

Translation and validation of the Arabic version of the Geriatric Oral Health Assessment Index (GOHAI)

Shaher Daradkeh¹⁾ and Yousef S. Khader²⁾

¹⁾Ministry of Health, Irbid, Jordan

²⁾Health and Medical Sciences Sector, Higher Council for Science and Technology, Department of Community Medicine, Public Health and Family Medicine, Faculty of Medicine, Jordan University of Science and Technology, Irbid, Jordan

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Abstract: Our aim was to translate the original English version of the Geriatric Oral Health Assessment Index (GOHAI) into Arabic and assess its validity and reliability for use among people in North Jordan. After translation into Arabic and back-translation to check the translation quality, a total of 288 participants completed the Arabic version of the GOHAI questionnaire. Individual GOHAI items were recoded and summed as originally recommended. The questionnaire sought information about socio-demographic characteristics and self-reported perception of general and oral health. Clinical examination included assessment of periodontal status, and number of decayed teeth, missing teeth, filled teeth and crowned teeth. Reliability, internal consistency, and concurrent, convergent and discriminant validity of GOHAI scores were examined. Mean GOHAI score was 40.9 (SD = 10.6, range: 12 to 60). Cronbach's alpha for the GOHAI score was 0.88, indicating a high degree of internal consistency and homogeneity between the GOHAI items. The test-retest correlation coefficient for add-GOHAI scores was 0.72, indicating good stability. Add-GOHAI scores increased with poorer perceived general and oral health. Convergent validity, construct validity and discriminant validity of the GOHAI were demonstrated. The Arabic translation of the GOHAI

demonstrated acceptable validity and reliability when used for people in North Jordan. It could therefore be used as a valuable instrument for measuring oral health-related quality of life for people in this region. (J. Oral Sci. 50, 453-459, 2008)

Keywords: validity; reliability; oral health; quality of life; Arabic; Jordan.

Introduction

Measures of oral health-related quality of life (OHQoL) are essential for epidemiological and clinical studies in order to provide accurate data for health promotion, disease prevention programs and allocation of health resources (1). Other uses of such measures were described by Fitzpatrick et al. (1) and Slade and Spencer (2). Most of the OHQoL instruments (2-6) that have been shown to have adequate validity and reliability are based on three main dimensions: physical symptoms, perception of well-being and functional capacity. Among the most commonly used instruments is the Geriatric Oral Health Assessment Index (GOHAI) (3). This has been validated and widely used in North America. Its internal consistency is satisfactory and its concurrent and construct validity have been confirmed (7). Swedish (8), Malay (9), Chinese (10) and French (11) versions have shown acceptable reliability and validity. However, none of the indicators of OHQoL have been validated in Arabic for use among people in North Jordan.

It is important that an adopted instrument should be culturally relevant and valid for the local population while demonstrating acceptable psychometric properties (12-14). It is therefore essential to carry out a rigorous translation and validation process of the instrument when used in

Correspondence to Dr. Yousef S. Khader, Health and Medical Sciences Sector, Higher Council for Science and Technology, Department of Community Medicine, Public Health and Family Medicine, Faculty of Medicine, Jordan University of Science and Technology, Irbid 22110, Jordan
Tel: +962-795435025
Fax: +962-2-7201064
E-mail: yousef.k@excite.com

another population with a different culture. Therefore, this study was conducted to translate the original English version of the GOHAI into Arabic and validate it to evaluate the impact of oral disease on the quality of life of people in north Jordan

Methods

Study population

A total of 300 consecutive people who had attended North Badia Comprehensive Health Center for any reason over a period of two months were invited to participate in this study. After providing verbal consent to participate, 290 (96.7%) people were clinically examined. Two subjects were excluded from the study because their questionnaire answers were incomplete, leaving 288 to be included in the analysis.

Translation and scoring of the GOHAI

The GOHAI was translated into Arabic by two dentists who were fluent in both English and Arabic. The Arabic draft was then back translated into English by another two people fluent in both Arabic and English. The back-translated version was compared with the original English version to verify that the questions were properly translated. All of the back-translated items were worded similarly to the original ones and were comparable in their meaning. The Arabic draft was then discussed by three dentists who found that it would aid understanding to rephrase the questions in the form of simple statements instead of question format without changing their meaning. For example, GOHAI item 1 "How often do you limit the kinds or amounts of food you eat because of problems with your teeth or dentures?" was restated as: "Because of problems with my teeth or dentures, I limit the kinds or amounts of food I eat".

