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Original Research Article

Translation, validation and adaptation of the revised hearing handicap inventory in Assamese language

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ABSTRACT

Background: The revised hearing handicap inventory (RHHI), a short questionnaire, effectively evaluates the psychosocial effects of hearing loss in adults, regardless of age. As RHHI is available only in English, its use is limited at the regional level for people who don't understand and can't read English. The aim of the study was to translate, validate, and adapt the RHHI in Assamese language as this is not available in local language.
Methods: The translation procedure followed a traditional translation, back translation, and content validity as per Beatons's recommendation. The pre-finalized version was administered on sixty-three (63) adults with hearing loss at an interval of one month. Internal consistency of the translated tool was done by Cronbach's Alpha, reliability testing was done by percentage of agreement by kappa statistics and intraclass coefficient (ICC). Validity testing of the tool was done by Pearson correlation coefficient.
Results: Assamese version of RHHI had good internal consistency, good reliability. The overall Cronbach alpha was 0.944; value of corrected item-total correlations ranged from 0.494 to 0.772, indicating the strength of the relationship between each item and the total scale score. Test-retest reliability by kappa statistics revealed significant agreement among the measurements, with p values <0.001. Pearson correlation coefficients test values suggest validity of Assamese version of RHHI.
Conclusions: The Assamese version of the RHHI is a reliable screening tool for hearing impairment in Assamese-speaking adults. Despite limitations of study, findings suggest its potential to understand the handicap and difficulties due to hearing impaired population and for improving healthcare access and outcomes in northeastern India.

Keywords: Hearing handicap, Hearing loss, Patient reported outcome measures, PROM, Revised hearing handicap inventory, RHHI

INTRODUCTION

Hearing loss has an impact on speech, language, social skills, education, and self-esteem across all ages.[1,2] Evaluation of hearing loss only by audiological test does not assess the perceived handicap associated with hearing loss. The hearing-related patient-reported outcome measures (PROM) serve as a method for evaluating hearing handicap due to hearing impairment.[3,4] Hearing handicap inventory for the elderly (HHIE) was the first PROM developed in 1982 by Ventry and Weinstein, followed by several questionnaires like hearing handicap inventory for adults (HHIA), and HHIA-S.[5] The HHIE, comprised of 25 questions that evaluate self-perceived hearing handicap among older adults assessing emotional and social/situational aspects. Subsequently, in 1990, Newman et al. modified three questions from the HHIE to develop the HHIA, also with 25 questions, replacing older-

adult-specific items with ones relevant to younger adults, including workplace-related queries for individuals less than 65 years.[4,5]

Developed by Christy Cassarly, revised hearing handicap inventory (RHHI) stands out as a comprehensive tool for assessing the psychosocial impact of hearing impairment.[4] This 18-item scale has the advantage as it can be administered to all adults of all ages, unlike separate scales like HHIA/E developed for adults and elderly respectively. Moreover, due to a smaller number of items to be answered, it reduces the burden of both patient and clinician. Although this has been translated in few languages across the globe, to the best of our knowledge it has not been translated to any Indian language.

Language is communication's essence. In this study, we aimed to translate, develop, validate and examine psychometric properties of the Assamese version of RHHI questionnaire as there is lack of such questionnaire in native Assamese language. Throughout the process, we adopted the standard methods for forward translation, back translation and cultural adaptation to retain the original meaning as much as possible.

METHODS

RHHI questionnaire

The RHHI questionnaire contains 18 items. Each item is assigned scores of 4, 2, and 0 for "yes", "sometimes", or "no", respectively. Values of RHHI score ≥6 for RHHI is useful to screen for or detect hearing impairment requiring further audiologic evaluation.

Study design and population

This single-centre observational cross-sectional study was conducted at a tertiary hospital of northeastern part of India. The study was done between September 2023 to April 2024. Inclusion criteria included "adult" patients more than 18 years of age with complaints of hearing difficulty, who were able to read and write Assamese, able to provide consent and their hearing loss characteristics confirmed on pure tone audiometry. Exclusion criteria were patients with psychiatric illness, intellectual disability and hearing-impaired individuals using amplification devices.

