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Original article

Validity and reliability of the Oral Impacts on Daily Performance (OIDP) scale in the elderly population of Bosnia and Herzegovina

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Objectives: To adapt the Oral Impacts on Daily Performance (OIDP) index for elderly people in Bosnia and Herzegovina and test its validity, reliability and responsiveness to change.
Background: Clinical measures alone may not be adequate for assessing the oral health of individuals. Subjective oral health indicators tested within a particular cultural context may not be relevant across cultures.
Materials and methods: The study population comprised 231 free-living adults aged 65 years or older. The OIDP was cross-culturally adapted from English into the Serbian language and its psychometric properties were tested. Data were collected using a clinical examination and a questionnaire containing the OIDP.
Results: In terms of reliability, Cronbach's alpha coefficient was 0.82 and the intraclass correlation coefficient 0.88. The very high correlation of OIDP with self-rated oral health ($r = 0.78$) verified criterion validity, while construct validity was demonstrated through its significant and graded associations with other subjective health measures. OIDP change scores on a treated subsample showed moderate effect size (0.59) and were associated with perceptions of oral health change, providing evidence for its responsiveness to change.
Conclusion: The Bosnian version of the OIDP showed satisfactory validity, reliability and responsiveness to change confirming its appropriateness for use among older populations in Bosnia and Herzegovina.

Keywords: Oral Impacts on Daily Performance index, elderly population, quality of life, oral health.

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Introduction

Clinical indicators are important for the assessment of oral health and treatment needs; nevertheless, their limitations must be considered[1]. The exclusive use of clinical measures to assess the health and oral health of individuals has been widely criticised because they fail to consider functional and psychosocial aspects of health and do not adequately reflect the health status, functioning, concerns and perceived needs of individuals[2,3]. Measures of oral health-related quality of life (OHRQoL) are increasingly used in descriptive population-based research as a mean of capturing non-clinical aspects of oral health that patients' seem most relevant to their overall health and well-being[4]. In essence, oral disorders can affect interpersonal relationships and daily activities and therefore the 'goodness' or 'quality of life'[5]. Over the years, several subjective measures of oral health have been developed, ranging from single-item indicators to composite inventories or scoring systems, covering the aforementioned OHRQoL domains.

A number of the existing OHRQoL indicators are to a varying extent based on the conceptual framework derived from the World Health

Organization's (WHO) International Classification of Impairment, Disabilities and Handicaps (ICIDH)[6] which was modified for dentistry by Locker[7].

The Oral Impacts on Daily Performance (OIDP) is an internationally well-known OHRQoL instrument. It is theoretically based on the ICIDH framework but concentrates only on the measurement of disability and handicap, covering the physical, psychological and social dimensions of daily living. The OIDP evaluates the degree to which the daily life of a person has been negatively affected by oral conditions. It focuses on 10 basic daily life activities and behaviours such as: eating, speaking, cleaning teeth or dentures, doing light physical activities, sleeping, relaxing, smiling, laughing and showing teeth without embarrassment, emotional state, going out and enjoying the contact of other people.

The OIDP has been used in different studies of adult populations in Great Britain and Greece[8,9], Thailand[10], Tanzania[11], Uganda[12], Norway[13], Persia[14], Sweden[15], Korea[16] and Spain[17]. Despite being used in many countries, the OIDP has not been previously used in Bosnia and Herzegovina. Before applying an OHRQoL measure in a new context or with a different group of people, its psychometric properties need to be re-established[18].

To date, the responsiveness to change of the most measures of OHRQoL in different country has not been established. However, it cannot be assumed that a measure proved to be valid and reliable in cross-sectional studies will necessarily be suitable for use in assessing the outcomes of clinical interventions. Establishing the responsiveness of the existing OHRQoL measures would assist investigators to select the most appropriate measure, provide a basis for estimating sample size and assist health professionals to interpret the meaning of changes in scores derived from the measures[19].

For this reason, this study was conducted to adapt the OIDP index for elderly people in Bosnia and Herzegovina and test its validity, reliability and responsiveness to change in an older Bosnian population.

