

# The Croatian Version of the Oral Health Impact Profile Questionnaire

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## ABSTRACT

*Purpose of this study was to develop a Croatian version of the Oral Health Impact Profile questionnaire (OHIP-CRO49), following the accepted cross-cultural adaptation technique guidelines. The original version was translated by using a forward-backward translation method. The psychometric properties of the OHIP-CRO49 were tested. To test the construct validity 163 randomly selected subjects and 26 prosthodontic patients participated. The construct validity was supported by the association between the OHIP-CRO49 sum-scores and the self-reported oral health and five oral disorders. The test-retest reliability was tested on 30 prosthodontic patients and 30 students, and it was supported by high intraclass correlation coefficients ( $r=0.63$  to  $0.95$ ). To test the internal consistency 163 randomly selected subjects (general population), 26 prosthodontic patients and 29 dental students participated, and it was supported by high Cronbach's alpha coefficients ( $0.60$  to  $0.97$ ). The responsiveness was tested on 21 patients with a treatment demand (toothache), and was supported by a statistically significant mean OHIP-CRO49 score difference (from  $108.48$  to  $27.57$ ) and a high effect size ( $2.96$  and  $3.48$ ). Adequate psychometric properties in a typical patients' population make the new instrument suitable for assessment of Oral health-related quality of life (OHRQoL) in Croatia.*

**Key words:** Oral Health-Related Quality of Life (OHRQoL), Oral Health Impact Profile (OHIP), Croatia, psychometric properties

## Introduction

Oral health-related quality of life (OHRQoL) is an important patient-centered endpoint to be considered when assessing the impact of oral diseases in general population and evaluating the professional interventions<sup>1-4</sup>.

The English language Oral Health Impact Profile (OHIP) is an instrument, originally developed in Australia<sup>5</sup>, designed to measure self-reported disfunction, discomfort and disability attributed to oral conditions, and is based on the conceptual oral health model outlined by Locker<sup>6</sup>. The original instrument consists of 49 items representing 7 domains (functional limitation, physical pain, psychological discomfort, physical disability, psychological disability, social disability, and handicap) and has been proved to be reliable and sensitive to changes<sup>7-10</sup>, moreover it exhibits suitable cross-cultural consistency<sup>11,12</sup>.

The measurements of the patients' perceived oral health have been increasingly in demand for epidemiological, clinical and/or longitudinal studies in Croatia as a complementary outcome dimension to the traditional use of clinical oral disease indicators. Although the OHIP-49 is available in several languages (Chinese, Swedish, German, Hungarian, Japanese, Portuguese, Finish, French, Brazilian, Italian, Dutch)<sup>13-23</sup>, yet there is no Croatian version. Moreover, only short version has been recently developed (OHIP-CRO14)<sup>24</sup>, but it is not a suitable alternative to full OHIP-49 version in the cases when more information is needed, especially in the group of prosthodontic patients.

The aims of this study were to develop a Croatian version of the OHIP-49 instrument and to evaluate the psychometric properties of the new instrument in a new cultural context in typical populations.

## Material and Methods

The new instrument OHIP-CRO49 was translated from the original English language according to the accepted standards<sup>25</sup>. Psychometric properties of the new OHIP-CRO49 instrument were tested on 283 individuals. The assessment of validity, reliability and responsiveness was performed. Item weights have not been developed, since previous studies provided no evidence of their usefulness<sup>15,16,26</sup>.

A written consent was obtained from each subject. The study was approved by the institutional ethic's committee (School of Dental Medicine, University of Zagreb).

Besides OHIP-CRO49 questions the subjects also answered the question referring to the self-reported oral health and they graded their oral health by using an analogue scale ranging from 1 to 5 (1=unsatisfactory; 5=excellent). The subjects also answered the questions referring to the self-reported oral conditions (temporomandibular disorder pain, burning mouth sensation, joint clicking, oral habits and denture wearing; possible responses were yes and no).

