Original Articles

Linguistic adaptation and validation of All Aspects of Health Literacy Scale (AAHLS): A health literacy assessment tool for use in Hindi-speaking population

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ABSTRACT

Background. Health literacy plays an important role in determining healthcare and medication outcomes. There is a lack of an appropriate, validated scale to assess health literacy status among the Hindi-speaking population. We translated and validated the English version of the All Aspects of Health Literacy Scale (AAHLS) into Hindi.

Methods. We translated the scale as per WHO guidelines on translation and adaptation of instruments. We did preliminary pilot testing in 30 bilingual subjects and evaluated cross-language concordance of the scale. The final translated scale so obtained after cross-cultural adaptation was tested in a validation study on 130 subjects from the outpatient department of internal medicine in which test–retest repeatability, construct validity, discriminant validity and internal consistency were assessed. Analysis was done using paired t-test, one-way ANOVA, Cronbach α and intra-class correlation coefficient.

Results. An excellent correlation between Hindi and English versions of the scale for various factors ensured cross-language concordance. Hundred percentage response rate was observed in the validation study. The scale showed good internal consistency (Cronbach $\alpha=0.99$). The difference in total mean AAHLS score was not statistically significant across different age groups, genders and educational levels. Factor analysis showed a positive correlation among four factors/components of health literacy. For test–retest reliability, the intra-class correlation coefficient for all the items in different factors was significant (range 0.88–1.00; $p<0.0001$). Significant association of critical literacy sub-scores with functional ($r=0.274$, $p=0.002$) and communi-cative ($r=0.283$, $p=0.001$) sub-scores revealed a good construct validity.

Conclusion. The Hindi translated version of the AAHLS scale is a valid and reliable tool to assess health literacy in the Hindi-speaking population.

INTRODUCTION

Health literacy in simple terms is literacy applied to health context; however, with skills not just limited to reading and writing. According to the WHO, health literacy is defined as 'the cognitive and social skills which determine the motivation and ability of the individual to gain access to, understand and use information in ways which promote and maintain good health'.[1] As per Nutbeam's expanded model of health literacy concept, health literacy encompasses different components such as 'functional, communicative and critical health literacy'. Functional literacy comprises an individual's ability to read health-related information, writing ability and access to support systems. Communicative health literacy includes two components: 'information gathering and processing skills, and interactive skills needed for successful consultations with health providers'. Nutbeam's definition for critical health literacy implies 'taking a critical and reflexive stance vis-a-vis health information, considering issues of the relevance and reliability, and integrating knowledge of the social determinants of health and skills in community-level action'.[2]

According to the National Assessment of Adult Literacy in 2015, 36% of Americans had limited health literacy skills.[3] Limited health literacy has not only been documented among patients but also caregivers of the elderly and parents of children.[4] People with limited health literacy have poor knowledge about how to manage their disease and medications. They are more likely to misunderstand medication instructions, warning labels on medication containers and have difficulty understanding the correct dosage regimens.[5,6] It is acknowledged by healthcare professionals that limited health literacy serves as a barrier to improving healthcare outcomes in patients. Growing evidence has shown the association of limited health literacy with increased healthcare costs and worse health outcomes, including increased mortality.[7,8]

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Health literacy is a context-dependent skill as even people with adequate educational levels may struggle in healthcare tasks due to a lack of familiarity with the context.[2] However, with the adoption of strategies such as clear communication on medication management, increasing health literacy awareness, improving medication counselling skills, easy-to-read health education handouts, etc. major enhancement in health literacy can be achieved reflecting the dynamic nature of this concept.

In accordance with disease control priorities in developing countries, 'What gets measured gets done'; hence, to improve healthcare outcomes, there is a need to assess the skill levels related to health literacy in population to plan and implement appropriate preventive and promotional strategies in this area.[9]

A variety of tools have been developed to assess health literacy. Some commonly used tools include: Rapid Estimate of Adult Literacy in Medicine (REALM)—a word recognition test assessing health literacy based on patients' ability to pronounce a list of medical terms;[10] Test of Functional Health Literacy in Adults (TOFHLA)—consists of a reading comprehension section to measure prose literacy and a numeracy section. Patients are provided passages with health information with systematically deleted words, and the patient has to choose the correct word from a list of multiple-choice options;[11] BRIEF health literacy screening tool—a 4-item instrument with patients responding on a 5-point Likert scale;[12] Medical term recognition test (METER)—a self-administered medical term recognition test consisting of 40 medical and 40 non-medical words;[13] and All Aspects of Health Literacy Scale (AAHLS)—this is a 13-item scale to assess functional, communicative and critical health literacy. The scale is loaded on four factors corresponding to skills in using written health information, communicating with healthcare providers, health information management, and appraisal assertion of individual autonomy with regards to health.[14]