Materials and methods

The study population comprised of free-living older adults living in two municipalities: Foča and Sarajevo. Samples from Sarajevo and Foča were randomly drawn from participants of three senior day centres for elderly people. Subjects aged 65 years or over and presenting a Mini Mental State Examination (MMSE) score > of 21 or more (not cognitively impaired) were included in the study. The study was approved by the Institutional Ethics Committee (No. 01-2-5).

The process of adapting the OIDP index for adults into Serbian language and evaluating its psychometric properties included three main steps:

- linguistic translation of the original OIDP into Serbian language;
- pilot study to assess face and content validity;
- the main study for validity, reliability and responsiveness to change testing.

In the first step, the English version of the OIDP was translated into the Serbian language by two professional translators who speak fluent English and who are familiar with dental vocabulary. The translators worked independently and produced the translation of the questionnaire without consulting with the other interpreter or research team. The two translations were compared and a consensus forward translated version was made. Furthermore, the consensus version of the OIDP questionnaire was back-translated into English by another professional translator with excellent knowledge of English who had attended his postdoctoral studies in English-speaking countries. Backward translation was done without knowledge of the original text in English. The backward translation matched quite closely the original version.

The next step was to carry out a pilot study, to test the clarity, appropriateness and cultural relevance of the Serbian language version of the OIDP. This involved the application of the instrument to a sample of 44 Serbian speaking subjects (21 male and 23 female) who live in Bosnia and Herzegovina, aged over 65 years and without large variations in the socio-economic status. The results of the pilot study indicated that the questionnaire was carefully designed and items were precisely worded and understandable (89.8% subjects said it was somewhat easy or very easy to understand).

The main study was implemented on 231 free-living subjects. Data were collected using the clinical oral health assessment form, the oral health questionnaire and the OIDP questionnaire. The clinical dental examination was carried out by a trained dentist according to the WHO criteria[20] before the administration of the questionnaire. Clinical dental examinations were used to determine whether subjects were dentate or edentulous, count the number of natural teeth present and assess the need for restorative and prosthetic treatment. The oral health questionnaire recorded data on demographic information, perceived oral health conditions, satisfaction with oral health

status, perceived general health conditions and pain using a visual analogue scale (VAS). OHRQoL was assessed through the Bosnian version of the OIDP. It assesses the frequency of oral impacts and the severity of their effect on the daily life of the respondent. Multiplying the frequency and severity scores for each OIDP item provides the different performance scores, and the total score is expressed as a percentage of the sum of the performance scores divided by the maximum possible score multiplied by 100. Higher OIDP scores represent poorer quality of life. Finally, responsiveness of the OIDP was tested on participants requiring prosthetic treatment. Complete and removable dentures were made in these participants. At least 2 months after the treatment was provided, the same group of subjects completed the OIDP questionnaire again. It was assumed that the OHRQoL would improve substantially within a 2-month period after the treatment, as compared with the pre-treatment status.

Data analysis

The analysis of the study was carried out using the Statistical Package for Social Sciences (SPSS version 11.5 for Windows, SPSS Inc., Chicago, IL, USA). The internal consistency of the Bosnian OIDP was assessed by standardised Cronbach's alpha, alpha if item deleted, inter-item and item-total correlation coefficients. Test–retest reliability was assessed by the weighted kappa and the intraclass correlation coefficient, using data from 30 subjects not requiring prosthodontic treatment who were re-interviewed 2 weeks after the first visit. The OIDP scores were not normally distributed and the Kruskal–Wallis and Mann–Whitney tests were used for assessing the construct validity of the Bosnian OIDP by assessing its relationship with other subjective health status measures (perceived dental and prosthetic need, self-reported general health status, oral satisfaction and pain). Also, Spearman's rank correlation coefficient was used for criterion validity analysing relationship between OIDP scores and self-reported oral health status. Participant's perceptions of change in their oral health since the completion of treatment at the clinic were assessed by a single item with a five-point response scale ('Worsened a lot'; 'Worsened a little'; 'Stayed the same'; 'Improved a little'; 'Improved a lot'). Change scores for the OIDP were calculated by subtracting post-treatment from pre-treatment scores. The significance of the difference in the OIDP summary score between the baseline and the follow-up was tested using paired *t*-test. The standardised effect size was calculated by dividing the mean of change score by the standard deviation of the pre-treatment score.