### Translation

The original English version containing 49 items (OHIP-49) was translated into the Croatian language according to the accepted techniques<sup>5,25</sup>. First, it was translated by a professional translator, familiar with dental vocabulary and semantics together with a dentist with an excellent knowledge of English, who had lived in USA for one year for the purpose of education. This translation was revised by four Croatian dentists, with an excellent knowledge of English (Department of Prosthodontics, School of Dental Medicine, University of Zagreb). All translators worked independently. The translations were merged into one version. The final version was then back-translated into English by another professional trans-

lator, together with the dentist who had been in USA several times for post-doctoral educational purposes. The back-translation was then evaluated by a native English speaker who compared it with the original English version. Prior to back translation, a pilot study was performed within 30 patients to test the clearness of the items in the Croatian language.

### OHIP-CRO49

The OHIP-CRO49 consisted of 49 questions. For each question, subjects were asked how frequently they have experienced the impact in the last month<sup>15,16</sup>. Responses were rated using a Likert-type scale (0=never, 1=hardly ever, 2=occasionally, 3=fairly often, 4=very often). Zero indicated absence of any problems. Higher scores indicated more impaired oral health.

### Construct validity

Two sub-types of construct validity were tested, the convergent and the groups validity. One hundred and eighty nine subjects participated. A group of 163 subjects represented randomly selected persons from general population attending the Croatian Institute of Transfusion Medicine as voluntary blood donors (A, Table 1), the other group of 26 subjects were the patients with treatment needs at the Department of Prosthodontics, School of Dental Medicine, University of Zagreb (B, Table 1). Each person was interviewed in order to minimize the number of missing data. This personal interview ensured the 100% participation rate.

Convergent validity was tested by examining the association between self-reported oral health on an analogue scale ranging from 1 to 5 (1=unsatisfactory, 2=poor, 3=fair, 4=very good, and 5=excellent) and the OHIP (0–4) and the OHIP(2–4) sum-scores using Spearman rank correlation.

**TABLE 1**  
OVERVIEW OF SAMPLING STRATEGIES, DATA-COLLECTION METHODS AND SAMPLE POPULATIONS BY AGE, GENDER AND RESEARCH PURPOSE

Sample	Sample type	Data collection	n	Age mean (SD)	Age range	% women	Type of investigation
(A) General population <sup>a</sup>	Random	Questionnaire <sup>c</sup>	163	42–70 (17.8)	20–80	66	Construct validity, internal consistency
(B) Prosthodontic patients I <sup>b</sup>	Convenience	Questionnaire <sup>c</sup>	26	65.7 (11.6)	37–81	62	Construct validity, internal consistency
(C) Patients with a treatment demand (toothache) <sup>b</sup>	Consecutive	Interview	21	51.5 (16.2)	18–70	52	Responsiveness
(D) Students I <sup>b</sup>	Consecutive	Questionnaire <sup>c</sup>	29	22.4 (1.5)	19–26	72	Internal consistency
(E) Prosthodontic patients II <sup>b</sup>	Convenience	Questionnaire <sup>c</sup>	30	64.5 (12.5)	37–81	65	Test-retest reliability
(F) Students II <sup>b</sup>	Consecutive	Questionnaire <sup>c</sup>	30	22.2 (1.6)	19–25	67	Test-retest reliability

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<sup>c</sup> Interview-supervised, self-administered questionnaire

Groups validity was tested among five self-reported oral conditions with predicted impact on OHRQoL and the OHIP scores in the group B and between one self-reported oral condition and the OHIP scores in the group A. For that purpose the subjects answered the questions referring to the self reported oral conditions (temporomandibular disorder pain, burning mouth sensation, joint-clicking, oral habits and denture wearing). Possible responses were dichotomus (yes and no). A group of dental professionals set up an hypothesis that subjects with no dentures and those with a better self-reported oral health from general population would have lower OHIP-CRO49 scores than persons who indeed had those conditions (group A). The same dentists also set up an hypothesis that in prosthodontic group of patients (B, Table 1) temporomandibular disorder pain and burning mouth sensation would increase the OHIP scores<sup>15</sup>. Another hypothesis has been set up that joint clicking and oral habits (nail biting, tongue, lip, or cheek biting or biting of any objects) would not have notable influence on OHRQoL. Due to the fact that group B represented prosthodontic patients with treatment needs another hypothesis has been set up that there would be no significant difference between those with old unfavourable dentures and those without any dentures at all (partially edentulous). Point biserial correlation was calculated to examine the association between dichotomous variable (temporomandibular disorder pain, burning mouth sensation, joint clicking, oral habits, dentures) and OHIP-CRO49 scores (continuous variable). Two summary OHIP-CRO49 scores were calculated: the sum of the item responses resulting in the range 0–196, and the sum of impacts of questions mentioned occasionally, often and very often, resulting in the score 0–49 points.

