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# Cross-cultural adaptation and psychometric evaluation of oral health impact profile among school teacher community

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## Abstract:

**AIM:** To translate OHIP-14 into Hindi and test its psychometric properties among school teacher community.

**METHODS:** The OHIP-14 was translated to OHIP-14-H using WHO recommended translation protocol. During pre-testing, an expert panel assessed content validity of the questionnaire. Face validity was assessed on a sample of 10 individuals. The OHIP-14-H was administered on a random sample of 170 primary school teachers. Internal consistency and test-retest reliability were assessed using Cronbach's alpha and Intra-class correlation coefficient (ICC) respectively, with 2 weeks interval. Predictive validity was tested by comparing OHIP-14-H scores with clinical parameters. The concurrent validity was assessed using self-reported oral health and discriminant validity was ascertained through negative association with sociodemographic variables.

**RESULTS:** The mean OHIP-14-H score was 9.57 (S.D = 4.58). ICC and Cronbach's alpha for OHIP-14-H was 0.96 and 0.92 respectively. Concurrent validity using binomial regression model indicated that good (OR = 0.56, 95% CI = 0.55 – 4.47) and moderate (OR = 0.25, 95% CI = 0.17 – 1.87) OHIP-14-H scores were negative but significant risk indicators of poor self reported oral health ( $P < 0.009$ ). Significant predictive validity was observed between OHIP-14-H scores and clinical parameters ( $P < 0.000$ ).

**CONCLUSION:** Translated and culturally adapted OHIP-14-H indicates good reliability and validity among primary school teachers.

## Keywords:

Health status measure, oral health, quality of life, questionnaire, reliability, validity

## Introduction

The impact on various oral conditions on social life determines oral health-related quality of life (OHRQoL) and significantly occupy a prominent place in mind set of researchers, policy makers, and dental health-care professionals.<sup>[1]</sup> Significant association with OHRQoL and its impact on general health has well been documented in literature.<sup>[2]</sup> Editorial report by Aubrey Sheiham 2005, concluded the hampering physical, physiological,

and social aspects of life leads to poor OHRQoL.<sup>[2,3]</sup>

Indicators assessing OHRQoL before 1997 consisted of Social impact on disease (SID), Geriatric oral health assessment index (GOHAI), Dental impact profile, and Oral impacts on daily performance (OIDP).<sup>[4]</sup> Tools addressed post-1997 included child-OIDP scale, OHRQoL for dental hygiene, orthognathic quality of life (QoL) questionnaire, and surgical orthodontic outcome questionnaire.<sup>[4]</sup> Majority of these tools either focused on specific groups

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and social classes of the community or influence of therapeutic outcome on OHRQoL.<sup>[5]</sup> Amidst all, “Oral Health Impact Profile scale (OHIP-49)” developed by Gary Slade 1994 had a multidimensional construct.<sup>[6]</sup> Further in 1997, item-reduction statistics restricted the scale, rendering it equally effective and easy to administer 14-item questionnaire.<sup>[7]</sup>

In due course of time, researchers came up with easy to administer, shorter but valid and reliable culturally adapted versions of OHIP-14, namely, Spanish, Arabic, Nepalese, Dutch, Brazilian, German, Chinese, and Hungarian to evaluate the OHRQoL in community at large.<sup>[8-14]</sup> We undertook to develop a Hindi translated version of OHIP-14 to implement and easily assess OHRQoL in Hindi-speaking community. The rationale for selecting the desired population was to secondarily explore the community participation in primary school teachers in building up strong oral health motives in school going children.

The objective of our study was to translate the original English version of OHIP-14 into Hindi (OHIP-14-H) and demonstrate its psychometric properties on teacher community. An important aspect of Hindi translation was to assess the level of community acceptance for the OHRQoL assessment questionnaire.

## Subjects and Methods

A cross-sectional study was conducted in teacher community among primary school teachers. The study was carried out for a period of 2 months (June to July 2015) in Indore city. Ethical clearance was obtained from the Institutional review board. A registered list of primary schools in Indore city was sought to randomly approach 15 schools for permission regarding conduct of the study. A simple random sampling strategy was employed to obtain an *a priori* determined the sample of primary school teachers.

