Validation of the Geriatric Oral Health Assessment Index (GOHAI) in the Malay Language

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Abstract

***Objective**: To translate and validate the Geriatric Oral Health Assessment Index (GOHAI into the Malay language for use in Malaysia. **Methodology**: The 6-Likert scale GOHAI was translated into the Malay language and self-administered on 189 subjects aged 60+. All subjects underwent oral status assessment. The measure was assessed for construct and discriminant validity, for test-retest reliability and principal component factor. **Findings:** Mean GOHAI score was 46.2 (SD 9.7, range 17-60). The Cronbach's alpha was 0.79. Mean GOHAI scores increased with more positive self-rated oral health and general health. The elderly with no perceived dental treatment need had higher mean GOHAI scores than those with perceived needs. There were slightly stronger inverse correlations between GOHAI scores and caries experience, number of teeth present, and number of pathologically mobile teeth. The measure demonstrated strong test-retest reliability. Eight of the 12 items had Spearman's r ³ 0.7. Only one principal factor was found at eigenvalue > 1. Using ANCOVA, self-rated perception of oral health and perceived need for dental treatment had the most significant impact on the GOHAI score. **Conclusion and recommendations:** The Malay language version of the GOHAI demonstrated acceptable validity and reliability and will be an important instrument to measure oral health-related quality of life among Malay-speaking Malaysians. Use of the Malay language version GOHAI should also be pursued among diverse adult age groups.*

Key Words: Oral health, GOHAI, quality of life, elderly

Introduction

In anticipation of an increase in the elderly population aged 60 years and more (1), the Ministry of Health Malaysia (MOH) formulated guidelines in 2001 for a national oral healthcare program for the elderly (2). The guidelines suggest use of a measure to assess the impact of oral conditions on quality of life (QoL) of individuals. The Geriatric Oral Health Assessment Index (GOHAI) was considered and a collaborative project to adapt and validate the GOHAI was initiated in 2002.

The 12-item GOHAI was developed to evaluate three dimensions of oral health-related QoL which includes: 1) physical function including eating, speech and swallowing; 2) psychosocial function including worry or concern about oral health, dissatisfaction with appearance, self-consciousness about oral health and avoidance of social contacts because of oral problems and 3) pain or discomfort including the use of medication to relieve pain or discomfort from the mouth (3).

Since its development (4), the GOHAI has been translated into Spanish (5), Chinese (6) and French (7). The index has been found valid for use on younger adults (5,7) with satisfactory psychometric properties among ethnically diverse samples (5) and on differing groups of elderly (8). It has been referred to as the GENERAL Oral Health Assessment Index (3). A study by Matthias *et al.* (9) found the GOHAI to be a significant predictor of self-ratings of dental appearance in an elderly population. The GOHAI has been tested as an outcome measure (5,8,10). Dolan (1997) (10) evaluated the sensitivity of the GOHAI to dental treatment with other self-reported measures of oral health, and findings suggest that the GOHAI is sensitive to dental treatment provision.

The objective of this study was to cross-culturally adapt and validate the English language GOHAI into the Malay language as a survey instrument for research or for clinical purposes in Malaysia.

Methods

Two accredited translators translated the GOHAI into the Malay language and two others independently back translated both versions into English. A seven-member Review Panel led by the principal author assessed the translations. Two pre-tests were undertaken to determine comprehension and readability of the Malay language version, and to check for equivalence of items between the two languages. Four trained interviewers assessed volunteers for language proficiency, based on verbal translation and contextual understanding of a passage in Malay into English. Volunteers completed both versions of the GOHAI, either version randomly administered first to avoid bias. Interviewers probed answers to ascertain equivalent meaning to the original.

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Each volunteer rated the equivalence of each item (1=not equivalent, 2=not quite equivalent, 3=neutral, 4=almost equivalent, and 5=completely equivalent).

The first pre-test was on 13 bilingual volunteers who met the criteria for language proficiency. This was a convenient sample from an urban area with mean age of 63 years (SD 8.0), the majority (77%) with secondary education level (11 years of education) or higher, and comprising the three major ethnic groups in Malaysia. Feedback elicited was incorporated into a second version that underwent the same processes on 11 volunteers of mean age 46 years (SD 5.0), were multiethnic and with the majority (91%) of tertiary education level. The final version was based on a consideration of equivalence ratings, agreements using Bland Altman's test and Spearman's rank correlation coefficients for each item. Consensus was for the best common way to express a concept in the Malay language.