Individual GOHAI items were recoded and summed as originally recommended. Two summary scores were calculated. Add-GOHAI was calculated as the sum of values of responses to the 12 items for each participant with the resulting score ranging from 12-60. Simple count score (SC-GOHAI) was calculated by counting the number of GOHAI items with responses "sometimes", "often", or "always". Less than 5% of values were missing, and these were replaced with the median of all values in the series.

Questionnaire

In addition to the 12 items of the GOHAI, the questionnaire included socio-demographic characteristics such as age, sex, educational level, marital status, employment, and income. Subjects were also asked about their perception of their general and oral health, whether

they were satisfied with their dental condition, their assessment of their need for dental treatment, pain or discomfort due to temporomandibular joint (TMJ) disorders, burning mouth sensation, sensation of TMJ clicking, and bad oral habits such as biting objects. Because of the high illiteracy rate in North Badia, the questionnaire was completed through personal interview.

Clinical examination

The researchers assessed periodontal status and number of decayed teeth, missing teeth, filled teeth, and crowned teeth. Sterile dental mirrors and standardized periodontal probes were used to measure probing pocket depth (PPD) and clinical attachment level (CAL). PPD was measured from the gingival margin to the bottom of the crevice to the nearest millimeter (mm). If the cement-enamel junction (CEJ) was exposed, CAL was measured by reading off the distance from the CEJ or the margin of fixed restoration to the base of the pocket. In other cases it was measured indirectly by subtracting the distance from the gingival margin to the CEJ from the pocket depth, with the tip of the probe used to feel for the CEJ level. In both cases, CAL was measured to the nearest mm.

PPD and CAL were measured at six sites (mesio-facial, mid-facial, disto-facial, mesio-lingual, mid-lingual, and disto-lingual) per tooth for all teeth, excluding third molars. The number of decayed teeth, filled teeth, and missing teeth for each participant were recorded. Periodontitis was defined as presence of four or more teeth with PPD ≥ 4 mm and CAL ≥ 3 mm at one site or more.

Reliability

Cronbach's alpha was calculated to assess the degree of internal consistency and homogeneity between items (15). Pearson's correlation coefficient was used to measure item-scale correlation to assess the correlation between the individual items and their scale score. To assess test-retest reliability, 30 participants repeated the GOHAI one week after the questionnaire was first administered. Test-retest reliability was measured using Pearson's correlation coefficient for individual items and for the overall GOHAI score.

Validity

Concurrent validity was investigated by examining the degree to which the GOHAI scores were related to the scores of four self-reported items: general health, oral health, need for dental care, and satisfaction with oral health status. We assessed the ability of the GOHAI to distinguish between groups of people with different responses to these self-reported items, which it should

theoretically be able to do. Convergent validity was evaluated by examining the association between GOHAI scores and objective assessment of oral and dental status (number of missing teeth, number of decayed teeth, and the presence or absence of periodontal disease) and self-reported symptoms with hypothesized effects on oral health-related quality of life: TMJ pain, burning mouth sensation, and bad breath). It was predicted that subjects who did not have one of such symptoms would have better oral health-related quality of life and thus higher GOHAI scores compared with subjects who had that symptom (11,16). Discriminant validity was evaluated by examining the association between GOHAI scores and self-reported bad oral habits that were hypothesized not to be notably associated with oral health-related quality of life (16) and thus to have no effect on GOHAI scores.

Statistical analysis

Statistical Package for Social Sciences (SPSS, version 11.5) software was used to analyze data. Frequency distributions were produced. Means and standard deviations of the dependent variables (Add-GOHAI and SC-GOHAI scores) were estimated and compared among different groups of the study population using a *t*-test or one-way ANOVA as appropriate. Pearson's correlation coefficient was used to measure item-scale correlations. Responses to the 12-item questionnaire were subjected to factor analysis using squared multiple correlations as prior communality estimates. The principal components method of factor extraction and varimax method of factor rotation were used in factor analysis. A *P*-value of less than 0.05 was considered statistically significant.

Results

Participants' characteristics

A total of 288 participants (155 men and 133 women) agreed to participate and completed the GOHAI questionnaire. Their socio-demographic characteristics are shown in Table 1. Their mean age (\pm SD) was 33.4 (\pm 13.2) years. A total of 134 (48.6%) respondents were 30 years of age or younger and 184 (63.9%) were married. Monthly income was 160 JD or less (1 \$ = 0.7 JD) for 106 (50.7%) respondents, and only 44 (15.3%) had attained more than high school education. More than two thirds of participants (70.7%) reported that they visited the dentist only when they had pain and 118 (42.6%) reported that they brushed their teeth once or more per day.

