

ORIGINAL ARTICLE**HOW VALID ARE THE PSYCHOMETRIC PROPERTIES OF THE ORAL HEALTH IMPACT PROFILE-14 MEASURE IN ADULT DENTAL PATIENTS IN IBADAN, NIGERIA?****Folake B. Lawal, Juliana O. Taiwo, Modupe O. Arowojolu****ABSTRACT**

BACKGROUND: *The Oral Health Impact Profile (OHIP) is the most widely used quality of life (QoL) measure to evaluate the influence of oral diseases on individuals. QoL measures have been noted to be context and environment specific, and there is a need to cross-culturally adapt a scale before its introduction into any community. This study aimed to evaluate the psychometric properties, validity and internal consistency of the OHIP-14 measure in an adult patient population in Ibadan, Nigeria.*

METHODS: *A cross-sectional study was conducted over a four-month period on 204 adult patients using OHIP-14 structured questionnaire, global self-report indicator of oral conditions and perceived treatment need. Oral examinations were performed to assess periodontal status, caries experience and attachment loss. Data were analyzed using SPSS and p-value for statistical significance was set at < 0.05. Results: A total of 204 patients participated in the study with a mean OHIP score of 11.2 (\pm 9.8). OHIP scores were not related to the sociodemographic characteristics. Perception of need for treatment was greater among those who reported impacts on their QoL (89.3% vs. 14.3%, $p < 0.001$). The OHIP scores correlated negatively with global self rating of oral health status ($\rho = -0.23$, $p < 0.01$). Higher OHIP scores were associated with having carious teeth ($p = 0.023$). The Cronbach's alpha for the 14 inventory items ranged from 0.857 to 0.871.*

CONCLUSION: *The OHIP-14 measure showed good psychometric properties with satisfactory validity and internal consistency in adult patients in Ibadan, Nigeria.*

Keywords: *Oral health, quality of life, OHIP-14, validity, internal consistency*

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INTRODUCTION

The status of the oral cavity reflected through symptoms and signs of oral diseases can have significant influences on the quality of life (QoL) of individuals (1). There are various multidimensional methods of measuring these oral health related QoL of which the Oral Health Impact Profile (OHIP) is one of the most widely used (2). The original OHIP, based on Locker's conceptual framework (3) and the WHO International Classification of Impairments, Disabilities and Handicaps consists of 49 items in English-language. This has, because of ease of administration, been adapted into a short form containing 14 items testing the seven composite

domains (4). The domains emphasized by the OHIP scale are: functional limitations, physical pain, psychological discomfort, physical disability, psychological disability, social disability and handicap. It has been validated and found to be equivalent to the comprehensive 49 item version (4-6).

The use of measures to evaluate the health status of individuals has been shown to be context, culture and environment specific (7). This has created the need to cross-culturally adapt these measures especially in the face of a global village where collaboration in medical and dental research is highly encouraged (7,8).

Although the OHIP-14, which was originally developed in Australia (4), has been validated in other English speaking countries such as the USA (9), Scotland (10) and Canada (11,12), it has not been tested for its psychometric properties, validity and reliability in resource challenged settings such as Nigeria, where cultural beliefs often impact on oral health beliefs and practices (13-15). This study, therefore, aimed to evaluate the psychometric properties of the OHIP-14 measure in an adult Nigerian patient population, and to assess the validity and internal consistency of the measure. If the OHIP-14 measure is found to have satisfactory psychometric properties in this environment, it will facilitate comparison of research outcomes in dental public health between Nigerian communities and the rest of the world.

MATERIALS AND METHODS

Study Location: This was a cross-sectional study conducted between September and December 2011 at the Oral Diagnosis Unit of the Dental Centre, University College Hospital, Ibadan and the Primary Oral Health Care Centre, Idikan, Ibadan, Nigeria. The Dental Centre is a tertiary referral facility with specialists in all major dental sub-specialties serving a primary population base of 5 million. The Primary Oral Health Care Centre, Idikan, was established in 1982 to cater for the unmet needs of a population in which primary dental care was non-existent then. The centre receives patients from a mainly indigenous peri-urban population.