Translation of questionnaire (RHHI) from English to Assamese

For the translation and validation process, we followed the guidelines proposed by Guillemin, Bombardier, and Beaton.[6,7] The original version of RHHI was translated into Assamese by linguistic expert fluent in both English and Assamese. Back ward translation to English was done by another bilingual expert translator. The Assamese translation was then reviewed and compared with original questionnaire by a committee of four experts consisting of the two bilingual translators and two authors fluent in both English and Assamese. The committee members suggested few modifications of words in question no 10 from group of people to social gatherings to suit the cultural values of Assamese speaking populations such that the questions become easily understandable and achieve equivalence between the original and translated versions. After the consensus among members of expert committee was achieved on all items of questionnaire, a prefinal version of the translated questionnaire was drafted.

Validation of questionnaire (RHHI)

Preliminary pilot testing of the pre-final version of translated questionnaire was done by administering the pre-final version of translated questionnaire to 30 Assamese speaking adults and were asked verbally what they understood about each item. After subjecting pilot testing of these questionnaire, reframing of question no 7 and 12 was done and final version of translated RHHI in Assamese was finalised.

Psychometric properties of Assamese version of RHHI

Hundred participants were recruited for study by convenient sampling, only those adults with hearing loss fulfilling the inclusion and exclusion criteria and who participated twice for the study were included. A total of sixty- three (63) participants completed the Assamese version of RHHI twice at the one-month interval while coming for review at department and were included for statistical analysis.

Audiological investigation

Pure tone audiometry was done for all the participants in a sound treated room using manual audiometer (GSI-Grason-Stadler, USA). In pure tone audiometry air conduction measurements were done at octave or semi octave frequencies at 250,500,1000,2000,4000,6000,8000 Hz and bone conduction measurements at octave intervals from 250 Hz to 4000 Hz. Pure tone average was calculated as four-frequency average value of hearing loss at 500, 1000, 2000 and 4000 Hz. Data on hearing threshold, degree of hearing loss, and handicap scores was collected.

Statistical analysis

The data were first entered into Microsoft Office 2019 Excel spreadsheets. The statistical analysis for validation of questionnaire was done using IBM statistical package for the social sciences (SPSS) Statistics (IBM Corp. NY, USA) version 29.01.0(171).

Descriptive statistics were used to report participant characteristics. The reliability of the scale was calculated using the internal consistency method and test–retest method between repeated administrations. Internal consistency was measured using Cronbach's alpha for total score. Cronbach's alpha measures how closely related are

a set of items in a questionnaire as a group. Cronbach's alpha of ≥0.6 indicated adequate and acceptable internal consistency. P value less than 0.5 was considered as statistically significant.[8]

The test-retest stability was tested by determining the percentage of agreement by kappa statistics between two administrations of the questionnaire to the same participant at the gap of one month. Landis and Koch have outlined the following criteria for interpreting the strength of agreement for the kappa coefficient: 0.01=poor, 0.01–0.20=slight, 0.21–0.40=fair, 0.41–0.60=moderate, 0.61–0.80=substantial, and 0.81–1.00=almost perfect. A kappa value of 0.6 was considered indicative of moderate test-retest reliability and served as the cutoff for selecting questions for inclusion in the screening tool.[9] Further confirmation of the test-retest reliability was assessed with the intraclass correlation coefficient (ICC), to determine whether the translated questionnaire was reliable for comparing the total scores at one-month interval.[10] The validity of the questionnaire was established by calculation of Pearson correlation coefficients with aim to examine relationships between the items of the questionnaire.[10-12]

One-way analysis of variance (ANOVA), also known as the F test, was used to compare mean scores of Assamese versions of RHHI among groups based on degree of hearing loss.[10-13]

RESULTS

In our study, hundred number of cases were enrolled of which sixty-three (63) participants were included for analysis who fulfilled the inclusion and exclusion criteria. The gender distribution was almost equal (N=63, male=32 (50.7%), female=31 (49.2%). The mean age of participants was 59.53 (13.22). The mean duration of hearing loss was 66.87 (98.93). Sensorineural hearing loss was the most common type of hearing loss 46 (73%) followed by mixed hearing loss and conductive hearing loss in 12 (19%) and 05 (7.9%) respectively. Among the other ear symptoms, vertigo and tinnitus was present in 10 (15.9%) and 10 (15.9%) respectively (Table 1).