Self-perceived general and oral health

Table 2 shows the distribution of respondents according to different self-reported ratings of health. Seventy-one

Table 1 Socio-demographic and important characteristics of participants

Variable	n	(%)
Gender		
Male	155	(53.8)
Female	133	(46.2)
Age (year)		
\leq 30	134	(48.6)
$>$ 30	142	(51.4)
Marital status		
Married	184	(63.9)
Not married	104	(36.1)
Educational level		
Illiterate	80	(27.8)
High school or less	164	(56.9)
More than high school	44	(15.3)
Income (JD)		
\leq 160	106	(50.7)
$>$ 160	103	(49.3)
Smoking habit		
Smoker	89	(30.9)
Non-smoker	199	(69.1)
Visit to the dentist		
Regular	39	(13.6)
Not regular	45	(15.7)
On pain	203	(70.7)
Tooth brushing		
\geq 1/ day	118	(42.6)
Not regular	109	(39.4)
Never	50	(18.1)

(24.8%) respondents reported that they had excellent general health and 95 (33.2%) reported that they had very good general health. Only 11.5% of the participants reported that they had excellent oral health and 18.1% perceived their oral health as being very good. Three quarters of the subjects perceived themselves as needing dental treatment. Only 36.9% of participants were satisfied with their oral health status.

Oral health

Oral health examination showed that 65.6% of subjects had at least one decayed tooth, 61.8% had at least one missing tooth, 49.0% had one or more filled teeth, and 16.3% had one or more crowned teeth. Periodontal disease was present in 33.3% of the subjects.

Acceptability of and responses to the Arabic version of the GOHAI

The frequency of missing responses for GOHAI items ranged from 0.1% to 3.8%. Using the "add scoring" method, only one subject had a minimum score of 12, indicating the greatest possible impact from oral conditions, and 9

Table 2 Distribution of participants according to self-reported health-related ratings

Variable	Frequency	
	n	(%)
Self-reported general health		
Excellent	71	(24.8)
Very good	95	(33.2)
Good	78	(27.3)
Moderate	32	(11.2)
Bad	10	(3.5)
Self-reported oral health		
Excellent	33	(11.5)
Very good	52	(18.1)
Good	77	(26.8)
Moderate	81	(28.2)
Bad	44	(15.3)
Self-perceived need for dental care		
Yes	216	(75.0)
No	72	(25.0)
Self-reported satisfaction with oral health		
Yes	106	(36.9)
No	181	(63.1)
Self-reported TMJ pain during last month		
Yes	106	(36.8)
No	182	(63.2)
Self-reported TMJ clicking during last month		
Yes	68	(23.7)
No	219	(76.3)
Self-reported bad breath		
Often	35	(12.2)
Sometimes	128	(44.6)
Rarely	48	(16.7)
Never	76	(26.5)
Self-reported burning mouth sensation		
Yes	63	(22.2)
No	221	(77.8)
Self-reported bad oral habits		
Yes	99	(34.4)
No	189	(65.6)

TMJ: Temporomandibular joint

(3.1%) subjects had the maximum score of 60 indicating no impact. When the SC scoring method was used, 21 (7.3%) subjects had a score of zero and 11 (3.8%) subjects had the maximum score of 12. The most common negative impact (sometimes, often, or always) was sensitivity of teeth or gums to hot, cold, or sweets.

Mean GOHAI score was 40.9 (SD = 10.6, range: 12 to 60). The mean number of negative impacts (sometimes, often, or always) was 6.1 (SD = 3.5, range: 0 to 12).

Factor analysis, reliability, and validity

Only one component was extracted. The factor loadings ranged from 0.51 to 0.78 for all items except for item 5. Cronbach's alpha for the GOHAI was 0.88, indicating a high degree of internal consistency and homogeneity

between the GOHAI items. The item-scale correlation coefficients ranged from 0.53 to 0.77 for all items except item 5, which had a correlation coefficient of 0.27. The mean values of the individual GOHAI items were close to each other. Test-retest correlation coefficients ranged from 0.41 to 0.75 for all individual items except item 5, which had a test-retest coefficient of 0.01. The test-retest correlation for the total add-GOHAI score was 0.72 indicating good stability.

Concurrent validity for the GOHAI was evaluated by examining the correlation between self-perceived general and oral health status and the two GOHAI summary scores (Table 3). Add-GOHAI scores increased with poorer perceived general and oral health. As self-reported general and oral health decreased, SC score (number of negative impacts) increased, indicating poorer health and oral health-related quality of life. Furthermore, people who perceived themselves as needing dental care or those who were not satisfied with their oral health status had a significantly lower mean GOHAI and higher mean SC-GOHAI scores, indicating poorer oral health-related quality of life.