### Reliability

The test-retest reliability was tested on 60 subjects. Thirty subjects (group E, Table 1) were patients of the Department of Prosthodontics, School of Dental Medicine, University of Zagreb. The same OHIP-CRO49 questionnaire was obtained twice within a two week time-interval prior the proposed therapy had ever begun. Another thirty subjects (group F, Table 1) were students who had not been treated considering any oral and/or dental problem within a two-week interval between two different completions of the OHIP-CRO49 questionnaire. It was predicted that the OHRQoL would not change during the two week period without any oral treatment in both groups. Intraclass correlation coefficients (ICC) were calculated for all OHIP-CRO49 item scores and the 7 subscores<sup>14</sup>. Limits of agreement were calculated around the mean difference<sup>15</sup>.

The internal consistency was tested on 218 subjects (group A, B and D, Table 1) by using Cronbach's alpha and the average inter-item correlation for all OHIP-CRO49 item scores and the 7 subscores<sup>16</sup>. The Cronbach's alpha measures how well a set of items measures a single construct. Values >0.70 indicated acceptable results<sup>16</sup>.

### Responsiveness

Responsiveness of the OHIP-CRO49 was tested on 21 patients with a treatment demand (group C, Table 1). The patients were suffering from an acute toothache and they completed the OHIP answers twice, the first time before the treatment and the second time one month after the treatment. The received treatment procedures included crown trepanation in 57% of the cases with consecutive endodontic treatment, and in the remaining 43% of patients tooth extraction was the only possible option. It was assumed that OHRQoL would improve in one month after treatment. The difference in OHIP-CRO49 between the baseline and the follow up was tested by using the paired t-test and by calculating the effect size and the standardised response mean<sup>17</sup>. According to Cohen the effect size of 0.20 is considered small, 0.50 moderate and 0.80 large<sup>27</sup>.

### Missing data

Each subject was interviewed in order to minimize missing data, which ensured the 100% participation rate.

### Data analysis

Statistical analysis was made using SPSS 14 for Windows (SPSS Inc., Chicago, Illinois, USA) and MS Excel (Microsoft Office, Windows XP 2005, USA).

## Results

### Construct validity

The validity was verified by significant association between the self-reported oral health and the two OHIP sum-scores in the general population, as well as in the prosthodontic patients ( $p < 0.01$ , Table 2).

The association between the five self-reported oral conditions and the two OHIP sum-scores confirmed our hypothesis in prosthodontic patients. Joint-clicking, oral habits and wearing of old unfavourable dentures had a very low influence on OHRQoL as correlation with the OHIP scores was not statistically significant ( $p > 0.05$ , Table 2).

Our hypothesis was also confirmed by statistically significant correlation between denture wearing and each of the two OHIP scores in general population ( $p < 0.05$ , Table 1).

### Reliability

The test-retest reliability was tested on 60 subjects (group E and group F in Table 1), by using a time-interval of two weeks between the administration of the same OHIP-CRO49 questionnaire. None of the subjects were subjected to any oral and/or dental treatment during the two week interval. It was assumed that the OHRQoL would not change during this two week period without any oral treatment. Intraclass correlation coefficients (ICC) were calculated for all OHIP-CRO49 item scores and the seven subscores<sup>14</sup>. The limits of agreement were

**TABLE 2**  
 CONSTRUCT VALIDITY: ASSOCIATION BETWEEN SELF-REPORTED ORAL HEALTH AND SIX ORAL CONDITION, AND A CROATIAN  
 VERSION OF THE ORAL HEALTH IMPACT PROFILE WITH 49 ITEMS (OHIP-CRO49)