Results

Of the 257 people aged 65 years or older who were invited to participate in this study, 19 were excluded because of cognitive impairment (MMSE ≤ 21); from the remaining 238 subjects, seven did not consent and therefore analysis refers to 231 participants (response rate: 97.1%). The socio-demographic distribution of the sample is shown in Table 1. Regarding clinical status, 19.9% participants were edentulous, 47.2% were assessed to need restorative treatment, while in terms of prosthetic treatment, 32.5% needed treatment in one jaw and 39.1% in both jaws (Table 2).

Internal consistency and test–retest reliability analyses showed homogeneity of the OIDP items. The inter-item correlation coefficients among the scores of the 10 items of the index ranged from 0.02 to 0.79 and the mean inter-item coefficient was 0.23. The corrected item-total correlation ranged from 0.37 to 0.64 (Table 3). Cronbach's alpha coefficient was 0.82 and this alpha value was not increased by the removal of any item. In terms of test–retest reliability, the weighted kappa statistic and the intraclass correlation coefficient were 0.82 and 0.88, respectively.

The criterion and construct validity of OIDP index was assessed through its association with several subjective health status variables (Table 4). Regarding the testing of criterion validity, statistical significance ($p < 0.001$) was observed for the comparison of OIDP scores between different categories of self-reported oral health status, with a

Table 1 Socio-demographic characteristics of the Bosnian elderly subjects ($n = 231$).

Variable	*n (%)*
Sex	
Male	116 (50.2)
Female	115 (49.8)
Age	
65–74	130 (56.3)
75–84	86 (37.2)
85+	15 (6.5)
Education	
No education	42 (18.2)
Primary school	79 (34.3)
Middle school	75 (32.4)
High school	35 (15.1)

Table 2 Percentage distribution of clinical status in Bosnian elderly subjects (n = 231).

Clinical status and needs	*Categories*	*Per cent*	
Denture status	Both edentulous	19.9	
	Upper edentulous	16.5	
	Lower edentulous	5.6	
	Both dentulous	58.0	
Number of natural teeth	0	19.9	
	1–10	22.1	
	11–20	37.7	
	21 or more	20.3	
Restorative need (for the dentate; n = 185)	No need	52.8	
	Filling	27.9	
	Endodontic treatment	8.6	
	Extraction	10.7	
Prosthetic need		Dentate	Edentate
	No need	28.4	0.0
	In one jaw	32.5	0.0
	Both jaws	39.1	100.0

Table 3 Reliability analysis of Oral Impacts on Daily Performance index: corrected item-total correlation, Cronbach's alpha and alpha if item deleted (n = 231).

Performances	*Corrected item-total correlation*	*Alpha if item deleted*
1. Eating	0.44	0.81
2. Speaking	0.59	0.79
3. Cleaning mouth	0.45	0.81
4. Light physical activities	0.58	0.79
5. Sleeping	0.48	0.81
6. Relaxing	0.43	0.81
7. Smiling	0.64	0.79
8. Emotional state	0.64	0.79
9. Going out	0.38	0.81
10. Enjoying the contact of other people	0.37	0.82
α = 0.82		

relatively strong correlation coefficient of 0.78. In relation to construct validity tests, people with higher levels of oral satisfaction and perceived general health status had lower OIDP scores than those with lower levels of satisfaction and perceived general health status, respectively ($p < 0.001$). People who perceived need for dental and prosthetic treatment had much higher OIDP scores than those that did not think they needed treatment ($p < 0.001$). Also, there was a highly significant relationship ($p < 0.001$) between OIDP and pain in mouth in the past 6 months. The higher level of the satisfaction with oral health indicates the lower the OIDP score. All these associations showed a clearly distinctive graded pattern, with higher OIDP scores for each group of consecutively lower perception.