As predicted, lower add-GOHAI scores were associated with self-reported TMJ pain, burning mouth sensation, and bad breath, a finding that supports convergent validity (Table 4). Participants who had one or more missing or decayed teeth had lower add-GOHAI scores than those who had no missing or decayed teeth. Those with periodontal disease had lower add-GOHAI scores than those without periodontal disease ($P < 0.005$), supporting construct validity of the add-GOHAI.

Discriminant validity was evaluated by examining the association between GOHAI scores and self-reported bad oral habits which were hypothesized not to be notably associated with oral health-related quality of life and thus have no effect on the GOHAI scores. Table 5 shows that there was no statistically significant difference in GOHAI scores between those who reported bad oral habits and those who did not. Moreover, GOHAI could not discriminate between participants according to the number of filled or crowned teeth.

GOHAI scores were also studied among groups known to have different levels of health. Results were as expected. Respondents who were older than 30 and those with a low level of education had lower add-GOHAI and higher SC-GOHAI scores. GOHAI discriminated between the subjects according to tooth brushing; those who regularly brushed their teeth had higher add-GOHAI scores than others (Table 6).

Table 3 Concurrent validity: Correlation between self-reported general and oral health and the Geriatric Oral Health Assessment Index (GOHAI) scores

Item	Pearson's correlation coefficient	
	Add-GOHAI	SC-GOHAI
Self-perceived general health (1 = excellent, 2 = very good, 3 = good, 4 = fair, 5 = poor)	- 0.30	0.31
Self-perceived oral health status (1 = excellent, 2 = very good, 3 = good, 4 = fair, 5 = poor)	- 0.70	0.69

Table 4 Convergent validity: Differences in the average of the Geriatric Oral Health Assessment Index (GOHAI) scores (Add-GOHAI and SC-GOHAI) according to self-reported responses to different health-related questions and objective assessment of oral health

Item	n	Add-GOHAI Mean \pm SD	P-value	SC-GOHAI Mean \pm SD	P-value
Self-reported TMJ disorder pain during last month			< 0.005		< 0.005
No	182	43.4 \pm 10.6		5.2 \pm 3.6	
Yes	106	36.5 \pm 9.0		7.6 \pm 2.7	
Self-reported burning mouth sensation			< 0.005		< 0.005
No	221	42.5 \pm 10.5		5.6 \pm 3.6	
Yes	63	35.3 \pm 8.5		7.9 \pm 2.5	
Self-reported bad breath			< 0.005		< 0.005
Never	76	46.5 \pm 9.8		4.1 \pm 3.2	
Rarely	48	45.6 \pm 9.0		4.6 \pm 3.4	
Sometimes	128	37.7 \pm 9.8		7.2 \pm 3.2	
Often	35	33.3 \pm 6.9		8.5 \pm 2.2	
Periodontal disease			< 0.005		< 0.005
No	192	43.4 \pm 10.1		5.3 \pm 3.5	
Yes	96	35.8 \pm 9.8		7.6 \pm 3.1	
Missing teeth			< 0.005		< 0.005
\geq 1	178	37.9 \pm 9.7		7.0 \pm 3.2	
0	110	45.7 \pm 10.2		4.6 \pm 3.5	
Decayed teeth			< 0.005		< 0.005
\geq 1	189	38.8 \pm 10.0		6.8 \pm 3.2	
0	99	44.9 \pm 10.5		4.8 \pm 3.6	

TMJ: Temporomandibular joint

Table 5 Discriminant validity: Differences in the average of the Geriatric Oral Health Assessment Index (GOHAI) scores (Add-GOHAI and SC-GOHAI) according to variables that have no predicted effect on oral health related quality of life

Item	n	Add-GOHAI* Mean \pm SD	P-value	SC-GOHAI* Mean \pm SD	P-value
Self-reported bad oral habits			0.435		0.174
No	189	41.2 \pm 11.0		5.9 \pm 3.6	
Yes	99	40.2 \pm 9.8		6.5 \pm 3.4	
Filled teeth			0.215		0.077
\geq 1	140	40.1 \pm 10.1		6.5 \pm 3.4	
0	146	41.7 \pm 10.9		5.7 \pm 3.6	
Crowned teeth			0.147		0.297
\geq 1	47	38.8 \pm 10.4		6.6 \pm 3.1	
0	241	41.3 \pm 10.6		6.0 \pm 3.6	

