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Validation of the Jamaican version of the Oral Health Impact Profile (OHIP-14) in adults: JAM-OHIP study

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ABSTRACT

Background: *The Oral Health Impact Profile (OHIP-14) is a widely used tool for measuring the effects of oral health-related quality of life (OHRQoL). However, the validity of the OHIP-14 in the Jamaican context, referred to as the Jamaican Oral Health Impact Profile (JAM-OHIP), has yet to be established.* **Purpose:** *This study aims to determine the validity of the Jamaican language version of the OHIP in evaluating the OHRQoL of Jamaican adults.* **Methods:** *The original English version of the Oral Health Impact Profile (OHIP-14) was translated into the Jamaican language using forward and backward translation. The JAM-OHIP was used to evaluate the OHRQoL of 236 individuals at the University of the West Indies Dental Polyclinic. The overall fit was checked using a chi-square test ($p > 0.05$), comparative fit index (CFI), Tucker–Lewis index (TLI), root mean square error of approximation (RMSEA), and standardized root mean square residual (SRMR).* **Results:** *More DMFT ($p < 0.01$) was associated with high JAM-OHIP scores, and the most impacted domain was physical pain. Cronbach's alpha and the standardized item alpha for the JAM-OHIP were 0.82. The overall fitting results for the CFA were $\chi^2(68) = 80.558$, $p = 0.142$, and $\chi^2/g.l. = 1.185$. The CFI and TLI were 0.996 and 0.994, respectively. The SRMR was 0.072 and the RMSEA was 0.028 ($CI_{95\%} = [0.000; 0.050]$) $p = 0.953$.* **Conclusion:** *The JAM-OHIP instrument was shown to be reliable and valid for the assessment of OHRQoL in the Jamaican adult population.*

Keywords: oral health; quality of life; surveys and questionnaires

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INTRODUCTION

Health-related quality of life (HRQoL) refers to the extent to which health influences the attainment of a fulfilling life. This is heavily influenced by culture, values, and biases, which may affect the conceptual and colloquial translation of the psychological and social aspects often associated with the psychometric qualities of HRQoL.[1] Oral health-related quality of life (OHRQoL) is an essential component of general health and well-being[2] and can impact the construct of HRQoL.[3] OHRQoL refers to one's perception of how oral health impacts an individual's life quality and overall well-being.[4] It is relevant to both children and the elderly.[5,6]

The Oral Health Impact Profile (OHIP) is a tool designed to evaluate the impact of oral conditions on a person's quality of life. The OHIP-14 is a concise version used to evaluate OHRQoL through the assessment of seven domains: functional limitation, physical pain, psychological discomfort, physical disability, psychological disability, social disability, and handicap.[7] It was proven to have strong validity, reliability, and precision[7] and has been validated in several languages.[8] The importance of this instrument both for research and for clinical practice justifies the number of validations.

The OHIP-14 has been previously used in an adult Jamaican population;[9] however, to date, there are no OHRQoL measures that have been adapted to the Jamaican

culture and language. The Jamaican language is considered the native language of Jamaicans. It is believed that those with lower levels of education and of socio-economic status are better able to communicate using this language.[10] Therefore, the aim of this study was to adapt the original English version of the OHIP-14[7] to the Jamaican language and test its validity and reliability for use among adults of the Jamaican population.

MATERIALS AND METHODS

Ethical clearance (ECP 157,17/18) was granted by the ethics committee of the University of the West Indies (UWI) before embarking on this study. All participants in this study gave written and informed consent.

An initial version of the Jamaican language version of the OHIP-14, referred to as the Jamaican Oral Health Impact Profile (JAM-OHIP), was developed using forward translation by native Jamaican language specialists. Two independent native Jamaicans unacquainted with the English version conducted the backward translations. The backward translations and the OHIP-14 were compared to assess for major differences in their construct. This version was then subjected to a pretest, in which a sample of 10 individuals native to Jamaica were interviewed. Following each item, the individuals were asked the open-ended question "What does this mean?" in order to evaluate their understanding of each item of the JAM-OHIP. The translators further evaluated the results from the pretest and made the necessary modifications. Based on these modifications, the final JAM-OHIP version was derived.