The sample size was derived based on the concept of N/p ratio that is item to participant ratio of 1:10. Each question was addressed by 10 responders.<sup>[15]</sup> The 14-item questionnaire enabled us to compute a sample size of 140 participants. Nonparticipation of the responders in the study was compensated by increasing the sample size of 20% of the predetermined. Thus, final samples for the study consisted of 170 primary school teachers.

The translation of OHIP-14 was done as per the procedure for forward-backward translation and adaptation protocol, recommended by the World Health Organization.<sup>[16]</sup> The translation procedure was carried out in four sequential stages. The forward translation into Hindi language emphasized on conceptual rather

than literal translation thus avoiding technical terms and jargons. The aim was to use natural and acceptable Hindi language for majority of Hindi-speaking community.

Stage two consisted of appointing a bilingual expert panel including the forward translator, one expert in public health and one expert with experience in translation and development of questionnaires. Based on consensus arrived by the panel, subsequent changes and discrepancies in translated questionnaire were sorted.

The initial forward translated Hindi version was backtranslated into English by a single-independent translator having good technical command of both the languages. The back translator had no previous knowledge regarding questionnaire. The back-translated version was cross-checked with original (English) OHIP-14 questionnaire. Apparent discrepancies were discussed and eventually resolved with the back-translator.

Ten participants from the study community were recruited for pretesting procedure. Participants in the pretesting phase were not considered as a part of the main study. The Hindi-translated version was administered to the study subjects with a small debriefing of the content. Face-to-face interview sessions with participants were carried out by primary investigator. The respondents were also interviewed regarding understanding and content of the questionnaire. The final version of OHIP-14-H was collaborative compilation of all iterations made throughout the process. All the activities were well-coordinated by the primary investigator.

Four main aspects of validity considered in the study were face, content, criterion, and construct validity. The content and face validity assessment of the translated scale was undertaken to ascertain the appropriateness and relevance to content ensuring feasibility, readability, and clarity of language to the participating audience. The expert panel analyzed the content validity assessing stability of the questionnaire despite cultural/linguistic reframing. The target population was made a part of the assessment protocol for face validity. Necessary discussions were done with participants to ascertain encountered difficulties.

In the present study, construct validity was assessed to correlate theoretical paradigm of construct by examining measures of predictive and discriminant validity. Clinical parameters such as oral hygiene status and Decayed Missing Filled Teeth (DMFT) levels were compared with OHIP-14-H scores to determine the significance level of correlation. Besides, discriminant validity was assessed by negative/insignificant association with OHIP-14-H scores of socio demographic variables such as gender, education, and socioeconomic status.

Criterion validity (concurrent validity) was assessed by examining correlation between self-reported oral health and OHIP-14-H scores. Internal consistency or homogeneity of the translated OHIP-14-H scale was determined by subjecting participant's responses for all 14-items to alpha reliability analysis. Cronbach's alpha values of 0.8 and 0.9 were considered to establish good to almost perfect consistency.<sup>[17,18]</sup>

Reproducibility of the questionnaire was evaluated by readministering the translated scale to one-half of the participants randomly in 2 weeks duration. A "test-retest" reliability analysis was performed [Figure 1]. The period of readministering was crucial since shorter interval could lead to high-assumed correlation in comparison to longer interval.<sup>[19]</sup>

Data onto sociodemographic details, clinical oral examination, and self-rated oral health was collected using a structured pro forma. Oral hygiene index – simplified and DMFT score was recorded by the primary investigator ( $\kappa = 0.84$ ).<sup>[20,21]</sup> ADA Type III oral examination was carried out under natural light

and illumination using mouth mirror, explorer and CPI probe. Modified Kuppuswamy's socioeconomic scale, upgraded to the latest consumer price index, May 2015 was employed to classify the socioeconomic status of the participants.<sup>[22,23]</sup>

Data collected was entered into Microsoft Excel and analyzed using Statistical Package for Social Sciences, SPSS Version 20.0. (2011), (IBM SPSS Statistics for Windows, Armonk, NY: IBM Corp.). The internal consistency was assessed using Cronbach's alpha values while intraclass Correlation Coefficient determined the reproducibility of the translated scale. Kappa statistics was used to evaluate the intrarater reliability of the primary investigator. The frequency distribution analysis was done using Chi-square tests. Binary logistic regression analysis was employed to assess the reliability and validity of OHIP-14-H. The level of significance was set at 5%.