Data collection: Following ethical approval from the Joint University of Ibadan/University College Hospital Ethics Review Committee, OHIP-14 structured interviewer-administered questionnaires were used to obtain information from 204 out of 218 consecutively selected patients aged 18 years and older who consented to participate in the study (giving a response rate of 93.6%). A minimum sample size of 163 patients was estimated to be adequate. The assumptions made were: the proportion of patients expected to report an impact with the OHIP-14 measure = 88.2% (16), precision (d) = 5% and confidence interval = 95%. An average of 72 individuals were registered each month as new patients, thus collection of the sample size took three months. Information on their oral health status was obtained using

questions assessing the global self rating of oral health status and perceived need for dental treatment. The participants' oral health status was also evaluated by oral examination.

The OHIP-14 questions were asked as "During the past 12 months, how often have problems with your mouth and teeth caused you *any trouble pronouncing words, affected sense of taste, painful aching anywhere in your mouth, discomfort in eating any food or to feel tense.*" Other questions included if problems with the mouth and teeth had: *made diet unsatisfactory, led to interruption of meals, difficulty to relax, embarrassment, made you a bit irritable with other people because of problems, to be self conscious, difficulty doing your usual jobs (or attending school), made life less satisfying or unable to perform usual functions.* Each question was assessed based on the following response scale: 4 = 'very often', 3 = 'fairly often', 2 = 'occasionally', 1 = 'hardly ever', and 0 = 'never'. The total score was calculated using the additive method (17, 18) in which the response codes for each item of the fourteen OHIP-14 indices were summed up. The original English version of the OHIP-14 was translated into Yoruba, culturally adapted to the environment and back translated into English. Two specialists then independently compared the back translated version and consensus was used to produce an equivalent version of the original OHIP-14.

Information was also obtained using the global self-report indicator of oral conditions in which respondents were asked to rate the present condition of their mouth and teeth. The responses were recorded using a Likert scale with values from 1 = 'very poor' 2 = 'poor', 3 = 'neither good nor poor', 4 = 'good', to 5 = 'very good'. The lower the scores, the worse they rated their oral health status. They were also asked if they perceived a need for treatment or not for their present oral condition.

Oral examination was conducted at the end of the interview using gloves, sterile dental mirror, and community periodontal index probe (CPI probe). Examination was done, according to World Health Organization criteria (19), with each patient sitting upright on a dental chair in the clinic and natural day light served as the source of illumination. Dental caries experience was assessed using the number of decayed, missing,

and filled teeth (DMFT) for each patient. The periodontal health of each patient was evaluated using the Community Periodontal Index (CPI). The CPI was measured and charted to determine the severity of periodontal disease from 0 (healthy periodontium), through 1 (bleeding observed), 2 (calculus felt on probing), 3 (periodontal pocket of 4 or 5 mm) to 4 (periodontal pocket depth of 6mm or more). The Loss of Attachment (LOA) was measured using the same probe and highest score in each sextant recorded. The number of mobile teeth was also recorded.

Psychometric properties: The face and content validity were measured by assessing constituent items, ease of administration and their correlation to each other. The criterion validity was assessed by comparing the total OHIP score and number of OHIP-14 inventory items reported with the global self ratings of the oral health status of the study participants and the perceived need for treatment. Construct validity was assessed by comparing the OHIP score with oral examination findings, presence of mobile teeth, DMFT status, number of decayed (D of DMFT), missing (M of DMFT) and filled teeth (F of DMFT), CPI score and LOA score. Internal consistency was measured using Cronbach's alpha coefficient. The coefficient is indicative of good internal consistency if the overall value is greater than 0.7 (20).

Data management: Data were recorded and analyzed using SPSS version 19. The results of the univariate analysis were presented using frequencies, percentages and proportions for categorical variables and means together with standard deviations for continuous variables. For the purpose of cross tabulation, the OHIP score was dichotomized as "OHIP = 0 (i.e. no impact) and OHIP > 0 (i.e. impact on daily performance)".

For bivariate analysis, the categorical variables were dichotomized and chi-square statistics used to evaluate the association between

variables with the p-value for statistical significance set at < 0.05. Spearman rank correlation was used to evaluate the correlation between continuous variables.

RESULTS

Sociodemographic characteristics of the study participants: A total of 204 patients, 101(49.5%) males and 103(50.5%) females, participated in the study. The mean age of the participants was 40.9 years (\pm 14.9 years). The majority, 123(60.3%), were Christians and 81(39.7%) were Muslims. The rest, 142(69.6%), were married, 50(24.5%) were single, 3(1.5%) were separated and 9(4.4%) were widowed. A total of 84(41.2%), 36(17.6%), 55(27.0%) and 20(9.8%) participants had tertiary, post-secondary, secondary and primary education respectively while 9(4.4%) had no formal education. A total of 94(46.1%) study participants were unskilled workers, 41(20.1%) were dependants and 69(33.8%) were skilled workers.