Most of the tools used to assess health literacy are available in English and Spanish language versions. However, researchers who intend to obtain data from subjects speaking other languages need translated versions of the scales in respective language(s) to compare culturally and linguistically different populations. The ability of the translated scale to assess equivalent construct with an equivalent metric is essential. Hence, the translated scales need to be validated before being applied in the field to ensure equivalence with the original scale. Our extensive search of the literature did not reveal the availability of validated Hindi versions of any such tools. This is an important shortcoming for using them in India as a major proportion of our population is not comfortable with the English language. Hindi, apart from being the most spoken and understood language in India, is also spoken in other countries such as Nepal, Mauritius, Fiji, Guyana, Suriname, and Trinidad and Tobago. Hence, we aimed to translate AAHLS, a commonly used health literacy tool in Hindi, and incorporate the required cultural adaptation.

REALM and METER are medical terms or word recognition tests, hence do not truly reflect the health literacy status.[10,13] TOFHLA is time-demanding and needs specially trained investigators.[11] BRIEF does not appropriately assess all the components of health literacy.[12] We specifically used the AAHLS scale due to its wider applicability in assessing all the components of health literacy, viz. functional, communicative and critical.[14]

METHODS

Study design

We conducted this cross-sectional study in collaboration with the departments of Pharmacology and Internal Medicine, Pandit B.D. Sharma Postgraduate Institute of Medical Sciences, Rohtak, Haryana, India. The study was conducted in accordance with the Declaration of Helsinki and good clinical practice guidelines. Adequate measures were taken to maintain confidentiality of data.

Study population and eligibility

Patients visiting the outpatient clinics of the Department of Internal Medicine were screened for inclusion in the validation study. Eligibility criteria included men and women more than 18 years of age, presenting with any medical condition and willing to give written informed consent. No restriction with respect to the highest educational level was followed although persons having formal education in medical and health sciences were not included. Patients with any learning, audiovisual, psychiatric or intellectual disability or disorder, as well as the inability to read or understand the Hindi language were excluded from the study.

Study conduct

The study was conducted in two phases, namely translation of the scales and validation of the translated version of the scales.

Phase 1: Translation of the scales. The English version of the scales was translated into Hindi as per the four sequential stages (forward translation, expert panel back-translation, pre-testing and cognitive interviewing, and development of final translated version of the scale) recommended by the WHO guidelines on translation and adaptation of instruments.[15]

The initial translation of the scales from English to Hindi language (forward translation) was made by a person having formal education in both English and Hindi languages and familiar with the medical terminologies in the scales. Once the initial translated version was available, it was reviewed by a bilingual expert panel who had access to the English version of AAHLS. The panel jointly discussed the various terms and expressions used, made suggestions, and identified and resolved any discrepancies. This step was taken to ensure that the language used was easy to understand with an emphasis on conceptual and cultural rather than literal, i.e. word-to-word equivalence. Any changes or suggestions made by the consensus of all members were incorporated and a draft version of the translated scale was developed.

This version of the scale was then back-translated into English by an independent translator having no prior knowledge of the scale. The purpose of back translation was to ensure the accuracy of translation and identify any misunderstandings or unclear terms demanding modification/s in the initial translation. The back-translated version of the scale was then compared with the English version by the expert panel, modified to remove any ambiguity and a revised version of the scale was developed. This was followed by a pre-test or preliminary pilot testing in which a sample of 30 bilingual subjects having proficiency in both languages and representative of the population for validation study, were administered the translated and original versions of the scales. After completing the scale, the subjects underwent a face-to-face interview session with the investigator in which they were debriefed, i.e. asked to elaborate on what

they thought the scale meant to ask, whether they were able to repeat the questions in their own words, their explanation for selecting the answers and what came to their mind on hearing a particular phrase or term. The respondents were also asked if they found any term difficult to understand, unacceptable or offensive and any suggestions for alternative terms or expressions. Furthermore, the responses on the original and translated scales were compared to ensure cross-language concordance. The purpose of the pre-test was to make sure that the translated items retain the same meaning as the original items. The suggestions received were reviewed and incorporated in the scale with the consensus of the study team personnel to obtain the final version of the translated scale.

Phase 2: Validation of the translated Hindi scales. The eligible patients were administered the final translated version of the scale. Demographic details including age, gender, residential address, educational qualification, family income, etc. were recorded in a pre-designed proforma. Further, using the modified Kuppuswamy socioeconomic scale 2019, scoring was given for occupation of the head of the family (score 1 to 10), education of the head of the family (score 1 to 7) and total monthly income of the family (score 1 to 12); all the three scores were added up to get the total score on the Kuppuswamy scale. Depending on the total score obtained, subjects were categorized into the respective socioeconomic class as upper (I) for a total score ranging from 26 to 29, uppermiddle (II) for scores of 16–25, lower middle (III) for scores 11–15, upper lower (IV) for scores 5–10 and lower (V) for score <5.