Table 2 findings suggests that the Assamese version of RHHI scale demonstrates high internal consistency reliability, as evidenced by a Cronbach's alpha coefficient of 0.944.

Table 3 shows the test-retest stability by percentage of agreement by kappa statistics. With the Kappa values for all questions range from 0.739 to 0.949.

Table 4 shows Pearson Correlation Matrix of items of RHHI. In our study, sample size (N) is 63. As seen in table 4, other than question no 4 that shows weak positive correlation with Q3 (r=0.234, p=0.064), obtained values of all other questions greater than critical value of 0.250 and is highly significant, so these are valid questions.

Table 1: Baseline characteristics of patients.

Variables	Values
Age (years)	
Mean [SD]	59.53 [13.22]
Gender, N (%)	
Male	32 (50.7)
Female	31 (49.2)
Education, N (%)	
Illiterate	9 (14.28)
Upto 10th standard	24 (38.09)
Upto 12th standard	17 (26.98)
Graduate	12 (19.04)
Postgraduate	01 (1.58)
Occupation, N (%)	
Homemaker	30 (47.61)
In job	14 (22.22)
Businessman	02 (3.10)
Retired	12 (19.0)
Jobless	05 (7.93)
Type of hearing loss, N (%)	
Conductive hearing loss	05 (7.93)
Sensorineural hearing loss	46 (73.01)
Mixed hearing loss	12 (19.04)
Degree of hearing loss as per WHO classification, N (%)	
Slight	5 (7.9)
Moderate	10 (15.9)
Moderately severe	0 (0)
Severe	35 (55.6)
Profound	13 (20.6)
Associated vertigo, N (%)	
Present	10 (15.87)
Absent	53 (84.12)
Associated tinnitus, N (%)	
Present	10 (15.87)
Absent	53 (84.12)

Table 2: Scale reliability and item characteristics of RHHI – Assamese version.

Statistic	Value
Cronbach's alpha	0.944
Mean of scale	44.00
Variance of scale	320.00
Standard deviation of scale	17.88

The Table 5 provides the results of the intraclass correlation coefficient (ICC) analysis to assess the agreement among measurements made by participants at two different time. For single measures, ICC is 0.458, indicating moderate to good agreement and for average measures, ICC is 0.968, indicating excellent agreement. This finding is supported by the 95% confidence interval (CI) ranging from 0.374 to 0.559, suggesting that the true ICC value is likely within this interval.

The F test further confirms the significance of this result, with a p-value of less than 0.001, indicating agreement beyond chance alone. The one-way ANOVA test was conducted to compare mean scores of Assamese version of RHHI among groups based on degree of hearing loss showed a marginally significant difference in the mean RHHI scores across the different levels of hearing loss (F (3, 59) = 2.362, p=0.080).

Table 3: The test-retest stability by percentage of agreement by kappa statistics.