In the second phase five urban areas - north, east, south, west and central - of Peninsular Malaysia were chosen for slight language differences. Subjects were those who met the criteria from new patients at MOH facilities ("clinic") and from among the elderly in the community, from day-care centers and homes for the elderly ("community"). The inclusion criteria were: Malaysians aged 60+, literate and proficient in the Malay language, and to avoid bias from recent contact, the review panel decided on the criteria "must not have had dental treatment in the current year." Sample size calculation was based on test-retest reliability measured by the intra-class correlation (r). The assumed expected GOHAI r was 0.8. An r of 0.7 or higher would have been acceptable.

$H_0 : P_0 = 0.7$ and $H_1 : P_1 = O.8$.

Using a two-sided test suggested by Walter *et al.* (11) with b=0.1 (90% power) and a=0.05, 162 subjects were required. Sample size was inflated to 180 assuming a dropout rate of 10%. The translated GOHAI was self-administered to avoid interviewer bias, followed by an oral status examination. For test-retest reliability, the GOHAI was re-administered within 1-14 days.

Table 1
Characteristics of subjects

Patient Characteristics (N=189)	n	%	Mean GOHAI score	SD	p-value
GOHAI Score			46.2	9.7	
Range				17 - 60	
Gender[a]					.52
Male	126	66.7	46.5	10.0	
Female	63	33.3	45.5	9.0	
Ethnic Group[b]					.99
Malay	170	89.9	46.1	9.8	
Chinese	12	6.3	46.8	9.1	
Indian/Pakistani	6	3.2	45.3	8.5	
Others	1	0.5	44.0	0.0	
Education Level[b]					.31
No formal education	3	1.6	36.7	13.3	
Primary	79	41.8	46.2	10.4	
Secondary	90	47.6	46.7	9.1	
Tertiary	17	9.0	44.6	8.2	
Wears removable denture[a]					0.06
No	111	58.7	47.3	8.9	
Yes	78	41.3	44.6	10.5	
Perceived need for dental treatment[b]					<0.001
No	47	24.9	52.0	7.3	
Yes	132	69.8	44.4	9.6	
Don't know	10	5.3	41.4	9.6	
Perceived general health[b]					0.03
Good	104	55.0	47.8	9.3	
Fair	74	39.2	43.9	9.8	
Poor	11	5.8	45.5	10.0	
Perceived oral health[b]					<0.001
Good	101	53.4	49.5	8.7	
Fair	74	39.2	42.3	9.5	
Poor	14	7.4	42.2	8.7	

[a] *Independent t-test*
[b] *ANOVA*
Significance level set at p<0.05

Data included age, gender, ethnic group and education level, denture-wearing status, perception of dental treatment need, and perception of health and oral health. The scope of oral status assessment followed that of Atchison and Dolan (1990) (4) to include types of oral lesions, teeth present, crown and root caries (12) and pathological tooth mobility (13). The Oral Hygiene Index-Simplified (OHI-S) was used (14). Five dental officers were calibrated against a benchmark examiner. Examiners achieved >85% agreement for oral lesions and "moderate or higher" Kappa scores (15,16) for OHI_S and tooth mobility, and "substantial or higher" Kappa scores for caries assessment.

The 6-point Likert scale rating was utilized (4). Data were not used if there were missing data for 3 or more items. If there were missing data for 2 or fewer, the item mean was substituted for the missing value (3). The GOHAI score ranged from 0 to 60. A higher GOHAI score indicates better self-reported oral health status.