Oral Health Impact Profile (OHIP) scores of the study participants: The mean OHIP score of the study participants was 11.2(\pm 9.8, range: 0 to 37). A total of 35(17.2%) participants had an OHIP score of zero (0), i.e. no impact on QoL from oral health status, and 169(82.8%) had a score of 1 or higher. The mean number of impacts experienced was 4.9(\pm 4.0) impacts. The most commonly reported OHIP-14 items as a result of oral health status were "painful aching anywhere in the mouth" (69.1%) and "discomfort in eating any food" (62.7%).

OHIP scores and sociodemographic characteristics: Table 1 shows that there was no statistically significant relationship between OHIP scores and the following: gender, age, marital status, educational status and occupational class ($p > 0.05$).

Table 1: Relationship between OHIP scores and sociodemographic characteristics

Sociodemographic characteristic	OHIP scores			χ^2	p value
	0 (No Impact) No (%)**	> 0 (Impact) No (%)**	Total No (%)**		
Gender					
Male	18 (17.8)	83 (82.2)	101 (100.0)	0.062	0.803
Female	17 (16.5)	86 (83.5)	103 (100.0)		
Total	35 (17.2)	169 (82.8)	204 (100.0)		
Age (years)					
≤ 40	20 (16.7)	100 (83.3)	120 (100.0)	0.049	0.824
> 40	15 (17.9)	69 (82.1)	84 (100.0)		
Total	35 (17.2)	169 (82.8)	204 (100.0)		
Marital status					
Unmarried	6 (9.7)	56 (90.3)	62 (100.0)	3.506	0.061
Married	29 (20.4)	113 (79.6)	142 (100.0)		
Total	35 (17.2)	169 (82.8)	204 (100.0)		
Educational status					
Secondary or lower	16 (19.0)	68 (81.0)	84 (100.0)	0.359	0.549
Post-secondary or >	19 (15.8)	101 (84.2)	120 (100.0)		
Total	35 (17.2)	169 (82.8)	204 (100.0)		
Occupational class					
1 – Skilled	13 (18.8)	56 (81.2)	69 (100.0)	1.980	0.372
2 – Unskilled	18 (19.1)	76 (80.9)	94 (100.0)		
3 – Dependant	4 (9.8)	37 (90.2)	41 (100.0)		
Total	35 (17.2)	169 (82.8)	204 (100.0)		

* - Statistically significant

Perceived need for treatment and OHIP scores:

A total of 156(76.5%) participants perceived a need for dental treatment, which included 89.3% of those with OHIP score greater than zero (reported impact) and 14.3% of the participants with OHIP score of zero i.e. reported no impact ($p < 0.001$).

Global self rating of oral health status and OHIP scores: There was a negative correlation ($r_s = -.23$) between OHIP scores and global self rating; those with higher OHIP scores were more likely to rate their oral health status as poorer ($p < 0.01$). There was also a significant relationship between OHIP score and number of OHIP items experienced ($r_s = .96$, $p < 0.01$).

OHIP scores and clinical normative findings: A total of 114 participants (87.7%) out of 130 with a

DMFT > 0 reported impacts (OHIP score > 0) compared to 55(74.3%) participants out of 74 with a DMFT of 0 with similar OHIP scores ($p = 0.015$). The proportion of participants with carious teeth on examination ($D > 0$) who reported impacts was higher than the proportion without carious teeth ($D = 0$) who reported impacts (88.0% vs. 75.9%, $p = 0.023$). A higher proportion of participants without attachment loss had OHIP score > 0 compared to those with attachment loss ($p = 0.024$). There were no significant associations between OHIP score and having mobile teeth, missing teeth, “missing teeth” due to caries and other oral conditions, “filled teeth” or having pathological periodontal pockets (Table 2).

