Validation of General Oral Health Assessment Index in a Cohort of Rural Dwellers in Southwestern Nigeria

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ABSTRACT

Objective: To determine the psychometric properties of the General Oral Health Assessment Index (GOHAI) in a sample of adult rural dwellers in Southwestern Nigeria.
Methods: This cross-sectional study was conducted among 395 adults attending dental outreach programs in Igboora, Nigeria. A translated interviewer administered questionnaire comprising socio-demographic characteristics, GOHAI questions, self-rating of oral health and satisfaction with dental appearance was used to obtain data. Oral examination was also performed. The data obtained was analyzed for reliability and validity of GOHAI using SPSS and p value was set at <0.05%.
Results: The GOHAI score of respondents ranged from 5 to 60. Many 283 (71.6%) reported at least an impact of oral condition on quality of life (OHRQoL). The most reported impairment was the use of medication to relieve pain (221, 55.9%). GOHAI demonstrated excellent internal consistency with a Cronbach alpha of 0.97. Principal component analysis resulted in extraction of one factor; Kaiser-Meyer-Olkin measure was 0.96 and Bartlett's test was significant (p<0.001). GOHAI was able to discriminate between those with periodontal treatment needs (p<0.001), missing teeth (p<0.001) or decayed teeth (p=0.001) and those without those oral findings. Higher GOHAI scores (less impact on OHRQoL) correlated negatively with poor self-rating of oral health (rs = -0.72, p<0.001) and dissatisfaction with dental appearance (rs = -0.70, p<0.001). More males (p=0.012) and divorced respondents (p=0.016) reported impacts on OHRQoL than others.
Conclusion: GOHAI has acceptable psychometric properties and validity among underserved adults living in a rural Nigerian community.
Keywords: GOHAI. OHRQoL. Oral health. Psychometric properties. Quality of life. Validity.

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INTRODUCTION

Rural communities are faced with poorer access to oral health care and consequences of poor oral health when compared to urban regions. The prevalence of oral diseases such as periodontal diseases is high in rural communities and many inhabitants have poor oral hygiene.[1,2] In addition, quite a number of residents of such communities live with unmet dental needs due to inaccessibility of oral health care services and low level of awareness of the importance of oral health among other socio-cultural factors.[3] Although many rural dwellers have high unmet dental needs, the quantification of the burden of the suboptimal oral health status has not been adequately evaluated based on how it affects their daily activities.

Evaluation of the effects of oral conditions on the daily activities of individuals has been done commonly using oral health related quality of life (OHRQoL) measures.[4] Oral health related quality of life measures are used to complement clinical indices.[5] These measures have been found beneficial

as they describe how the daily activities of individuals are impaired or facilitated by oral conditions.[6] They also have the advantage over clinical indices of taking into consideration individuals' perspectives about their health.[4,6]

OHRQoL measures have gained popularity as they are useful in planning and evaluation of oral health programs.[4,6] Although some of these indices have been used in Nigeria and their applicability determined,[7-10] the General Oral Health Assessment Index (GOHAI) has not been appropriately evaluated for its psychometric properties. GOHAI is one of the various indices with items addressing positive and negative impacts of oral condition on quality of life.[11] It was initially developed for use among the older age group[11] but has been found valuable among adults and younger age groups.[11] It has the advantage of minimizing lack of report of an impact as it has a comprehensive list to describe how oral health may affect daily activities.[12] The comprehensiveness of the index and the reporting of positive and negative impacts are quite beneficial in underserved areas with poorer access to oral health care and relatively lower literacy levels as obtains in rural communities. Despite these advantages, the cultural adaptation of the instrument is yet to be ascertained among Yoruba speaking rural dwellers who are highly influenced by culturally norms. This study therefore assessed the psychometric properties of GOHAI in a sample of rural dwellers in Southwestern Nigeria thereby determining its validity and reliability in this population.

MATERIALS AND METHODS

A cross sectional study design was used to achieve the study objectives. The study site was Igboora, Southwestern Nigeria. Igboora, a largely rural and agrarian community, is the head-quarters of the Ibarapa Central Local Government Area of Oyo State. A minimum sample size of 384 adults was obtained from a calculation using a sample size formula for cross sectional studies.[13] A prevalence of 50% was assumed since there was no previous (similar) population-based study on the OHRQoL measure. The study participants were adults attending dental outreach programs conducted in the community over a period of six months. All individuals aged 18 years and above who gave consents to participate were recruited for the study. Those who were ill, non-resident in the community for a period of six months or longer and those who did not understand Yoruba language, the indigenous language of the community, were excluded from the study. Ethical approval was obtained from the Oyo State Ethics Review Committee.