Variable	n	OHIP(0–4) (mean)	OHIP(2–4) (mean)	Correlation coefficient and level of significance
General population (n=163)				
Self-reported oral health				–0.58 ** OHIP(0–4) –0.54 ** OHIP(2–4)
Excellent	31	5.2	1.4	
Very good	63	17.8	4.7	
Good	55	30.6	10.1	
Fair	10	30.0	9.1	
Poor	4	44.5	11.0	
Denture				–0.18 * OHIP(0–4) –0.19 * OHIP(2–4)
Yes	23	29.9	9.5	
No	140	19.7	5.8	
Prosthetic patients I (n=26)				
Self-reported oral health				–0.49** OHIP(0–4) –0.50** OHIP(2–4)
Excellent	2	57.5	16.0	
Very good	4	40.3	12.8	
Good	18	77.1	25.4	
Fair	2	123.5	34.0	
Poor	0	0.0	0.0	
Temporomandibular disorder (TMD) pain				–0.50 ** OHIP(0–4) –0.44 * OHIP(2–4)
Yes	4	110.3	35.5	
No	22	66.8	21.2	
Burning mouth sensation				–0.57 ** OHIP(0–4) –0.62 ** OHIP(2–4)
Yes	9	107.2	33.3	
No	17	55.7	18.1	
Joint clicking				–0.07 NS OHIP(0–4) –0.26 NS OHIP(2–4)
Yes	6	86.5	29.2	
No	20	69.6	21.7	
Oral habits				–0.38 NS OHIP(0–4) –0.37 NS OHIP(2–4)
Yes	9	98.2	29.3	
No	17	60.4	20.2	
Denture				–0.154 NS OHIP(0–4) –0.33 NS OHIP(2–4)
Yes	21	78.6	25.2	
No	5	52.0	15.6	

\*\*p<0.01; \*p<0.05; NS-not significant

computed around the mean of the differences (95% confidence intervals for the mean)<sup>15</sup> (Table 3).

The internal consistency was tested on 218 subjects (Groups A, B and D in Table 1), by calculating Cron-

bach's alpha and the average inter-item correlation for all OHIP-CRO49 item scores and the 7 subscores. The Cronbach's alpha values >0.80 indicate a reliable scale, although in the initial stages of the study, the values >0.70, can be acceptable<sup>16</sup>.

**TABLE 3**  
TEST-RETEST RELIABILITY MEASURED BY INTRACLASS CORRELATION COEFFICIENTS (ICC) FOR A CROATIAN VERSION OF THE ORAL HEALTH IMPACT PROFILE WITH 49 ITEMS (OHIP-CRO49) AND SEVEN SUBSCALES

Scale (number of items)	Students II (n=30)			Prosthodontic patients II (n=30)		
	ICC	Mean of the differences	Limits of agreement	ICC	Mean of the differences	Limits of agreement
OHIP-CRO49 (49)	0.95	2.69*	0.93 to 4.45	0.82	5.83	-3.34 to 15.00
Functional limitation (9)	0.89	1.21*	0.44 to 1.97	0.89	1.23	-0.23 to 2.70
Physical pain (9)	0.88	0.70	-0.09 to 1.49	0.82	1.47	-0.43 to 3.36
Psychological discomfort (5)	0.93	0.70*	0.23 to 1.17	0.86	1.13	-0.09 to 2.18
Physical disability (9)	0.88	0.07	-0.36 to 0.49	0.84	0.60	-1.58 to 2.28
Psychological disability (6)	0.92	0.30	-0.13 to 0.73	0.84	1.53	-0.13 to 2.93
Social disability (5)	0.63	-0.27	-0.66 to 0.12	0.75	-0.10	-1.30 to 1.10
Handicap (6)	0.74	-0.13	-0.56 to 0.29	0.75	-0.03	-1.56 to 1.49

\*  $p < 0.05$  (paired t-test)

### Responsiveness

The mean change score was 80.91 for the OHIP(0–4) sum-score and 28.62 for the OHIP (2–4) sum-score in the group of patients with a toothache after the successful treatment (Table 5). The statistically significant difference between the pre-treatment and post-treatment scores ( $p < 0.01$ ) verified adequate responsiveness of the OHIP-CRO49.

### Discussion

Development of specific OHRQoL questionnaires has led to the construction of the OHIP instrument, »self-complete« questionnaire that investigate function, symptoms and the social and psychological impact of oral disorders and treatment procedures on general health. Such data could be helpful to dentists in planning a treatment solution for each patient, in order to improve his/her oral and general health. OHIP instrument also enables a comparison between different populations. Re-

cently the short Croatian version (OHIP-CRO14)<sup>24</sup> has been developed. However, short version does not provide all required information in specific groups of patients. Therefore, the aim of this study was to develop a Croatian version of the 49 item Oral Health Impact Profile (OHIP-CRO49) and to evaluate its psychometric properties (validity, reliability and responsiveness). To achieve this goal the original English OHIP version had to be adapted into the Croatian cultural environment<sup>5</sup>.