This cross-sectional study was carried out at the UWI Mona Dental Polyclinic (UMDP). Patients aged 18 to 59 years old undergoing treatment at the UMDP participated in the study. Exclusion criteria included participants who had pain that prevented them from speaking with ease; were unable to answer all the questions; had a hearing impairment and/or speaking difficulties; were not of Jamaican nationality; presented with emergency oral conditions, such as Ludwig's angina and space infections that extended to the throat causing dyspnea, dysphagia, and/or dysarthria; and were unwilling to participate in the study.[7]

A pilot study was conducted with 35 individuals to analyze the reliability of the JAM-OHIP. The Cronbach's alpha value of the JAM-OHIP was estimated to be 0.869, representing a good internal consistency. Furthermore, for the item-total correlation coefficients, most were above 0.20, which is the recommended minimum value for including an item in a scale. At this stage, the instrument proved to be adequate. It was well understood by its respondents, it was easy to apply by the examiners, and psychometric results were sufficient for a test sample.

Five examiners (AO, CL, SW, LD, BT) were trained and calibrated in two separate steps.[11] First, the diagnosis of caries using the decayed, missing, and filled teeth (DMFT) index was discussed. This was followed by inter-examiner

calibration in which a gold standard examiner (MAB) used the DMFT index to examine twenty individuals. After two weeks, these same individuals underwent intra-examiner calibration. The Kappa values for inter-examiner and intra-examiner agreement were > 0.89.[9]

Clinical data was collected using the DMFT index under natural light with ball-point probes and mirrors.[9,11] Each participant completed a self-administered questionnaire, which included sociodemographic data and oral hygiene habits. Oral hygiene habits included brushing teeth (yes/no); frequency of brushing teeth; use of fluoride toothpaste (yes/no); use of dental floss (yes/no); and motive for dental visit (toothache, checkup/oral prophylaxis, periodontal treatment, fabrication of crown/bridge/prosthesis, tooth extraction, root canal treatment, fillings for caries, fillings for aesthetic reasons, and other aesthetic treatments).[9]

A Jamaican language specialist was recorded reading the items in the JAM-OHIP questionnaire. The video was shown to all the participants who responded to each question by rating their oral health from 0–4 (0 = never, 1 = hardly ever, 2 = occasionally, 3 = fairly often, 4 = very often).

All the analyses were performed using R Core Team[12] version 4.0.0 within the RStudio[13] interface, alongside the lavaan,[14] EFAtools,[15] semPlot[16] and psych[17] packages. Sociodemographic data were descriptively analyzed and included the mean, standard deviation, and relative frequency. Internal consistency was assessed using Cronbach's alpha and item-total correlations. We considered acceptable values between 0.7 and 0.9 for Cronbach's alpha and values > 0.3 for item-total correlations.[18,19] A Mann–Whitney test was used to assess the construct validity through the association of the DMFT with the JAM-OHIP scores.

Further statistical analysis included two preliminary tests to verify the adequacy of the sample in order for exploratory factorial analysis (EFA) to be done: the Kaiser–Meyer–Olkin (KMO) measure of sampling adequacy (MSA) and Bartlett's test of sphericity, which tests the hypothesis that the items are uncorrelated, that is, whether the matrix is factorable or not.[20,21] A value of ≥ 0.6 for the overall KMO MSA was considered suitable for factor analysis.[21] In addition, individual measures of MSA for all items must be > 0.5 to be considered acceptable.[20] To identify the number of factors to retain, a parallel analysis (PA) was cosidered.[20] Then, after the number of factors was specified, an EFA was done to explore the dimensional structure of the instrument. Following the general recommendation by Osborne,[22] the extraction method used in EFA was Principal Axis Factoring (PAF)[20] with promax oblique rotation.[21,23] As Tavakol and Wetzel[24] suggest a moderate correlation between the item and the factor, we considered 0.3 as a good rule of thumb for the minimum loading of an item, and communalities above 0.4 were considered acceptable.[25,26] As a general rule, the proportion of the total variance explained by the retained factors should be at least 50%.[27] We also determined the reliability through Cronbach's

alpha for each factor separately by including the selected items only. Since the variables of the questionnaire were ordinal, we considered the polychoric correlation matrix over the Pearson correlation matrix for all the analyses.[28]

Finally, to test our hypothetical factorial model created through the EFA, we conducted a confirmatory factorial analysis (CFA) and used a path diagram representing the factor's structure. For parameter setting, the Diagonally Weighted Least Squares (DWLS) estimators and a polychoric correlation matrix were used. After running the model, we checked the overall fit through the chi-square test, comparative fit index (CFI), Tucker–Lewis index (TLI), root mean square error of approximation (RMSEA), and standardized root mean square residual (SRMR). For the chi-square test, the hypothesis of a perfect fit cannot be rejected, thus its p-value should be > 0.05. Lastly, its relationship with the degrees of freedom (d.f) was also used, and the reference value considered was χ^2 /d.f < 3.[29]

RESULTS

Altogether, 236 individuals participated in the study with a mean age of 35.56 years (SD ±15.4), with the majority being females (63.6%), residents in the city (69.1%), employed (61.4%) with tertiary education (57%), and with an income of three or more minimum wages (Table 1).