Overall, there was a significant improvement in OIDP score after treatment compared with OIDP score before treatment (mean OIDP scores before and after treatment: 13.66 and 6.95; $p < 0.01$). The biggest changes were in relation to impacts on smiling, going out and enjoying the contact of other people. 23.8% of subjects reported that their oral health was a lot better following treatment at clinics; 33.3% reported that it was a little better and 19.0% reported no change. Also, 23.8% subjects reported that their oral health was a little worse, while none of subjects reported that their oral health was a lot worse. Looking at the OIDP change scores by categories of global perceptions of oral health change, we observed a gradient with an increase in the mean change scores for consecutively better perceptions; 'worsened a little' had a negative mean OIDP change score and the respective scores were higher for 'stayed the same', 'improved a little' and 'improved a lot'. There was a significant difference in the pre- and post-treatment scores of those who reported improving a little ($p < 0.05$) and those who reported improving a lot ($p < 0.01$), but not so for the groups that reported staying the same or deteriorating (Table 5). The effect size for the scale calculated for all subjects was 0.59.

Discussion

This is the first study to examine quality of life in Bosnia and Herzegovina, where a Bosnian version of the OIDP index was developed and tested for its reliability, validity and responsiveness to change in the older population. Considerable effort has been invested in this research in the appropriate cultural adaptation of the OIDP, to overcome language and cultural differences following the methodology used in previous studies[8–17].

In the process of translating the questionnaire, some discrepancies between the original text and backward translation were found. For example, the item on 'cleaning teeth or dentures' in the original version was back-translated as 'difficulties with oral care' (brushing your teeth or dentures). After discussion, this sentence was revised to 'difficulties with cleaning your mouth (for example brushing teeth or dentures)'. Also, in the original text, there

Table 4 Construct and criterion validity test for Oral Impacts on Daily Performance (OIDP) index and relationship with clinical measures among the validation sample (n = 231).

			OIDP score			
Variables	*Categories*	*n (%)*	*Mean (SD)*	*Quartiles*	r_s	*p*
Subjective health status measures						
Perceived dental and prosthetic treatment need	No	115 (49.8)	2.6 (5.5)	(0.0, 0.0, 2.4)		<0.001[a]
	Yes	116 (50.2)	21.2 (12.7)	(12.3, 20.8, 29.8)		
Self-reported oral health status	Good	115 (49.8)	2.3 (5.3)	(0.0, 0.0, 1.6)	0.78[b]	<0.001[c]
	Fair	19 (8.2)	10.3 (9.3)	(0.0, 13.2, 15.6)		
	Poor	76 (32.9)	20.5 (10.2)	(12.6, 21.4, 27.2)		
	Very poor	21 (9.1)	34.7 (11.1)	(23.6, 36.8, 40.4)		
Self-reported general health status	Good	111 (48.1)	2.6 (5.5)	(0.0, 0.0, 1.6)		<0.001[c]
	Fair	37 (16.0)	13.4 (11.5)	(0.0, 15.2, 23.0)		
	Poor	83 (35.9)	23.7 (12.4)	(17.6, 22.0, 32.4)		
Oral satisfaction	Dissatisfied	98 (42.4)	23.4 (12.0)	(17.6, 22.0, 31.6)		<0.001[c]
	Neutral	22 (9.5)	9.8 (8.9)	(0.0, 10.6, 15.3)		
	Satisfied	111 (48.1)	2.2 (5.2)	(0.0, 0.0, 0.8)		
Pain (visual analogue scale)	0	195 (84.4)	8.5 (10.6)	(0.0, 2.4, 16.8)		<0.001[c]
	1–5	25 (10.8)	29.3 (13.5)	(23.8, 31.6, 37.8)		
	6–10	11 (4.8)	32.9 (11.9)	(20.0, 33.2, 39.2)		

[a]Mann–Whitney test for associations of OIDP with: 'perceived dental and prosthetic treatment need'.
[b]Spearman's correlation coefficient for associations of OIDP with self-reported oral health status.
[c]Kruskal–Wallis test for associations of OIDP with the remaining variables.

Table 5 Distribution of change scores in Oral Impacts on Daily Performances (OIDP) by global self-rated perceptions of change in treated participants (n = 42).