* *t*-test

Table 6 Association between variables with predicted effect on oral health-related quality of life and the GOHAI score

Item	n	Add-GOHAI Mean \pm SD	P-value	SC-GOHAI Mean \pm SD	P-value
Age (year)			0.005		0.009
\leq 30	134	42.8 \pm 10.4		5.5 \pm 3.5	
$>$ 30	142	39.2 \pm 10.2		6.6 \pm 3.3	
Educational level			$<$ 0.005		$<$ 0.005
Illiterate	80	37.5 \pm 10.0		7.2 \pm 3.4	
High school or less	164	41.9 \pm 10.5		5.7 \pm 3.5	
More than high school	44	43.3 \pm 10.5		5.4 \pm 3.4	
Tooth brushing			$<$ 0.005		$<$ 0.005
\geq 1/ day	118	42.7 \pm 10.8		5.5 \pm 3.5	
Not regular	109	40.5 \pm 10.3		6.2 \pm 3.4	
Never	50	36.4 \pm 9.0		7.5 \pm 3.2	

Discussion

This study examined the validity and reliability of the GOHAI Arabic version in a selected group of people in north Jordan. The GOHAI, which was originally developed and tested in well-educated, elderly Americans (3) has also been demonstrated suitable in younger, poorly educated populations.

When used among Jordanian people, the Arabic version of the GOHAI showed acceptable validity and reliability. However, it was noticeable that the proportion of subjects reporting discomfort when eating anything (Q5) was lower than that reporting other problems. This item was also atypical in other ways. It had a low item-scale correlation and was poorly correlated with other items. The most likely explanation is that this item was one of three items worded in a positive direction while the remaining items were worded in a negative direction, which might have caused a misunderstanding. The three positively worded items had the lowest item-scale correlations.

Factor analysis extracted only one component. Factor loadings ranged from 0.51 to 0.78 for all items except for item 5, suggesting that the Arabic version of GOHAI demonstrated good internal consistency. Cronbach's alpha coefficient (0.88) was comparable to that obtained from the French version (0.86) (12) and higher than those for versions of the GOHAI in other languages, which varied from 0.74 to 0.81 (3,8-10,17). Item-scale correlations varied from 0.27 to 0.77 in the Arabic version, compared with 0.28 to 0.61 in the Chinese version (10) and 0.40 to 0.78 in the French version (11).

When 30 subjects retook the questionnaire one week after it was first administered, the test-retest correlation coefficient between the add-GOHAI scores was 0.72. This finding was similar to that reported for the Malay version (0.72) (9) and lower than that reported for the French version (0.87) (11).

Self-rating of oral health was poor and perception of need for dental treatment was very high, indicating a substantial negative impact of oral conditions among this population. The low socio-economic status of this population may explain the relatively large negative impact of oral conditions on functioning and well-being.

Concurrent validity of the Arabic GOHAI version was comparable to that of the original English GOHAI version (3). The analysis demonstrated the expected associations between the GOHAI score and the reported oral and general health status, perceived need for dental treatment, and self satisfaction with oral health. Lower add-GOHAI scores were associated with poorer perceived oral and general health, need for dental care, and low satisfaction with oral health.

Regarding convergent validity, this study supported others (2) in showing that people with TMJ pain, burning mouth sensation, or self reported bad breath had lower add-GOHAI scores than those who did not have these symptoms. Bad oral habits did not have any significant effect on the GOHAI score. However, education and employment were important factors influencing the GOHAI score, as reported previously (7,17).

This study found significant relationships between the GOHAI and certain clinical measures including number of missing teeth, number of decayed teeth, and periodontal status. However, associations between the GOHAI score and the number of filled or crowned teeth were not significant. Missing and decayed teeth affect eating, esthetics, and speech, and dental decay may cause pain and discomfort. Periodontal diseases cause tooth mobility, tooth loss, limiting the ability to eat comfortably and resulting in esthetic and speech problems. On the other hand, fillings and crowns are designed to restore as much of the lost function and esthetics as possible, accounting for the fact that those with filled and crowned teeth did

not score significantly worse on the GOHAI than others.

In conclusion, the Arabic translation of the GOHAI demonstrated acceptable validity and reliability when used for people in north Jordan. It could therefore be a valuable instrument for measuring oral health-related quality of life for people in this region. Further research is needed to examine the stability of the GOHAI over different periods of time and to examine it as a tool to evaluate dental treatment outcomes in the Jordanian population.

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