Pearson's chi-square was used to assess percentage differences and Independent t-test and ANOVA were used to assess mean GOHAI scores for demographic variables. The hypothesis for construct validity was that higher GOHAI scores were asso-

Table 2
Percentage distribution of subjects on individual GOHAI items

No. Item	0 never	1 seldom	2 sometimes	3 often	4 v. often	5 always
PHYSICAL FUNCTION						
1. Limit the kinds of food	38.6	11.1	30.7	6.3	5.8	7.4
2. Trouble biting or chewing	28.0	15.9	28.0	15.3	5.3	7.4
3. Able to swallow comfortably	10.1	5.8	9.0	10.6	5.8	58.7
4. Unable to speak clearly	59.3	15.9	14.8	4.2	2.1	3.7
PAIN / DISCOMFORT						
5. Able to eat without discomfort	9.0	6.3	19.6	12.7	7.9	44.4
8. Used medication to relieve pain	59.3	15.3	17.5	4.2	2.1	1.6
12. Sensitive to hot, cold or sweet foods	45.0	16.9	28.6	3.2	2.1	4.2
PSYCHOSOCIAL						
6. Limit contacts with people	80.4	6.9	7.4	2.1	0.5	2.6
7. Pleased with look of teeth	10.1	8.5	20.6	8.5	6.9	45.5
9. Worried about teeth, gums or dentures	46.6	16.4	21.7	5.8	2.1	7.4
10. Self-conscious of teeth, gums or dentures	68.8	12.2	9.5	5.8	1.6	2.1
11. Uncomfortable eating in front of others	62.4	11.1	14.8	5.3	1.1	5.3

0=never, 1 = seldom, 2= sometimes, 3 = often, 4 = very often, 5 = always
The scores were maintained for items 3, 5 and 7 and reversed for the remaining 9 items so that a higher score was associated with more positive oral health GOHAI score range 0-60

ciated with no perceived treatment need, and better self-reported health and oral health. Health and oral health self-ratings were scored 3=good, 2=fair, and 1=poor. For discriminant validity, GOHAI score associations with oral conditions were examined using Spearman's rank correlation coefficients (r). Internal consistency was assessed by Cronbach's alpha. Item-scale correlation coefficients were used to assess correlation of each item with the GOHAI score. Spearman's r and weighted kappa were calculated to assess the test-retest reliability. A principal component factor analysis with varimax rotation was conducted. Factors with eigenvalue greater than 1 were extracted. Analysis of covariance (ANCOVA) was used to investigate the effects of independent variables on the GOHAI score. The selected variables were: gender, age, ethnic group, education level, single-item self-rated oral health perception, health perception and perceived dental treatment need, denture-wearing, types of oral lesions, OHI_S score, teeth present, DMFT, root DFT and mobile teeth scored 2. The significance level was set at 0.05, and only significant variables were retained in the final model. STATA V 8 was used for data analysis.

Results

Subjects' characteristics are shown in Table 1. Mean age was 67.1 (SD 5.5; range 60-92 years). The majority (53%) were from the community, with "clinic" and "community" having similar characteristics in terms of sociodemographic characteristics, oral health status, and wearing of dentures. Two-thirds were males, the majority was Malays and had achieved primary (6 years of education) and secondary (11 years of education) education levels.

Responses to the GOHAI items tended to "never", "sometimes" or "always', with few utilizing in-between responses (Table 2). Non-parametric tests were thus applied for variables against GOHAI scores. The majority perceived that they needed dental treatment (69.8%) and more than half rated their health and oral health as good. The mean GOHAI score was 46.2 (SD 9.7, range 17 – 60) with 75% of subjects scoring 41 and more (Table 1).

Mean GOHAI scores are also shown in Table 1 and ranged from 36.7 (SD 13.3) to 52 (SD 7.3). There was a higher mean GOHAI score with no perceived dental treatment need ($p<0.001$), and an increasing trend of mean GOHAI scores with better self-reported oral health ($p<0.001$); and to a lesser extent health ($p=0.03$), supporting assumptions for construct validity.

Hypotheses for discriminant validity were that higher GOHAI scores would be associated with higher number of teeth present; and lower GOHAI scores would be associated with higher caries experience, OHI_S score, number of pathologically mobile teeth and number of oral lesions. These expectations were fulfilled although weak (Table 3).

Cronbach's alpha for the translated GOHAI was 0.79. Item-scale correlation ranged from 0.38 - 0.69 and were strong in the majority (Table 4). The lowest value was 0.38 for item 3 ("able to swallow comfortably"). Test-retest weighted kappa varied from "moderate" (0.41 – 0.6) to "substantial" (0.61 – 0.8), the lowest for item 7 ("pleased with look of teeth") (Table 4). Two thirds of the 12 items had Spearman's r of 0.7 and above.