Data were collected with an interviewer administered questionnaire and by conducting an oral examination. Prior to the oral health education activities, participants were addressed and the purpose of the study was explained to them. This was followed by obtaining consent from each participant and the questionnaire was administered. The questionnaire comprised of sociodemographic variables, the 12 items of the GOHAI with three positive worded questions assessing the impact of oral health and nine questions assessing negative impact of oral health on daily activities. The responses to the questions were recorded on a Likert scale with the following interpretations: 0 – never, 1 – seldom, 2 – sometimes, 3 – often, 4 – very often and 5 – always. The questionnaire was translated into Yoruba language by two independent bilinguals, Yoruba and English-speaking individuals, whose native language was Yoruba. The differences noted in the translated questionnaires were discussed and an agreement reached. The questionnaire was thereafter adjusted appropriately. The translated questionnaire was back translated by another independent expert versed in both English and Yoruba languages. The back translated questionnaire was compared with the original questionnaire and there was hardly any difference between the two versions. The questionnaire was pre-tested among 40 residents of Idere community, the adjacent town in Ibarapa Central Local Government Area to ascertain the comprehensiveness of the questionnaire, face validity and feasibility of the study.

The total GOHAI score for each respondent was calculated by summing up the scores (additive GOHAI scores) for each item after reversing the scores for the nine negatively worded questions as done in the original derivation of the instrument.[6,11] Thus, higher total scores implied less impact on quality of life and positive oral health.[6,11]

In addition, oral examination was conducted using sterile instruments by a trained and calibrated dentist assisted by a trained research assistant who recorded the oral examination findings into the oral health assessment form. Oral examination was done with the participants seated upright on a chair. Natural light served as the source of illumination for the examination. Oral examination allowed the charting of dental caries and decayed teeth as present or absent.[14] Participants with gingival bleeding or periodontal pockets were charted as

having periodontal disease.[14] Participants with oral conditions that required treatment were referred to the Community Dental Clinic, Igboora for treatment and they were followed up.

The validity of the GOHAI was assessed by evaluating its face, concurrent and discriminant validity. The face validity of the questionnaire was evaluated by asking a three-member team of dentists to describe what the questionnaire assessed. Those dentists did not have prior knowledge of the aims and objectives of the study. In addition, face validity was evaluated during the pretest at Idere. Concurrent validity was assessed by correlating GOHAI scores with self-perceived oral health and satisfaction with oral condition. Discriminant validity was assessed by the ability of GOHAI to discriminate between those with oral conditions and those without oral conditions.

Reliability of the instrument was assessed using Cronbach alpha and a score > 0.7 considered acceptable.[15] The corrected inter-item correlation was also assessed. In addition, factor structure was assessed using principal component analysis at eigenvalue of 1. Kaiser-Meyer-Olkin measure of sampling adequacy was performed. Bartlett's test of sphericity was also conducted to determine redundancy among the GOHAI items.

Data obtained was analyzed with Statistical Package for Social Sciences (SPSS) version 23. Inter examiners' variability was assessed using Kappa's statistics. The association between GOHAI score and oral examination findings was assessed using chi square statistics and GOHAI score was recoded into two categories (those with no impact i.e. GOHAI score of 60 and those with at least an impact i.e. score ≤ 59). Spearman correlation was used to assess the association between GOHAI scores and satisfaction rating of oral health as well as self-rating of oral health. Item correlation with total GOHAI score was assessed using Spearman correlation coefficient r_s. The level of statistical significance was set at $p < 0.05$.

RESULTS

A total of 395 residents of Igboora community aged 18 to 100 years participated in the study. All the individuals approached for the study consented to participate making the response rate 100%.

There were 225 (57.0%) females. Many, 232 (58.7%), were married; half of the participants, 199 (50.4%), had no formal education and 251 (63.5%) were unskilled workers. Many, 222 (56.2%), rated their oral health as good or very good and 225 (57.0%) were satisfied with the appearance of their teeth (Table 1). The GOHAI score ranged from 5 to 60: the median score was 54.0 and mean score was 46.4 (±14.9). Many, 283 (71.6%), reported at least an impact of oral condition on their quality of life. The most reported item was use of medication to relieve pain (55.9%) followed by inability to chew or limitation of amount of food (54.3%) (Table 2).