Table 2: Relationship between OHIP scores of participants and clinical oral findings

Normative findings	OHIP score			χ^2	p value
	0 – No Impact No (%)	≥ 1 – Impact reported No (%)	Total No (%)		
Has mobile tooth					
Yes	7 (13.7)	44 (86.3)	51 (100.0)	0.563	0.453
No	28 (18.3)	125 (81.7)	153 (100.0)		
Total	35 (17.2)	169 (82.8)	204 (100.0)		
Has missing tooth					
Yes	14 (13.5)	90 (86.5)	104 (100.0)	2.038	0.153
No	21 (21.0)	79 (79.0)	100 (100.0)		
Total	35 (17.2)	169 (82.8)	204 (100.0)		
DMFT Status					
= 0	19 (25.7)	55 (74.3)	74 (100.0)	5.929	0.015*
> 0	16 (12.3)	114 (87.7)	130 (100.0)		
Total	35 (17.2)	169 (82.8)	204 (100.0)		
Decayed (DMFT)					
= 0	21 (24.1)	66 (75.9)	87 (100.0)	5.201	0.023*
> 0	14 (12.0)	103 (88.0)	117 (100.0)		
Total	35 (17.2)	169 (82.8)	204 (100.0)		
Missing (DMFT)					
= 0	27 (19.4)	112 (80.6)	139 (100.0)	1.578	0.209
> 0	8 (12.3)	57 (87.7)	65 (100.0)		
Total	35 (17.2)	169 (82.8)	204 (100.0)		
Filled (DMFT)					
= 0	32 (16.7)	160 (83.3)	192 (100.0)	0.552	0.458
> 0	3 (25.0)	9 (75.0)	12 (100.0)		
Total	35 (17.2)	169 (82.8)	204 (100.0)		
CPI score					
0 – 2 (No pocket)	27 (16.1)	141 (83.9)	168 (100.0)	0.789	0.374
3 – 4 (Has pocket)	8 (22.2)	28 (77.8)	36 (100.0)		
Total	35 (17.2)	169 (82.8)	204 (100.0)		
LOA score					
= 0	21 (13.7)	132 (86.3)	153 (100.0)	5.070	0.024*
> 0	14 (27.5)	37 (72.5)	51 (100.0)		
Total	35 (17.2)	169 (82.8)	204 (100.0)		

* - Statistically significant

Internal consistency of OHIP-14 inventory

items: The Cronbach's alpha for the overall OHIP-14 scale was 0.876. Table 3 shows that the Cronbach's alpha for each of the 14 OHIP-14 inventory items ranged from 0.857 to 0.871 i.e. all above 0.800. The item-total correlation ranged from 0.437 to 0.695.

DISCUSSION

Cross-cultural adaptation is an important component of the validation process for an instrument to be deemed appropriate for introduction into any linguistic block or community (21). The present study is aimed at validating the OHIP-14 measure in a typical Nigerian community, where the cultural and linguistic characteristics are different from what obtains in communities in the western hemisphere

Table 3: Cronbach's Alpha Item-Total Statistics for the fourteen OHIP-14 inventory items of the participants

OHIP inventory item*	Inter-Item Correlation	Cronbach's Alpha
Trouble pronouncing words	0.507	0.867
Sense of taste affected	0.437	0.870
Painful aching in mouth	0.480	0.869
Discomfort in eating	0.521	0.867
Self-conscious or embarrassed	0.443	0.871
Felt tense because of oral health problems	0.695	0.857
Diet unsatisfactory	0.580	0.864
Interruption of meals	0.577	0.864
Difficulty to relax	0.610	0.862
Embarrassed by problems	0.459	0.870
Irritable with other people	0.550	0.865
Difficulty doing usual jobs	0.521	0.867
Found life less satisfying	0.649	0.861
Unable to perform usual functions	0.533	0.866

* - Abbreviated phrases used to represent the inventory items

that have been used to validate the English version of the OHIP-14 measure. The quantification of the OHIP in this study has involved the use of both the ordinal Likert scale with a total additive score and a categorization into dichotomous scoring of "reported impact" or "did not report impact" on QoL. Both approaches have been found useful in previous studies (21-23) and neither has been recommended in favour of the other.

The findings from this study revealed that the prevalence of impacts determined by the OHIP-14 inventory was 82.8%. This value is quite high compared to reports from elsewhere; impact prevalence of 15.7% was reported amongst Australians using the same OHIP-14 scale (9), 15.3% in Americans (9) and 15.1% amongst Hispanic Americans (2). The characteristics of the participants selected for the present study may be contributory to the very high prevalence of reporting impacts of oral health status on QoL as the sample consisted of patients being seen at the dental clinic. Liu et al. (22) in a cross-sectional study conducted in Shanghai found a prevalence of reporting impacts of 13% and 57% amongst healthy subjects and those with oral mucosal diseases respectively ($p < 0.001$). Furthermore, a previous cross-sectional study conducted on secondary school students in Nigeria, which recruited apparently healthy "non clinic presenting" 12 to 16 year olds reported a prevalence of 14.7% (23). Robinson et al. (16), on

the other hand, reported a prevalence of impact of 88.2%, using the OHIP measure, amongst British dental patients.