It was concluded that the Malay language GOHAI fulfilled the assumptions for construct and discriminant validity, that there is high internal consistency between items, and that the measure showed very satisfactory test-retest reliability.
The principal factor analysis per-

formed for eigenvalue greater than 1, and rotated loading factor of at least 0.40, found only one factor, this finding being similar to that of Atchison and Dolan (1990)(4). This explained 79% of the total variance.

Results of the ANCOVA performed are shown in Table 5. For this group, self-rated oral health, and perceived dental treatment need have significant impact on the GOHAI score. For this elderly group, it appears that perception of their own oral health and need for dental treatment impact most on quality of life.

Discussion

Malay or *Bahasa Melayu* is the official language of Malaysia, and although akin to the Indonesian language (*Bahasa Indonesia*), it differs in colloquialisms and pronunciations. Within Malaysia, the Hall of Language and Scriptures *(Dewan Bahasa dan Pustaka)* regulates standards of the language. Yet, differences exist between Peninsular Malaysia and East Malaysia (Sabah and Sarawak) on the island of Borneo. Differences also exist in language use between different areas within Peninsular Malaysia itself.

The Malaysian population is multiethnic; hence, language use not only varies between areas of Peninsular Malaysia itself but also between the different ethnic groups. Due to the cultural diversity, there was much deliberation on the best common way to express the GOHAI items in the Malay language. This necessitated two pre-tests of the translations. However, this study is still considered a good field study of the Malay language version GOHAI due to majority involvement of the Malay group and recruitment of subjects from different areas exhibiting differences in language use.

Following studies on translations of GOHAI (5-7), the authors kept closely to the original 6-category Likert scale (4). It was considered that the 1990 sentinel study "underpinned" all GOHAI studies and that the scores could be later rescored as described by Atchison (1997) (3). There were no changes in the order of items and their positive and negative directions, unlike that of the Chinese translation, which changed the direction of four questions and the order of items to have a mix of positively and negatively worded items (6).

The GOHAI scores in this study were found to be lower than that of the Medicare sample (4) and when rescored to the 5-point scale were found to be slightly higher than that for the Chinese version (6) (Table 6). The effect of cultural influences on the GOHAI scores cannot be discounted. The frequency distributions of items demonstrate that this group of Malaysian elderly tended towards "modest" responses, in spite of being shown a

Table 3
Oral health status and Spearman's Rank Correlation Coefficient with GOHAI scores

Oral Status Parameter		Spearman's Rank Correlation Coefficient with GOHAI score
DMFT		-0.20
Mean (SD)	20.2 (8.6)	
Range	2 - 32	
Teeth Present		0.20
Mean (SD)	15.0 (9.7)	
Range	0 - 30	
Oral Hygiene Index Simplified (OHI_S)		-0.03
Mean (SD)	1.6 (1.5)	
Range	0 – 5.8	
Root Caries		-0.12
Mean (SD)	1.0 (1.9)	
Range	0 - 13	
Teeth with pathological mobility (> 2 mm and/or can be depressed into socket)		-0.15
Mean (SD)	0.8 (1.6)	
Range	0 - 8	
Number of oral lesions (by type)		-0.02
Mean (SD)	0.1 (0.3)	
Range	0 - 2	

Table 4
Item-scale and test-retest correlation for GOHAI items

Item	Item-Scale Correlation	Test-retest Correlation: Weighted Kappa	Test-retest Correlation: Spearman's Rank Correlation Coefficient
Overall GOHAI score		.70	.88
1=limit kinds of food	.58	.59	.72
2=trouble biting or chewing	.63	.57	.71
3=able to swallow comfortably	.38	.51	.53
4=unable to speak clearly	.53	.49	.62
5=able to eat without discomfort	.50	.55	.63
6=limit contact with people	.57	.49	.51
7=pleased with look of teeth	.55	.41	.44
8=used medication to relieve pain	.54	.72	.78
9=worried about teeth, gums, dentures	.64	.60	.72
10=self-conscious of teeth, gums, dentures	.69	.59	.71
11=uncomfortable eating in front of people	.69	.67	.84
12=sensitive to hot/cold/sweet foods	.50	.70	.78