## Results

Distribution of study participants in with respect to age, gender, education, socioeconomic status, and tooth brushing behavior identified majority of participants belonging to middle (38.82%) and postmiddle age group (37.05%). 69.41% females belonging to the upper/middle socioeconomic class had higher educational level. Higher percentage of female respondents could be attributed to the fact that majority of primary schools employed female teaching staff as compared to males.

Irrespective of age stratification, significant number of respondents had poor OHIP ( $P < 0.003$ ) [Table 1]. 55.35% respondents, brushing twice or more daily reported of having poor impact on their oral health while similar but contrasting, results were derived from participant who never brushed but reported good OHIP scores ( $P < 0.03$ ) [Table 1]. Insignificant association with gender, education, and socioeconomic status indicated that OHIP of the participants did not diverge with the following variables in consideration justifying the discriminant validity of the questionnaire.

The mean total score of 14-item OHIP-14-H scale was  $9.57 \pm 4.58$  [Table 2]. The maximum difficulty was encountered with physical discomfort domain (48%) followed by functional limitation domain (38%), respectively. The result suggests that respondents were more comfortable reporting, assessing and evaluating the impact of oral conditions on QoL through all domains except for physical discomfort and functional limitation domains.

"Test-retest reliability" assessed using bivariate correlation analysis showed significant results of

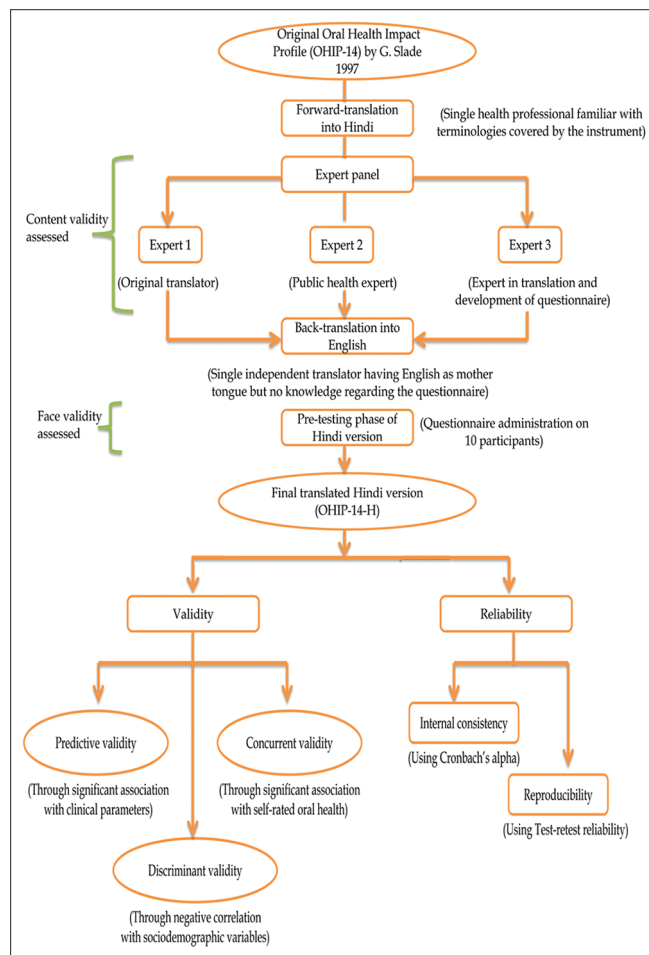


Figure 1: Flowchart representation of psychometric assessment/validation of Oral Health Impact Profile-14

