefficients ranged from 0.10 to 0.83, while item-total correlations coefficients ranged from 0.44 to 0.76; in Spanish research, the respective results were 0.10–0.63 and 0.39–0.72; in reports gathered among Romanian adults the results were the following: 0.01–0.74 and 0.25–0.77 [17, 20, 21]. Corridore et al. reported correlation coefficients from 0.27 to 0.69 [16], whereas Ekanayake et al. observed item-total correlation coefficients that ranged from 0.53–0.80 among older adults in Sri Lanka. [18]

The validity construction was mostly supported by the subjective criteria as in other studies [13, 17, 18, 21, 23–27]. Our results only confirm previous assumptions according to which dental problems may not only be a source of pain, but may also cause emotional and physical disorders. Similar conclusions were drawn by Silva et al. [28], who observed higher values of OHIP-14 in subjects with lost teeth or deficient prosthesis in the domains: psychological discomfort and physical pain respectively, which may be interpreted as having a negative impact on the quality of life, clearly suggesting that oral disorders affect the quality of life. Similar reports were delivered by over half of the subjects in studies carried out by Khalifa et al. [24] and Montero-Martin et al. [20]. It was consistent with the results obtained by Slusanschi et al. [21] from among a group of 45–64-year-olds who listed physical disability (56%) and physical pain (41%) as the top most affected dimensions of quality of life [21]. They emphasized the significance of physical pain and psychological disability for the total OHIP-14 score, as opposed to the importance of disability and handicap, where the reported impact was the weakest [21]. Our research confirmed the results since social disability and handicap were respectively 0.93 ± 99 and 0.99 ± 1.94. In a general comparison of the influence of particular dimensions, the results can be placed on the lowest position. Total OHIP-14 score obtained in our research was 8.72 ± 13.39, which is similar to the results of validation from the Spanish 8.7 ± 10.5 [20] and Brazilian 9.1 ± 9.5 [29] version of the questionnaire. Slightly higher results were obtained in research conducted among the elderly in Sweden 14.6 ± 10.5 [19], as well as in research carried out in Greece 14.9 ± 10.0 [17]. The most affected domains in our study were those of physical pain (1.81 ± 2.12), psychological discomfort (1.44 ± 2.30) and physical disability (1.33 ± 2.25), which is consistent with the results

of Greek researchers [17], 2.6 ± 2.0; 2.9 ± 2.0; 2.0 ± 1.9 respectively. Moreover, in the study assessing the factors associated with the impact of oral health on the quality of life in Brazilian independent elderly, higher scores in the dimensions "physical pain" and "psychological discomfort" were observed [29].

In our research correlations between the quality of life assessed with the OHIP-14 score and dental condition, dental treatment needs, wearing removable dentures and self-rated general health and oral health condition were observed. Both mean values of the DMF index, and the average number of missing teeth showed a positive correlation with the total OHIP-14 score, as well as with its 7 domains. These results were able to suggest that the Polish version of OHIP demonstrated good validity and reliability. Similar results were obtained by Papagiannopoulou et al., who observed a significant correlation between OHIP-14 and DMFT [17]. Khalifa et al. also observed a correlation between worse quality of life among subjects with a higher amount of tooth decay [24]. Roumani et al. also observed a significant positive correlation of high OHIP-14 score with a higher number of decayed and missing teeth, and a lower number of natural and filled teeth [27]. Motallebnejad et al. examining 160 adults over 50 showed higher OHIP-14 score among subjects who required dental treatment, and the identified need for surgical treatment reflected itself in impaired quality of life [30]. Similar observations were shared by Montero-Martin et al., who demonstrated a major impact on the quality of life among patients who required teeth extraction due to caries destruction [20]. Our research also confirmed inferior quality of life among subjects with lost teeth (below 20 teeth), which had been indicated before both among Sudanese adults, and in research conducted in Greece and Japan [17, 24, 25]. Simultaneously, lost teeth replaced by removable dentures did not improve the quality of life of the respondents. This is reflected in the results obtained, according to which the quality of life was worse in all OHIP-14 domains among subjects wearing removable dentures. Our results prove that subjective self-assessment of general and oral health condition among subjects directly corresponds to the perception of quality of life.

The relationship observed substantiates the use of the OHIP-14 as a reliable assessment tool. Among the respondents who assessed their general and oral health status as low, average quality of life was also significantly different. A similar conclusion was drawn by Corridore et al. [16] and Papagiannopolunou et al. [17], who observed the following correlation: the subjects who reported their

oral or general health status to be poor had a higher OHIP score than those who thought their health status was good. Moreover, Ostberg et al. [19] studied a the Swedish population in the age 80 and over complaining of pain related with masticatory organ and found, in accordance with the presumptions, a very low level of quality of life.

The Polish version of the OHIP-14 showed good and sufficiently satisfactory psychometric properties. In this study, Cronbach α showed satisfactory values. The high alpha value indicates that the 14 items of the translated version of the OHIP scale measure the same construct. Average inter-item correlation confirmed satisfactory reliability of the OHIP-14 questionnaire. The results of the present study revealed that the reliability of OHIP-14 is suitable for the assessment of the OHRQoL.

The authors concluded that the Polish version of the OHIP-14 instrument demonstrated good validity and reliability with original English version. It may, therefore, be considered a valuable instrument for measuring oral health-related quality of life for the Polish adult population.

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