Questions at test-retest	Measure of agreement Kappa	Asymptotic standard error[a]	Approximate T-value[b]	Approximate significance
Question 1	0.764	0.075	7.317	<0.001
Question 2	0.818	0.067	7.278	<0.001
Question 3	0.801	0.071	8.026	<0.001
Question 4	0.774	0.075	7.301	<0.001
Question 5	0.945	0.038	9.172	<0.001
Question 6	0.892	0.052	8.988	<0.001
Question 7	0.949	0.035	10.196	<0.001
Question 8	0.925	0.042	10.012	<0.001
Question 9	0.814	0.073	8.611	<0.001
Question 10	0.739	0.073	7.640	<0.001
Question 11	0.842	0.061	9.028	<0.001
Question 12	0.838	0.063	8.494	<0.001
Question 13	0.839	0.062	8.914	<0.001
Question 14	0.864	0.059	9.302	<0.001
Question 15	0.831	0.059	9.398	<0.001
Question 16	0.878	0.052	9.729	<0.001
Question 17	0.769	0.072	8.481	<0.001
Question 18	0.798	0.066	8.936	<0.001

[a]Not assuming the null hypothesis, [b]using the asymptotic standard error assuming the null hypothesis

Table 4: Pearson correlation matrix of items of RHHI – Assamese version.

Variables	Pearson correlation	Sig. (2-tailed)	N
Question 1	1		63
Question 2	0.559**	<0.001	63
Question 3	0.568**	<0.001	63
Question 4	0.234	0.064	63
Question 5	0.281*	0.026	63
Question 6	0.385**	0.002	63
Question 7	0.257*	0.042	63
Question 8	0.271*	0.032	63
Question 9	0.340**	0.006	63
Question 10	0.409**	<.001	63
Question 11	0.365**	0.003	63
Question 12	0.387**	0.002	63
Question 13	0.368**	0.003	63
Question 14	0.289*	0.021	63
Question 15	0.403**	0.001	63
Question 16	0.319*	0.011	63
Question 17	0.403**	0.001	63
Question 18	0.362**	0.004	63

*P<0.05, **p<0.01

Table 5: Showing test-retest reliability of items of questionnaire by intraclass coefficient.

Measures	Intraclass correlation[b]	95% confidence interval		F test with true value 0			
		Lower bound	Upper bound	Value	df1	df2	Sig
Single measures	0.458[a]	0.374	0.559	35.575	62	2170	<0.001

Continued.

Measures	Intraclass correlation[b]	95% confidence interval		F test with true value 0			
		Lower bound	Upper bound	Value	df1	df2	Sig
Average measures	0.968[c]	0.956	0.979	35.575	62	2170	<0.001

Two-way mixed effects model where people effects are random and measures effects are fixed, [a]the estimator is the same, whether the interaction effect is present or not; [b]type A intraclass correlation coefficients using an absolute agreement definition; and [c]this estimate is computed assuming the interaction effect is absent, because it is not estimable otherwise

DISCUSSION

Self-assessment questionnaires have gained acceptance as screening tools for detecting hearing impairment over past few decades. India's linguistic and cultural diversity is reflected by 22 officially recognized languages and countless dialects with unique regional customs. We aim to overcome language barriers in healthcare delivery through this translated questionnaire in Assamese.[14]

Patient-reported outcome measures (PROM) of hearing difficulty offer a practical and cost-effective alternative to audiometric tests. They can be administered through various mediums and do not require highly trained professionals for interpretation. This makes them suitable for use in clinical, community settings and research. These measures complement audiological assessment by documenting handicap related to hearing loss, helping in determining hearing aid candidacy and planning of interventions for hearing impairment.[15,16]

RHHI holds an advantage over other measures like HHIE and HHIA because it can be administered to adults of all ages.[4,15] In study by Dillard et al, authors have found RHHI an useful tool for assessing self-reported hearing difficulty and its ability to predict hearing aid use as pure-tone audiometry (PTA), thus emphasising its potential utility in settings where audiometry was not feasible, such as hearing loss screening programs at community level.[15] Similar findings were found in other studies where individuals with audiometrically measured hearing loss tend to report higher scores on the RHHI, indicating greater perceived hearing difficulty and study also stated the need for translation and cultural adaptation of questionnaires in other languages to enable the development of hearing healthcare policies and ease of administration.[16,17]

The Assamese version of the RHHI questionnaire seemed well adapted for screening hearing loss in Assamese speaking adult population of northeastern part of India. The translation process retained the original content of the RHHI questionnaire while making minor modifications to accommodate cultural nuances of the Assamese-speaking population, ensuring the questionnaire's relevance and appropriateness for this demographic. No subjects reported difficulty in understanding the translation. Two questions (item no 1 and 2) required minor changes like removal of word “radio’’ in item no 1 and replacement of “party” with “social function” to suit the culture of Assamese speaking population. These changes did not compromise the integrity of the instrument but rather enhanced its suitability for use in the Assamese-speaking population.