Table 1. Demographic background of the Jamaican adult subjects (n = 236). Jamaica, 2019–2020

Variable	n	%
Sex		
Female	150	63.6
Male	86	36.4
Resides in a City		
No	73	30.9
Yes	163	69.1
Race		
Black	216	91.5
Mixed	16	6.8
White	2	0.8
Indian and Chinese	2	0.8
Marital Status		
Single	181	76.7
Married	51	21.6
Divorced	2	0.8
Widowed	2	0.8
Level of Education		
Primary level 1d	23	9.7
Secondary level 1d	95	40.3
Tertiary level 1d	98	41.5
Skilled/technical course	20	8.5
Employment Status		
Unemployed	6	2.5
Student	85	36.1
Employed	145	61.4
Minimum Wage		
Less than a minimum wage	83	35.2
One minimum wage	21	8.9
Two minimum wages	39	16.5
Three or more minimum wages	93	39.4

The mean DMFT value was 8.9 (SD ±6.6), with 3.6 (SD ±3.8) decayed, 3.3 (SD ±4.8) missing, and 2.2 (SD ±3.0) filled teeth. Finally, all individuals answered that they brushed their teeth, while 154 (65.3%) responded that they used dental floss. The main reasons for visiting the dentist were checkup/oral prophylaxis (67.4%), fillings for caries (11.9%), tooth extraction (7.2%), and toothache (6.8%).

When OHRQoL data was analyzed, a high level of oral health impacts was noted. The mean total score of the JAM-OHIP was 12.7 (SD 10.2) and the most impacted domain was physical pain, with a mean value of 3.7 (SD 2.8). The psychological discomfort domain was also highly prevalent (mean 2.3, SD 2.5), followed by physical disability (mean 2.2, SD 2.5) and psychological disability (mean 1.5, SD 2.4) domains. The least impacted domains were functional limitation (mean 1.0, SD 1.7), social disability (mean 1.0, SD 1.9), and social handicap (mean 0.8, SD 1.8). The final version of the JAM-OHIP and its descriptive analysis of the studied sample are presented in Table 2.

The construct validity was tested according to the oral health status of the participants (Table 3). More decayed and missing teeth and less natural and filled teeth (p < 0.01) were seen in participants who had high JAM-OHIP scores. When the association between the JAM-OHIP and the individual components of the DMFT were evaluated, participants with higher components D (p = 0.02), M (p < 0.01), and F (p = 0.03) had increased scores, proving the tool's capability to discriminate between groups.

The internal consistency, measured through the Cronbach's alpha value of the JAM-OHIP, was 0.82. The inclusion of all items was necessary because deleting a single item each time produced alpha values lesser than the original value (values for Cronbach's alpha coefficients, if an item was removed, were between 0.79 and 0.81). A positive correlation for all items was seen in the matrix of inter-item correlations. Table 4 shows that the item-total correlation coefficients were all above 0.30, which indicates excellent internal consistency.

The KMO MSA suggests that data seems appropriate for factor analysis (overall KMO = 0.82 and the KMO index for each item ranged from 0.74 to 0.88). Additionally, Bartlett's test of sphericity showed significance at 0.05, indicating that these data are likely appropriate for conducting factor analysis (χ^2(91) = 913.71, p < 0.001). Parallel analysis suggested that the number of factors is 4. The EFA was then performed considering the structure of these four factors. The communalities range from 0.435 (Item 1: difficult to pronounce words) to 0.789 (Item 9: difficult to relax), i.e., above the cut-off value of 0.4. The proportion of the total variance explained by the factors was 63.6%, greater than the general rule of at least 50%.

Cronbach's alpha values and confidence intervals with 95% significance ($CI_{95\%}$) for the domains were 0.78 (lower $CI_{95\%}$: 0.73 and upper $CI_{95\%}$: 0.82) for "psychosocial impact", 0.72 (lower $CI_{95\%}$: 0.66 and upper $CI_{95\%}$: 0.78) for "physical impact", 0.7 (lower $CI_{95\%}$: 0.63 and upper $CI_{95\%}$:

0.76) for "psychological impact", and 0.55 (lower CI$_{95\%}$: 0.46 and upper CI$_{95\%}$: 0.64) for "social impact".