Participant's perception	*Number of subjects N (%)*	*Change score Mean (SD)*	*p*[a]
Worsened a little	10 (23.8)	−0.5 (5.33)	0.91
Stayed the same	8 (19.0)	6.45 (4.03)	0.12
Improved a little	14 (33.3)	6.83 (1.69)	**0.04***
Improved a lot	10 (23.8)	9.06 (6.61)	**0.02***
All subjects	42 (100.0)	5.56 (2.42)	**0.002****

[a]Paired t-test (OIDP score pre-treatment-OIDP score post-treatment).
*p<0.05, **p<0.01.

was an activity that is related to carrying out a major work role. Because our study included patients over 65 years, a retirement age for Bosnia, we decided that this item was not relevant for this group and it was omitted.

Translation into the Serbian language was done without any major problems, and the comparison between the original and backward translation of the OIDP index did not indicate any major substantive or conceptual differences. Its adequate cross-cultural adaptation was followed by the establishment of its face and content validity in a pilot study.

The results of the main study showed that the Bosnian version OIDP index for the elderly is a reliable and valid measure of OHRQoL. In terms of reliability, inter-item correlation, corrected item-total correlation and Cronbach's alpha indicated that this index had excellent internal consistency. All inter-item correlations were positive and all item-total correlations were above the minimum recommended level of 0.20[21], for including an item in a scale. Furthermore, Cronbach's alpha was significantly higher than the recommended levels and higher than in some previous studies[9,13,14], but lower than in the studies in Korea[16] and Tanzania[11]. Furthermore, the results of the test–retest procedure provided adequate evidence in relation to the external reliability of index. The weighted kappa and intraclass correlation coefficient were 0.82 and 0.88, respectively, indicated excellent agreement.

Construct and criterion validity of the instrument was assessed by investigating the relationship between OIDP score and other subjective measures only, without using any clinical indicators. Clinical measures were also excluded from the validation of the Oral Health Impact Profile in Canada[22], the Subjective Oral Health Status Indicators in Canada[23] and England[24] and the OIDPs in Greece and Great Britain[9]. Clinical measures were not considered in the validity testing, because numerous studies have identified a difference between pro-

fessionally and self-defined oral health, stemming from the conceptual distinction between health and disease[14]. In this study, the relationships between the OIDP score and subjective oral health measures (perceived dental treatment need, self-reported oral health status, self-reported general health status, pain VAS and oral health satisfaction) were statistically significant and showed a clear trend in the expected direction; the worse the subjective oral health ratings, the higher the OIDP score. Furthermore, in accordance with previous studies[9,16], the OIDP score was significantly associated with self-reported general health status. Also, in addition to links between the OIDP score and subjective oral health measures, the validity was also assessed in relation to the perceived need for conservative and prosthetic treatment. Subjects without the need for dental and prosthetic treatment reported significantly lower levels of oral impact on daily activities than their colleagues with a need for treatment.

Responsiveness represents a measure's ability to detect change when change has or might reasonably be expected to have occurred. For that, we looked at change in OIDP scores in a subsample that required and received prosthodontic treatment. Assessment of responsiveness is a rather debated issue with different approaches suggested[25,26] and we have tried to incorporate different ways of assessing it to overcome the well-established critique of the simple comparison between before and after measurements. This study showed that the quality of participant's life was significantly better 2 months after the treatment was compared with the baseline. However, we also provided more detailed evidence in terms of satisfactory responsiveness to change of the OIDP, as the change scores showed a clear and consistent graded relationship with global ratings of perceptions of change in oral health status. Participants that reported that their oral health deteriorated after treatment had also negative OIDP change scores, indicating deterioration in the OHRQoL, while those that reported that they improved a lot had the highest positive mean change score showing the highest improvement in OHRQoL. We have also employed the assessment of effect size. According to Cohen[27], the effect size of 0.20 is considered small, 0.50 moderate and 0.80 high. The magnitude of this change was moderate, using Cohen's benchmarks.

Conclusion

In conclusion, the OIDP is a valid and reliable measure of OHRQoL in elderly people in Bosnia and Herzegovina. The results of this study provided also evidence of the satisfactory responsiveness to change of the index in this population.

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