Although the original OHIP instrument consists of 49 items (which demand a lot of time to be completed), today shorter and larger versions have also been developed, such as OHIP-14<sup>28</sup>, OHIP-EDENT for edentulous patients<sup>29</sup> and OHIP-TMD for temporomandibular dysfunction patients<sup>22</sup>. On the other hand, longer versions were developed by adding some culture-specific items<sup>15,16</sup>, or some specific disease protocols<sup>30</sup>. In this study the original OHIP-49 had initially been translated to develop the instrument that could be used in Croatia and which would allow comparison with other countries.

**TABLE 4**  
INTERNAL CONSISTENCY MEASURED BY CRONBACH'S ALPHA AND AVERAGE INTER-ITEM CORRELATION FOR A CROATIAN VERSION OF THE ORAL HEALTH IMPACT PROFILE WITH 49 ITEMS (OHIP-CRO49) AND SEVEN SUBSCALES

Scale (number of items)	General population (n=163)		Prosthodontic patients I (n=26)		Students I (n=29)	
	Cronbach's alpha	Average inter-item correlation	Cronbach's alpha	Average inter-item correlation	Cronbach's alpha	Average inter-item correlation
OHIP-CRO49 (49)	0.94	0.29	0.97	0.38	0.93	0.24
Functional limitation (9)	0.78	0.29	0.82	0.34	0.88	0.33
Physical pain (9)	0.83	0.38	0.85	0.41	0.81	0.32
Psychological discomfort (5)	0.80	0.50	0.79	0.43	0.83	0.49
Physical disability (9)	0.84	0.41	0.92	0.57	0.65	0.21
Psychological disability (6)	0.84	0.49	0.88	0.56	0.83	0.46
Social disability (5)	0.78	0.43	0.92	0.72	0.69	0.31
Handicap (6)	0.71	0.35	0.89	0.59	0.61	0.20

**TABLE 5**  
RESPONSIVENESS OF A CROATIAN VERSION OF THE ORAL HEALTH IMPACT PROFILE WITH 49 ITEMS (OHIP-CRO49)

Sample	Measure	OHIP(0–4) sum-score	OHIP(2–4) sum-score
Patients with a treatment demand (toothache) (n=21)	Mean baseline score – mean follow up score	108.48–27.57**	33.67–5.05**
	95 % confidence interval	71.82–89.99	24.93–32.31
	Sum-score range at baseline	50–159	13–48
	Standardised effect size	2.96	3.48
	Standardised response mean	1.39	

\*\*statistically significant ( $p < 0.01$ )

The administration modus of the Hungarian version was used as a strategy in the development of the Croatian version of OHIP, since it certified a reliable procedure<sup>16</sup>. Every subject was interviewed in order to minimize the missing data. In the English language version the OHIP-49 the items had been weighted to reflect the relative importance of each question. Since the weights did not improve the measurement properties<sup>15,26</sup>, they were not obtained in this study. In OHIP-H the recommended recall period was one month, which was also suggested by the authors of the OHIP-G<sup>15,16</sup>. According to those studies, the one-month recall period offered a more accurate memory compared to a longer period of time. Therefore the one-month recall period was also used in this study.

The convergent validity of the OHIP-CRO49 was confirmed by strong correlation between the self-reported oral health and the OHIP-CRO49 0-4 and 2-4 scores. As has been expected, denture wearing had a significant influence on OHRQoL in general population which confirmed groups validity. In the group of the prosthodontic patients with a treatment need (new dentures), old and unsatisfactory denture wearing showed no significant influence on OHRQoL. This was explained by the fact that in the group of prosthodontic patients with treatment need both, those patients without any dentures and those patients wearing old and unfavourable dentures were equally dissatisfied. Considering oral habits and joint clicking, there was no significant influence on OHRQoL in the prosthodontic patients, as has been originally expected. Considering the temporomandibular disorder and burning mouth sensation, there was a significant influence on OHRQoL in the prosthodontic patients, as has been expected.