The CFA showed a hypothetical model with four factors for the JAM-OHIP. The overall fitting results for the CFA were $\chi^2(68) = 80.558$, p = 0.142, and χ^2 /g.l. = 1.185. The CFI and TLI were 0.996 and 0.994, respectively. Additionally, the SRMR was 0.072 and the RMSEA was 0.028 (CI$_{95\%}$ = [0.000; 0.050]) with a p-value of 0.953 for the RMSEA ≤ 0.05 test.

DISCUSSION

To our knowledge, this was the first study that tested the validity and reliability of the Jamaican language version of the OHIP, besides those that have assessed the evidence of the OHRQoL in a population of adults. A validated OHRQoL instrument available in the native language is a requirement for assessing the true impact of quality of life on oral health and is necessary for reaching target

Table 2. Final version of the JAM-OHIP and its descriptive analysis (n = 236). Jamaica, 2019–2020

JAM-OHIP	n (%) Never	n (%) Hardly Ever	n (%) Occasionally	n (%) Fairly Often	n (%) Very Often
1. Difficult to pronounce words	172 (72.9)	9 (3.8)	31 (13.1)	6 (2.5)	18 (7.6)
2. Worsened taste	206 (87.3)	1 (0.4)	78 (33.1)	21 (8.9)	58 (24.6)
3. Pain	76 (32.2)	3 (1.3)	78 (33.1)	21 (8.9)	58 (24.6)
4. Uncomfortable to eat	101 (42.8)	7 (3.0)	39 (16.5)	21 (8.9)	68 (28.8)
5. Self-conscious	123 (52.1)	23 (9.7)	28 (11.9)	21 (8.9)	41 (17.4)
6. Feel tensed	145 (61.4)	12 (5.1)	38 (16.1)	11 (4.7)	30 (12.7)
7. Diet unsatisfactory	133 (56.4)	16 (6.8)	44 (18.6)	13 (5.5)	30 (12.7)
8. Interrupted meals	140 (59.3)	12 (5.1)	44 (18.6)	12 (5.1)	27 (11.4)
9. Difficult to relax	184 (78.0)	7 (3.0)	16 (6.8)	6 (2.5)	23 (9.7)
10. Embarrassed	157 (66.5)	12 (5.1)	27 (11.4)	6 (2.5)	34 (14.4)
11. Irritable	186 (78.8)	3 (1.3)	27 (11.4)	4 (1.7)	16 (6.8)
12. Difficult to do jobs	197 (83.5)	4 (1.7)	18 (7.6)	6 (2.5)	11 (4.7)
13. Life less satisfying	193 (81.8)	7 (3.0)	21 (8.9)	2 (0.8)	13 (5.5)
14. Totally unable to function	197 (83.5)	9 (3.8)	15 (6.4)	6 (2.5)	9 (3.8)

Table 3. Discriminant validity of the OHIP-14 based on the clinical status of the subjects (n = 236). Jamaica, 2019–2020

Variable	OHIP-14 Mean (S.D.*)	Test
CPOD mean:		
CPOD < 8	9.42 (8.15)	Mann–Whitney
CPOD ≥ 8	15.4 (11.0)	P<0.01
Number of decayed teeth:		
Dt < 3	10.9 (10.1)	Mann–Whitney
Dt ≥ 3	13.8 (10.2)	P=0.02
Number of missing teeth:		
Mt < 3	13.8 (10.2)	Mann–Whitney
Mt ≥ 3	15.1 (10.7)	P<0.01
Number of filled teeth:		
Ft < 2	12.0 (9.6)	Mann–Whitney
Ft ≥ 2	14.1 (11.2)	P=0.03

Table 4. Reliability analysis based on the corrected item-total correlation, Cronbach's alpha coefficient if item deleted, and the KMO MSA (n = 236). Jamaica, 2019–2020

Impact Item	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted	KMO MSA
1. Difficult to pronounce words	0.35	0.81	0.85
2. Worsened taste	0.36	0.81	0.80
3. Pain	0.41	0.81	0.76
4. Uncomfortable to eat	0.41	0.81	0.80
5. Self-conscious	0.36	0.81	0.79
6. Feel tensed	0.46	0.80	0.83
7. Diet unsatisfactory	0.44	0.81	0.76
8. Interrupted meals	0.46	0.81	0.74
9. Difficult to relax	0.63	0.79	0.85
10. Embarrassed	0.54	0.80	0.83
11. Irritable	0.50	0.80	0.87
12. Difficult to do jobs	0.48	0.81	0.88
13. Life less satisfying	0.46	0.81	0.85
14. Totally unable to function	0.47	0.81	0.84
Overall	-	0.82	0.82

audiences. The results using the validated OHIP-14 should allow for comparison with other populations in different settings and with different languages.[8]