Mean GOHAI Score 46.2 (SD 9.7); range 17-60, Cronbach's alpha = 0.79

Kappa

< 0 = poor, 0.0 – 0.2 = slight, 0.21 – 0.4 = fair, 0.41 – 0.6 = moderate, 0.61 – 0.8 = substantial, > 0.8 = almost perfect

Table 5
GOHAI score and selected independent variables (ANCOVA)

Variables	Coefficient	Standard Error	p-value
Single item self-rated perception of oral health			0.01
Good	5.44	2.82	
Fair	0.47	2.76	
Poor*			
Single item perceived dental treatment need			0.05
Yes	6.21	3.33	
Don't know	1.96	3.00	
No*			
Intercept	43.40		

Reference category*
F-value = 3.04. df=24, 164; p-value < 0.001

card with graphical presentation of frequency differences as an aid to responses. This may have had an effect on the overall GOHAI scores. Item response distributions also showed that this literate group of elderly tended towards broad terms of "never", "sometimes" or "always". The implication is that consideration for future use of GOHAI in Malaysia should consider the 3-point Likert scale cited in Atchison (1997) (3).

For the psychosocial items 6 ("limit contact with people"), 10 ("self-conscious of teeth, gums or dentures") and to a certain extent 11 ("uncomfortable eating in front of people"), the majority answered "never", suggesting that this group of Malaysian elderly does not regard oral conditions as barriers to social interactions. This study explored discriminant validity as was done for the French study (7). As GOHAI is an assessment tool and not an objective measure, correlation between oral conditions and GOHAI scores were weak as expected, although there were slightly stronger correlations for caries experience, teeth present and self-rated oral health as hypothesized. The high internal consistency, good item-scale correlations and satisfactory test-retest reliability for all items confirm the robustness of the GOHAI similar to other studies involving ethnic and cultural diversity (5-7).

The lowest item-scale rating was for item 3 "able to swallow comfortably", originally included to assess xerostomia (4). It is likely that it is easier to conceptualize frequency of discomfort rather than comfort. This suggests that it may be necessary to reconsider negative wording of this item similar to that of the Chinese translation (6). Similar to the results of Atchison and Dolan (1990) (4), at eigenvalue of 1 or more with factor loadings of at least 0.4, only one factor emerged for this Malay language version of the GOHAI. Hence, there were no distinct "groups" of items as shown in the Chinese translation, which found three distinct factors (6).

Conclusion

The Malay language GOHAI fulfilled the assumptions for construct validity and for discriminant validity, with correlations found between GOHAI scores and caries experience, teeth present and number of pathologically mobile teeth. There was high internal consistency between items and satisfactory test-retest reliability. The single-item self-rated perception of oral health and perceived dental treatment need were found to have the most significant impact on the GOHAI score.

It is concluded that the Malay language GOHAI has demonstrated acceptable validity and reliability and will prove an important measure for the assessment of oral health-related quality of life among Malay-speaking Malaysians. However, use of the measure needs to further explore the 3-category response in the socio-cultural context of multiethnic Malaysia. Further research should pursue interviewer-administration of the Malay translation for the illiterate faction of the population. Socio-cultural diversity may warrant further refinement of language for each item if administered to other groups of Malaysians. Use of the Malay version GOHAI should also be pursued among diverse adult age groups.

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Table 6
Comparison of GOHAI Findings

Authors	Sample size	Mean age	Number of response categories (Range)	GOHAI Score Mean	sd	Range
Atchison & Dolan (1990) (4)	1,755	74	6 (0-5)	52.5	7.8	5-60
Atchison & Dolan (1990) rescored (4)	1,911	NA	5 (1-5)	53.8	6.7	16-60
Wong et al (2002) (5)	1,023	72.3	5 (1-5)	48.9	7.2	22-60
This study	189	67.1	6 (0-5)	46.2	9.7	17-60
This study rescored	189	67.1	5 (1-5)	51.1	6.7	29-60

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