The mean OHIP score in this study (11.2) suggests a relatively high impact of oral health status on quality of life, possibly as a result of the dental disease status of the patients, which necessitated their presentation in the first instance. It is expected that those who have oral symptoms severe enough for them to see a dentist will attribute a greater impact on their quality of life due to their oral health status. Similarly, a high mean OHIP score of 10.8 was reported among patients with oral mucosal diseases in Shanghai (22). High mean scores have also been documented in pregnant women (24) and the elderly (11).

The most frequently reported activity affected by oral impacts with OHIP-14 was painful aching in the mouth, followed by difficulty in eating and relaxing. Pain is a major worry of patients with oral conditions and is the major reason why they present to dental clinics (25). It is therefore not surprising that it is the most commonly reported impact of oral health status in the participants. Difficulty with eating also occupies a predominant position on the OHIP-14 scale further reinforcing the importance of eating to individuals.

There is no consensus on the criteria to be used in assessing the validity, reliability and responsiveness of oral health related quality of life

measures (10). We selected the criteria adopted for the present study based on popularity of usage as found during our literature search. This study showed satisfactory face and content validity of the OHIP-14 measure in the sampled population. The questionnaire was quite easy to administer and completed in a relatively short period of time. The small number of constituent items (14) could have contributed to encouraging a high participation rate and the ease of administration. Further evidence had been given by the ability of very low item non-response with the use of OHIP-14 self administered questionnaire (26). Based on our results and with the literacy rate in the country, it seems reasonable to suggest, as others have noted (24), that the OHIP-14 questionnaire can be understood by less educated individuals in resource challenged settings.

The criterion validity examines the ability of a measure to behave as expected if the theoretical basis behind the construct was true. In this study, it was assessed by comparing the OHIP score and number of reported OHIP-14 inventory items with the global self-rating of oral health and the perceived treatment needs. The hypothesis that those who reported impacts on their quality of life are more likely to self-rate their oral health status as poorer and equally perceive a need for treatment were confirmed to be true. The measure is thus able to discriminate between groups of patients based on their categorization of global self-rating of oral health status and perceived need for treatment.

The construct validity in this study was done by relating the OHIP scores with oral examination findings. The construct validity of the measure was only able to significantly discriminate between those respondents with clinical oral conditions using DMFT caries experience index and the decayed teeth in the expected direction. This corresponds with the findings of other authors (26-28). Although the measure was able to discriminate between respondents with mobile teeth and missing teeth in the expected direction, it was not statistically significant. However, of note is the significant association between respondents who had loss of attachment and OHIP-14, which occurred in the opposite direction from what was expected, higher proportion of respondents without attachment loss had OHIP-14 score greater than zero. This finding may be explained

by the chronic nature of periodontitis; attachment loss is an advanced form of chronic periodontitis in which pain may not be evident, even when there is dentinal exposure and patients may adapt over a period of time, depending on the degree, until there is pulpal exposure that brings so much pain. Further explanation for this could be that loss of attachment is commoner in the older age group in whom reduced expectations about oral health has been found (28). Additionally, only 10–20% of populations have severe periodontal disease represented by attachment loss, whereas the majority has milder forms of periodontal disease such as gingivitis, which tend to be painful (29, 30).

In the present study, OHIP-14 measure showed adequate reliability in terms of its internal consistency. The Cronbach's alpha score for the OHIP-14 was high (0.88) and above the recommended value of 0.70 (20). The Cronbach's alpha value for the OHIP-14 is similar to the value (0.88) reported in its original derivation study (4).

That the alpha coefficient for each of the subscale items was within the acceptable boundaries suggest that the English version of the OHIP-14 as translated is appropriate for use in the setting and development of a *de novo* version of Nigerian OHIP-14 or Yoruba OHIP-14 is not necessary.

This study was conducted in a country with different ethnic groupings and over 250 languages. We recognize the limitations of not being able to generalize the findings of the study conducted in one city to the entire country without exercising caution. The cultural experiences of the different ethnic groups differ and may ultimately influence the impact profile of individuals.

In conclusion, the OHIP-14 measure showed good psychometric properties with satisfactory face, content, construct and criterion validity as well as good internal consistency in adult patient population in Ibadan, Nigeria.

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