The test-retest reliability was satisfactory. Cronbach's alpha showed satisfactory results for the internal consistency of the OHIP-CRO49. Moreover, the average inter-item correlation also confirmed satisfactory reliability of the Croatian version of the OHIP questionnaire.

The responsiveness was tested on the group of patients with a treatment demand (acute toothache). It was hypothesized that acute pain would show a strong impact on the OHRQoL and that successful treatment would relieve the patients from pain and improve the OHRQoL. After the treatment (tooth extraction or root canal treatment), in 80% of the subjects pain disappeared

within seven days. Therefore, it was supposed that the one month post-treatment period would be optimal for a total recovery of the symptoms. The toothache patients completed the OHIP-CRO49 questionnaire during the acute pain phase and after the one-month after-treatment period. A great and statistically significant improvement in both, overall OHIP score (OHIP49) and OHIP 2-4 score was obtained. The effect size also showed satisfactory changes of the post-treatment OHIP-score.

The results obtained for the psychometric properties of the OHIP-CRO49 are very similar to the original OHIP-49 version, the OHIP-H and the OHIP-G.

According to the results of the present study the Croatian version of the OHIP-49 revealed sufficient psychometric properties. This will enable utilization of the OHIP-CRO49 questionnaire in diagnostic and treatment procedures, as well as for assessing the OHRQoL in cross-sectional and longitudinal studies.

Some other types of questionnaires which have been already used in Croatia for the measurement of patients' satisfaction with their removable dentures, were offering responses on the five grades Likert scale, where 1 indicated those patients who were not satisfied, and the increasingly higher score indicated more satisfied patients<sup>31-33</sup>. Such scale has been applied in the Croatian population, since the grades in the primary and high schools, and the universities in Croatia traditionally range from 1 (unsatisfactory) to 5 (excellent). Although the OHIP scores indicated 0 – no problems and 4 – the most severe problems, there was no problem for the Croatian population to assess their oral health by using such type of grades.

Since the OHIP49 approved a cross-cultural adaptation and a wide international use, it seemed logical to translate it into the Croatian language. Since the results of this study confirmed sufficient psychometric properties of the OHIP-CRO49 questionnaire, the utilisation of it will allow not only cross-sectional and longitudinal assessment, but also the comparison with other countries and cultures.

## Acknowledgements

This study was supported by the grant number No. 065-0650446-0420 of the Ministry of Science, Education and Sports of Croatia and by the grant number No.

J3-6286-0381-04 of the Slovenian Research Agency (ARRS). This study is also a part of the international bilateral re-

search project entitled »Subjective And Objective Factors Responsible For The Success Of Prosthodontic Treatment«.

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## HRVATSKA VERZIJA ORAL HEALTH IMPACT PROFILE UPITNIKA

### SAŽETAK

Svrha rada je razviti hrvatsku verziju Oral Health Impact Profile upitnika (OHIP-CRO49) slijedeći prihvaćena pravila međukulturalne tehnike adaptacije. Originalna verzija je prevedena koristeći metodu prevođenja naprijed-nazad. Konstruktivna valjanost testirana je kod 163 nasumice izabrana pojedinca i kod 26 protetskih pacijenata. Povezanost OHIP-CRO49 zbroja bodova te vlastite prosudbe oralnog zdravlja i pet oralnih poremećaja, potvrđuju konstruktivnu valjanost. Test-retest pouzdanost je testirana na 30 protetskih pacijenata i na 30 studenata te je potvrđena visokim intraclass correlation coefficients (0,63 do 0,95). Unutarnja konzistencija je testirana na 163 nasumice izabrana pojedinca (iz opće populacije), na 26 protetskih pacijenata i na 29 studenata te je potvrđena visokim Cronbach's alpha koeficijentom (0,60 do 0,97). Primjerenost je testirana kod 21 pacijenta sa potrebom za terapijom (zuboboljom) i potpomognut je statistički značajnom aritmetičkom sredinom OHIP-CRO49 i visokim effect size (od 108,48 na 27,57). Prikladne psihometrijske odlike kod tipične populacije potvrđuju ovaj instrument prikladnim za procjenu Oralnog zdravlja povezanog sa kvalitetom života (OHRQoL) u Hrvatskoj.