A hundred and twenty-eight (32.4%) respondents had decayed teeth, 172 (43.5%) had at least a missing tooth and 213 (53.9%) had periodontal disease. The face validity showed that there was no disagreement between the team of dentists as to what the questionnaire assessed. During the pretest, interaction of the interviewing team and the residents of Idere community revealed that emphasis must be placed on the interpretation of the double negative questions that is GOHAI items three, five and seven. This happened because the three questions in the original GOHAI are positively worded and should be interpreted as such compared to the other nine questions that are negatively worded to avoid confusion and probable wrong answers. Concurrent validity was shown as higher GOHAI scores correlated with dissatisfaction with dental appearance ($r_s = -0.72$, $p < 0.001$) and poorer rating of oral health ($r_s = -0.70$, $p < 0.001$). For discriminant validity; a higher proportion of those with decayed teeth, missing teeth, pain and periodontal diseases had impact on their OHRQoL than those without these oral health findings (Table 3).

The Cronbach alpha, a measure of internal consistency, was 0.97 and the value was reduced with deletion of any of the item. Factor dimension analysis of GOHAI showed that only one component was extracted. The factor loadings ranged from 0.65 to 0.81. The Kaiser-Meyer-Olkin measure of sampling adequacy was 0.96 and Bartlett's test of sphericity was < 0.001. In exploring the relationship between GOHAI scores and sociodemographic characteristics, a higher proportion of males (78.2% vs. 66.7%, p = 0.012) and the divorced (86.4% vs. 72%, p = 0.016) had more impacts on their quality of life compared to others (Table 4). Multivariate analysis showed that males (OR = 2.1, 95% CI = 1.3 - 3.5, p = 0.004) and those who were divorced (OR = 2.4, 95% CI = 1.3 - 4.4, p = 0.004) had higher odds of having poorer OHRQoL than others

DISCUSSION

This study assessed the validity and reliability of GOHAI in a Yoruba speaking rural, largely agrarian, community in South West Nigeria. The community was selected as the study site because of the typical

poor access to oral health care and low literacy levels in such underserved communities. Tools that measure the impact of oral health on the quality of life of individuals and are comprehensive enough involving both positive and negative impacts are quite helpful to the community dentists and allied professionals in evaluating the oral health status of individuals in the communities. This advantage can be explored in similar settings and can bridge the gap in evaluation of oral health status of individuals in underserved communities, especially if the tool is found to have good psychometric properties.

Table 1: Sociodemographic and important characteristics of participants

Variable	Frequency	%
Gender n =395		
Male	170	43.0
Female	225	57.0
Age (years) n =395		
≤30	47	11.9
31- 59	179	45.3
≥60	169	42.8
Marital status n =379		
Single	27	7.1
Married	232	61.2
Divorced	22	5.8
Widowed	98	25.9
Occupational class n = 395		
Skilled	34	8.6
Unskilled	251	63.6
Dependents	110	27.8
Educational qualification n = 395		
None	199	50.4
Primary	50	12.7
Secondary	64	16.1
Post-secondary/ Tertiary	82	20.8
Self-rating of oral health		
Very good	55	13.9
Good	167	42.3
Neither good nor poor	40	10.1
Poor	108	27.3
Very poor	25	6.3
Satisfaction rating of dental appearance		
Very Satisfied	57	14.4
Satisfied	168	42.5
Neither satisfied nor dissatisfied	46	11.6
Dissatisfied	91	23.0
Very dissatisfied	33	8.4

The results of this study showed that GOHAI has acceptable validity and reliability among the studied population. The face validity of the GOHAI was assessed at pretest and during the conduct of the study and was reported to have assessed how oral conditions affected daily activities. The importance of interpreting the positive worded items (GOHAI items three, five and seven) was emphasized to avoid confusion with the sequence of the other negative worded questions.

The GOHAI measure was able to discriminate between individuals with and without oral diseases. It was able to discriminate significantly between those with periodontal diseases, dental caries, missing teeth and pain, thus supporting its discriminant validity. The finding corresponds to those documented in other studies.[11,12,16,17] There

was also a strong correlation between GOHAI scores and self-rated oral health as well as satisfaction with dental appearance. Participants who rated their oral health status as good and those satisfied with their dental appearance had higher GOHAI scores and thus better OHRQoL. GOHAI measure thus demonstrated good concurrent validity with other measures of same construct of subjective assessment of oral health. This finding has been similarly reported by others.[11,16]

Table 2: GOHAI items and frequency of impairment

GOHAI item	Frequency	%
Limit the kinds of food	203	51.4
Trouble biting or chewing	215	54.4
Swallow comfortably	168	42.5
Prevent from speaking	177	44.8
Eating without discomfort	186	47.1
Limit contact with people	193	48.9
Pleased or happy with looks	187	47.3
Used medication to relieve pain	221	55.9
Worried or concerned	168	42.5
Felt nervous or self-conscious	163	41.3
Uncomfortable eating in front of people	164	41.5
Gums sensitive to hot, cold or sweet	207	52.4

Table 3: Discriminant validity of GOHAI: Association between GOHAI and oral examination findings