**Table 1: Frequency distribution of sociodemographic variables in contrast to differing levels of oral health impact profile - a measure of discriminant validity**

Variables	n (%)	OHIP-14-Hindi			P (χ <sup>2</sup> )
		Good OHIP (0-5), n (%)	Moderate OHIP (6-10), n (%)	Poor OHIP (11-14), n (%)	
Age (years)					
18-30	41 (24.13)	1 (2.45)	8 (19.51)	32 (78.04)	<0.003**
31-45	66 (38.82)	17 (25.75)	17 (25.75)	32 (48.50)	
Above 46	63 (37.05)	20 (31.74)	14 (22.22)	29 (46.04)	
Gender					
Male	52 (30.59)	14 (23.07)	9 (17.32)	29 (55.76)	0.41
Female	118 (69.41)	24 (20.33)	30 (25.44)	64 (54.23)	
Education					
Higher secondary	8 (4.72)	2 (25.00)	1 (12.50)	5 (62.50)	0.65
Graduate	64 (37.64)	17 (26.56)	12 (18.75)	35 (54.68)	
Postgraduate	98 (57.64)	19 (19.38)	26 (26.54)	53 (54.08)	
Socioeconomic status					
Middle	8 (4.72)	5 (62.50)	3 (37.50)	0 (00.00)	0.25
Upper	162 (95.28)	88 (54.32)	36 (22.23)	38 (23.45)	
Tooth brushing behavior					
Twice/once daily	118 (69.41)	36 (21.42)	39 (23.23)	93 (55.35)	0.03*
Never	52 (30.59)	2 (100.00)	0 (00.00)	0 (00.00)	

\*Statistical significance ≤0.05, \*\*Statistical significance ≤0.001. OHIP=Oral health impact profile

**Table 2: Mean total scores of oral health impact profile-14-Hindi and its seven domains with percentage difficulty encountered in responding to questions in respective domains**

OHIP-14-Hindi scale and domains (number of items pertaining to each domain are presented in the parenthesis)	OHIP-14-Hindi (n=170), mean±SD	Percentage difficulty encountered (%)
Functional limitation (2)	1.24±0.81	38
Physical discomfort (2)	1.04±0.87	48
Physiological discomfort (5)	3.44±1.76	31.2
Physical disability (1)	0.73±0.44	27
Physiological disability (1)	0.75±0.42	25
Social disability (1)	0.77±0.41	23
Handicap (2)	1.57±0.76	21.5
OHIP-14-Hindi total (14)	9.57±4.58	30.35

OHIP=Oral health impact profile, SD=Standard deviation

almost perfect agreement (intraclass correlation coefficient = 0.96, confidence interval [CI] = 0.93–0.99) indicating highly reliable translated scale ( $P < 0.000$ ). Internal consistency of the scale was found to be high (0.92) [Table 3]. The mean interitem correlation value of 0.45 was in agreement to the fact that, for a scale with converging domain structures the interitem correlation should lie between 0.25 and 0.60 (Watson and Clark 1992).<sup>[24]</sup>

A statistically significant difference was observed in relation to oral hygiene status. Participants having good (80%) to fair (55.55%) oral hygiene displayed good OHIP-14-H score ( $P < 0.001$ ). Majority of participants (72.74%) having DMFT scores >5 reported significant poor OHIP-14-H scores as compared to those having DMFT <5 ( $P < 0.000$ ) [Table 4]. The result suggests that clinical parameters such as oral hygiene status and caries experience show a positive-predictive behavior regarding QoL of an individual, thus establishing

a good predictive validity. Majority of teachers having good OHIP-14 score responded to have significantly good self-rated oral health status (58.06%) thus documenting a significant concurrent validity of OHIP-14-H scale ( $P < 0.019$ ).