It was found that the JAM-OHIP showed validity and reliability levels comparable to the original English version of the OHIP-14.[7] The results showed that the factor structure of the JAM-OHIP presented suitable adjustment indices. The internal consistency obtained in this study (0.82) was slightly lower when compared to results obtained in similar OHIP validation studies[30–32] but was nevertheless within the satisfactory range. It also demonstrated adequate reproducibility.[18,19]

Physical pain and psychological discomfort were shown to be the most prevalent domains in a similar Jamaican population[9] when the original English version of the OHIP-14[7] was used, and this is also consistent in other studies that assessed OHRQOL in different populations.[33,34] In this study, when using the JAM-OHIP, it was also noted that these domains were also the most prevalent. This indicates that this is an area that seems to be overlooked in healthcare settings and needs greater attention. The mean OHIP score in this study was 12.7 (SD 10.2), which is considerably greater than the finding of 5.751 (SD 8.7) in a validation study of the Chinese version of the OHIP-14.[30] It is also slightly higher than for those who felt they needed treatment (11.89, SD 11.50) in the validation study of the Portuguese version of the OHIP-14.[31]

It was noted that participants who had more decayed and missing teeth had a more statistically significant impact on OHRQoL (higher JAM-OHIP scores), which demonstrates that the tool possesses construct validity. Similarly, higher OHIP-14 scores were reported in persons with more oral health problems in other validation studies of the OHIP-14.[31,35]

This study had a sample size of 236 participants, similar to the sample sizes used in other validation studies of the OHIP-14.[31,35] This is considered to be within the accepted range for validation and cross-cultural adaptation studies.[31,36] The cut-off criteria for model fit indices (CFI/TLI $\geq$ 0.95, RMSEA $\geq$ 0.06, and SRMR $\geq$ 0.08) recommended by Hu and Bentler[37] assume the maximum likelihood (ML) estimation. However, since our data are ordinal and asymmetric, we chose to use the DWLS estimation in the CFA. Thus, we must evaluate the goodness-of-fit in a more careful way.[37,38] Zhao[39] pointed out that these cut-off criteria should be used as references instead of "golden rules." The DWLS-based CFI and TLI are difficult to use as an assessment of model misspecification because the values are so close to 1.[38] In Nye and Drasgow's simulation,[38] only a few of the 5,400 samples had a CFI/TLI at or below 0.99, despite the three different sample sizes, three levels of skewness, and three types of misspecification. Additionally, it is recommended that since our χ^2 statistic is small (i.e., we do not reject the null hypothesis, $p = 0.142$), CFI/TLI is large ($\geq$ 0.99), and RMSEA is small (0.028), we can affirm that the model we specified fits the data reasonably well.[39]

OHIP-14 is able to provide information about the individual's perception of the impact of their oral health on their quality of life.[7] This perception is influenced by cultural aspects.[1] This emphasizes the importance of each population using its own instrument with particularities and characteristics that can actually measure OHRQoL according to patients' reality.[8] The findings from this study therefore reinforce the importance of the validation of instruments according to the culture and language of a determined population.

It can therefore be concluded that the JAM-OHIP is a valid and reliable questionnaire that can measure OHRQoL in Jamaicans and can be useful for comparing populations globally. We can also conclude that the model specified fits the data reasonably well.

Notwithstanding, this study presents some limitations due to the population selected. Validation of the OHIP-14 was done only with a group of Jamaicans at a dental polyclinic who were patients undergoing treatment and therefore had access to healthcare, despite the diversity of social values and the importance of using the developed instrument in different settings. Findings obtained may vary in terms of culture, access to healthcare, and socio-economic status.[40] In spite of this, the literature is scarce in studies that use similar methods with this population. The OHIP-14 adapted for the Jamaican language was easily understood and applicable to the population and can be used as an important tool in the assessment of the OHRQoL of Jamaican adults. The JAM-OHIP will allow for data gathered to be used and compared nationally and internationally. It can be made available for use by researchers in both public and private clinical settings that analyze the impact of OHRQoL in different Jamaican populations.

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