Oral findings	GOHAI		X^2	p value
	No Impairment n (%)	Impairment n (%)		
Dental caries			11.624	0.001*
Present	22 (17.2)	106 (92.8)		
Absent	90 (33.7)	177 (66.3)		
Missing teeth			41.959	< 0.001*
Present	20 (11.6)	152 (88.4)		
Absent	92 (41.3)	131 (58.7)		
Pain			3.953	0.047*
Present	4 (12.9)	27 (87.1)		
Absent	108 (29.7)	256 (70.3)		
Periodontal treatment needs				
Present	34 (16.0)	179 (84.0)	34.944	< 0.001*
Absent	78 (42.9)	104 (57.1)		

* Statistically significant

Table 4: Sociodemographic characteristics with significant association with GOHAI

Sociodemographic variable	GOHAI		X^2	P value
	No impairment n (%)	Impairment n (%)		
Age (years) n =395				
≤30	16 (34.0)	31 (66.0)	4.138	0.126
31- 59	57 (31.8)	122 (68.2)		
≥60	29 (26.4)	130 (76.9)		
Gender n =395				
Male	37 (21.8)	133 (78.2)	6.380	0.012
Female	75 (33.3)	150 (66.7)		
Marital status n =379				
Single	10 (37.0)	17 (63.0)	10.305	0.016
Married	73 (31.5)	159 (68.5)		
Divorced	3 (13.6)	19 (86.4)		
Widowed	17 (17.3)	81 (82.7)		
Occupational class n = 395				
Skilled	8 (23.5)	26 (76.5)	0.892	0.640
Unskilled	75 (29.9)	176 (70.1)		
Dependents	29 (26.4)	81 (73.6)		
Educational qualification n = 395				
None	55 (27.6)	144 (72.4)	2.400	0.494
Primary	11 (22.0)	39 (78.0)		
Secondary	18 (28.1)	46 (71.9)		
Post-secondary/ Tertiary	28 (34.1)	54 (65.9)		

The internal consistency as assessed by Cronbach alpha had a value of 0.97, which was excellent,[15] thus confirming that the questions contained in the GOHAI measure are of the same construct. In addition, none of the items when deleted resulted in higher Cronbach alpha value. This also confirms that all the items making up GOHAI measure are essentially important when the index is used among individuals in underserved communities. The Cronbach alpha value of 0.97 obtained in this study is higher than values obtained in other studies; 0.79 in Los Angeles,[11] 0.79 in Malaysia,[18] 0.77 in Mexico[19] and 0.80 - 0.86 in the Netherlands.[12] Sociocultural variations in the various study sites may be responsible for the differences noted in values.

The GOHAI measure was further evaluated using Principal Component Analysis (PCA), after satisfying Bartlett test of sphericity and Kaiser-Meyer-Olkin measure of sampling adequacy.[20] One **factor** was extracted from the PCA and factor loadings ranged from 0.65 to 0.81, which is considered high and above the recommended value.[20] These findings further demonstrate that the GOHAI items are of the same construct, strongly correlated with each other and that the GOHAI measure has good internal consistency when used among individuals in underserved communities. Similar findings, outside underserved communities, have been reported by others.[11,16]

The most commonly reported GOHAI item by participants of this study was use of medication to relieve pain. The high rate of self-medication, a consequence of poor utilization of dental services[21] and low level of awareness,[22] which had been observed among the population are possible reasons. Contrasting results to medication use as the most frequently impaired GOHAI item was reported in the Netherlands.[12] In the Netherlands, trouble eating and chewing food was the most impaired activity among care dependent participants of that study while worries about teeth, gums and denture was noted among care independent participants.[12] In addition, trouble eating and chewing was noted as second to worries about teeth, gums and dentures among the care independent participants. The important role of food and nutrition in human behavior and its association with the oral cavity may explain this finding. Trouble eating and chewing food

was also observed as the second most impaired activity in the present study.

More males were observed to have reported impacts of oral condition on their OHRQoL compared to females. The meticulousness of females with oral health practices and likelihood of reduction of oral diseases among females may be a reason for this. Shao et al.[23] had reported similar findings while the converse had been documented by Ulinski et al.[24] and some authors[16] did not find any significant relationship between gender and OHRQoL. Marital status was associated with GOHAI scores and participants who were divorced had oral conditions impacting more often on their OHRQoL. The loss of effect of partner reinforcement of positive oral healthcare behavior may be a possible explanation, although this is yet to be fully evaluated

In conclusion, the GOHAI has acceptable psychometric properties and validity among underserved adults living in a rural Nigerian community. A limitation of this study was the use of convenience sampling for a cohort of adults attending dental outreach programmes rather than a more robust random sampling technique.

Competing interest

There is no competing interest involved in the conduct of the study

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