In our study the validation process of translated questionnaire demonstrated the instrument's reliability through its strong internal consistency on Cronbach’s alpha and good reliability during test-retest assessment among Assamese speaking adult population. The strength of the result of our study lies in the high Cronbach's alpha value. This indicates that the items in the scale are highly correlated with each other and measure the same underlying construct reliably indicating excellent internal consistency. This value surpasses the commonly accepted threshold of 0.7, suggesting a robust relationship among the items in the scale. In a similar study by Aryal S et al, authors translated and developed HHIA-S Nepali version and found Cronbach's alpha score of 0.93 for hearing impaired group which was considered as good reliability.[18]

For development of questionnaire in new language, choice of statistical method for reporting reliability such as inter-rater and test-retest reliability, is crucial. Kappa values for all questions in our study indicates substantial to almost perfect agreement between the test and retest administrations, suggest strong test-retest stability and reliability of the translated questionnaire.

The preferred statistic is the ICC over the Pearson’s correlation coefficient for several reasons such as its ability to handle various complexities, including systematic differences between raters or occasions, multiple raters or occasions, and differentiating between absolute and relative agreement. For longer scales, indices like mean inter-item correlation are recommended.[10,12] There should be an adequate time gap between assessments to prevent respondents from recalling their initial responses. This period, typically 10–14 days, balances memory recall and ensures the stability of the trait being assessed. For conducting our study and to develop the tool in Assamese language, we followed standard guidelines as followed by other authors.[10-12]

Finding of higher coefficient in our study suggests stronger reliability, indicating minimal changes in responses between administrations. Further confirming test-retest reliability by Intraclass coefficient demonstrated significant agreement ($p<0.001$). Tight 95% CIs suggest precise estimates of agreement levels in our study which is further confirmed by F, indicating agreement beyond chance.

The positive finding from the ANOVA analysis is that there exists a significant relationship between the severity levels of hearing loss and the RHHI score value. Despite the p value being slightly higher than the conventional threshold of 0.05, the statistical test (ANOVA) still

indicates that there is substantial variability in RHHI scores across different degree of hearing loss in the Assamese version of RHHI questionnaire. The post hoc tests revealed specific group differences in mean RHHI scores. The least significant difference (LSD) post hoc test indicates significant mean differences between groups with slight, moderate, and profound hearing loss compared to the group with no impairment. Similar findings were reported by Dillard et al.[16]

While the result of our study indicates strong internal consistency, reliability for the scale, there are several limitations to consider. First is small sample size of 63 participants. Although it may be sufficient for basic reliability analysis, larger sample sizes are generally preferred for more robust conclusions and generalizability of findings. Our study is primarily centred on a specific cultural or linguistic context, potentially limiting the scale's applicability across diverse cultural or linguistic groups. Further validation studies across different Indian languages are necessary to ascertain the scale's validity and reliability in various populations.

Overall, these positive findings indicate that the Assamese version of the RHHI questionnaire is a reliable and culturally appropriate tool for screening hearing impairment in Assamese-speaking adults. Its successful adaptation and validation may be utilised improving outcomes for individuals with hearing impairments in northeastern India.

CONCLUSION

Translated and validated version of RHHI in Assamese language offer a reliable tool for screening hearing impairment in Assamese-speaking adults. While acknowledging limitations like a small sample size and cultural specificity, these positive findings highlight the potential to improve healthcare access for individuals with hearing impairments in northeastern India. Further largescale research across diverse linguistic and cultural groups is needed to ensure broader application.

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