A bivariate logistic regression analysis implemented to determine poor self-rated oral health illustrated that middle-aged, graduate, men belonging to the upper or middle socioeconomic class and brushing only once daily were more likely to have poor self-rated oral health [Table 5]. On the contrary, participants having either moderate or good OHIP-14-H scores were less likely to report poor self-rated oral health (odds ratio [OR] = 0.56, CI = 0.55–4.47) and (OR = 0.25, CI = 0.17–1.87), respectively. The findings significantly ascertained the correlation between the impact on oral conditions and likelihood of reporting oral health status ( $P < 0.009$ ). The study results further strengthened the evidence for acceptable concurrent validity of OHIP-14-H.

## Discussion

The original OHIP-14 was concerned with impairment and three functional dimensions, namely, social, psychological, and physical. These domains represented four of seven qualities of life-dimensions proposed by Patrick and Bergner.<sup>[25]</sup> The translated OHIP-14-H scale was intended to complement traditional oral epidemiological indicators of clinical disease, thereby providing information about “burden of oral disease” within community inmates and the effectiveness of health services in reducing this burden of illness.<sup>[26]</sup>

The projected results of culturally adapting OHIP-14 scale of Hindi-speaking communities were in agreement with other studies except for some undermined differences in methodology and interpretation. The present study focused on corroborating WHO proposed methodology for translation, back-translation of OHIP-14-H, which was contrasting with similar studies on linguistic adaptation of OHIP-14.<sup>[13]</sup> Recently, published data onto aforementioned title lacked to justify the translation protocol and validation methodology.<sup>[27]</sup> It was observed that flaws in the translation, back-translation protocol could probably lead to the deterioration of face and content validity. The present study was able to justify both validities through the expert panel iterations as well as interaction with pilot participants.

Sufficient evidence for scientific basis of the present study was provided by systematic sample size determination

**Table 3: Internal consistency and reliability of the Hindi translated questionnaire (Oral health impact profile-14-Hindi)**

Parameter	Analysis	Value	95% CI
Internal consistency	Cronbach's alpha	0.923	-
	Mean interitem correlation	0.451	-
Test-retest reliability	Intraclass correlation coefficient	0.96*	0.93-0.99

\*Statistical significance,  $P \leq 0.001$ . CI=Confidence interval

**Table 4: Comparison of level of literacy with clinical parameters and self-reported oral health - a measure of predictive and concurrent validity of oral health impact profile-14-Hindi respectively**

Clinical parameters	OHIP-14-Hindi			P ( $\chi^2$ )
	Good OHIP (Score 0-5), n (%)	Moderate OHIP (Score 6-10), n (%)	Poor OHIP (Score 11-14), n (%)	
OHI-S				
Good	28 (80.00)	4 (11.43)	3 (8.57)	<0.001**
Fair	50 (55.55)	21 (23.33)	19 (21.12)	
Poor	15 (33.33)	14 (31.11)	16 (35.56)	
Dentition status				
DMFT <5	92 (62.16)	34 (22.98)	22 (14.86)	<0.001*
DMFT >5	1 (4.54)	5 (22.72)	16 (72.74)	
Self-reported oral health				
Poor	39 (50.66)	25 (32.46)	13 (16.88)	0.019*
Good	54 (58.06)	14 (15.06)	25 (26.88)	

\*\*Statistical significance,  $P \leq 0.001$ . OHIP=Oral health impact profile, OHI=Oral hygiene index-simplified, DMFT=Decayed missing filled teeth

through existing literatures.<sup>[10,15,28]</sup> Majority of studies were conducted on conveniently selected sample population. In contrast to these findings, the present study adopted a simple random sampling strategy to obtain an *a priori* determined sample size. Supportive evidence enabled us to derive the sample size using item to participant ratio (N/p). As rules-of-thumb, number of subjects per variable may vary from 4 to 10, with a minimum of 100 subjects to ensure stability of variance-covariance matrix.<sup>[15]</sup> Although this method of sample size determination holds true for studies involving item-reduction through factorial analysis, the results of a systematic review on quality of factor analysis of the Medical Outcome Short Form (SF-36) scale identified 3 out of 22 studies on cross-validation justifying the use of similar method for sample size estimation.<sup>[15]</sup> Recommendation as per another systematic review considered a range from 2 to 20 subjects per item, with an absolute minimum of 100–250 subjects for cross-validation research.<sup>[28]</sup>

The internal consistency and reproducibility of the translated scale were in agreement with studies conducted by Oliveira *et al.*, 2005.<sup>[29]</sup> Similar studies by Al Habashneh, *et al.* 2012, also revealed comparable results.<sup>[30]</sup> Cross-cultural adaptation in various geographical extents yielded similar results except for minor differences observed in Chinese and Persian versions.<sup>[9-13,31]</sup>

Predictive and discriminant validity were considered as measures of construct validity. The clinical parameters evaluated in present study were oral hygiene status and caries experience in comparison to the Dutch version of OHIP-14 which utilized WHO pro forma and compared parameters such as community periodontal index treatment needs (CPITN).<sup>[13]</sup> The assessment of predictive validity and discriminant validity was a contrasting feature of our study as we compared the clinical parameters and sociodemographic variables with OHIP-14-H scores. Determination of convergent validity was reserved for future studies, as we considered

**Table 5: Determinants of poor self-rated oral health based on binary regression analysis among primary school teachers (n=170)**

Variables	OR (95% CI)	P
Age		
Above 46 (reference)	1.00	
31-45 years	1.39 (0.77-4.80)	0.15
18-30 years	0.63 (0.77-3.65)	0.19
Gender		
Female (reference)	1.00	
Male	1.06 (0.49-2.26)	0.89
SES		
Lower (reference)	1.00	
Upper/middle	1.54 (0.07-2.44)	0.33
Education		
Postgraduate (reference)	1.00	
Graduate	3.19 (0.01-1.58)	0.12
Higher secondary	1.90 (0.29-1.17)	0.13
Tooth brushing behavior		
Twice or more (reference)	1.00	
Once daily	2.99 (0.16-54.42)	0.45
OHIP-14-Hindi		
Poor OHIP (reference)	1.00	
Moderate OHIP	0.56 (0.55-4.47)	<0.009**
Good OHIP	0.25 (0.17-1.87)	

\*\*Statistically significance  $\leq 0.001$ . SES=Socioeconomic status, OHIP=Oral health impact profile, OR=Odds ratio, CI=Confidence interval

the comparison of OHIP-14-H scores with similar prevalidated scale would yield accurate convergent validity.<sup>[17,19]</sup>

A differentiating feature of this investigation was specific community involvement. The primary school teachers play a crucial role as pioneers in child education and can contribute to capacity building. The participation of primary school teachers in the study was credited to the fact that teacher's can inculcate a positive oral health attitude and reinforce adequate cognitive behavior for good oral health in children. The initiative behind our study was in lieu to the concept of "Dental socialization."<sup>[8]</sup> The present study also focuses on concept of significant others (Primary school teachers) in contributing to better QoL.<sup>[8]</sup> The scientific layout behind selecting our study population was a key factor differentiating present study from similar studies.<sup>[9-11]</sup>

The limited sample size for the study may be of concern, meaning that psychometric properties of the scale may vary in a larger subset of population. The study results can be generalized on teacher community, but the external validation on a larger sample, consisting of local population, with limited educational level and differing level of literacy on language used in OHIP-14-H should be done cautiously.

Hence, successive studies using the OHIP-14-H will be focused more toward large sample of more representative

local population to have more comprehensive assessment of psychometric properties of OHIP-14-H. Influenced by the ease and understandability of the tool it is recommended to organize randomized control trials in future taking OHIP-14-H scale and similar other OHRQoL scales on local/rural communities.

## Conclusion

The psychometric assessment of the translated OHIP-14-H demonstrated a valid and reliable instrument to assess the impact of oral conditions on QoL among primary school teachers. OHIP-14-H can effectively be used to conduct researches on OHRQoL. Thus, OHIP-14-H being a culturally acceptable scale enables its use at both epidemiological and clinical levels.

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## Conflicts of interest

There are no conflicts of interest.

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