The data obtained were assessed for various validation parameters such as internal consistency, test–retest reliability and construct validity.

Study scale

The scale used in the validation study was the final Hindi version of the AAHLS. This is a 13-item scale loaded on four factors corresponding to the skills in using written health information (functional literacy: Q1 to 3), communicating with healthcare providers (communicative literacy: Q 4 to 6), health information management (critical health literacy: Q 7 to 10) and ability to take action for one's or community's health (empowerment questions: Q 11 to 13). For Q 1 to 11, scoring is done on a 3-point Likert scale (except Q 2 for which scoring was done on a 4-point scale) with a total score ranging from 11 to 34; a higher score indicating a higher level of health literacy. Questions 12 and 13 under the empowerment section are two-response items, hence they are analysed in a descriptive manner. The overall scale has been shown to have adequate reliability (Cronbach α=0.74) in a population with diverse ethnicity (Asians 56%, whites 35%, blacks 3%, mixed race 1% and others 5%).[14]

Sample size calculation

For the validation study, the sample size was derived based on the concept of N/p ratio, i.e. number of items to participant ratio of at least 10:1. Hence, it was decided to include 130 patients in the validation study.

Statistical analysis

Data collected were entered into Microsoft Excel data sheet and analysed using IBM SPSS™ Statistics for Windows, version 20.0 (IBM Inc., Armonk, NY, USA). Data were expressed as mean (SD), numbers and percentages. Analysis was done using paired *t*-test, one-way ANOVA, Cronbach α and intra-class correlation coefficient. Principal component analysis with varimax rotation was done to examine concordance of the factor structure of the Hindi version of AAHLS. The reliability and validity of the translated scales were assessed at 95% confidence interval. A value of $p<0.05$ was considered statistically significant. No specific hypothesis was tested.

RESULTS

Pre-test

During pre-test, all 30 subjects were able to debrief the scale and repeat questions in their own words. Two subjects suggested alternative Hindi terms for the English term 'often'. None of the subjects found any term unacceptable or offensive in the translated version. The suggestions as made were incorporated in the translated scale after consensus among the study team personnel to obtain the final version of the translated scale.

Content validity (cross-language concordance between Hindi and English versions of AAHLS): All the factors of AAHLS scale showed excellent correlations between Hindi and English versions (intra-class correlation coefficients ranged from 0.88 to 0.99; Table I) ensuring cross-language concordance.

Validation study

Descriptive statistics. During the validation study, all the forms were completely filled yielding a 100% response rate. The age of the participants ranged from 18 to 77 years with a mean (SD) age of 36.08 (11.76) years; 53% (69/130) of the subjects were men.

The third question in the empowerment section was a two-response item in which the respondents were asked 'what do you think matters most for everyone's health?' For this, 72 (55.4%) persons selected option 'a', i.e. 'information and encouragement to lead healthy lifestyles', while 68 (44.6%) chose option, 'b', i.e. 'good housing, education, decent jobs and good local facilities'.

The difference in total mean AAHLS score was not statistically significant across different age groups, genders and educational levels. However, for socioeconomic status class, the results were statistically significant with higher scores in upper class (I) (Table II).

Internal consistency

For determining the internal consistency, responses on Hindi and English versions of AAHLS of the 30 subjects in cross-language concordance were used. The Cronbach α was 0.99 reflecting good internal consistency/reliability.

Factor analysis

A positive correlation was observed among four factors (functional, communicative, critical, empowerment) of AAHLS

TABLE I. Cross-language concordance between the Hindi and English versions of All Aspects of Health Literacy Scale (AAHLS) factors

Literacy	Mean (SD) scores		Paired *t*-test (p)	Intra-class correlation
	English	Hindi		
Functional	6.3 (1.6)	6.27 (1.57)	0.66	0.98
Communicative	7.9 (1.51)	7.97 (1.49)	0.16	0.99
Critical health	9.6 (1.92)	9.6 (1.94)	1.00	0.99
Empowerment	3.77 (0.89)	3.6 (0.97)	0.13	0.88

in the correlation matrix (statistically significant Barlett's test of sphericity with χ^2=45.47, p<0.0001). The Kaiser–Meyer–Olkin value was 0.645, which is acceptable for performing factor analysis. The eigenvalue was >1 for one factor, i.e. functional health literacy (functional 1.76; communicative 0.94; critical 0.7, empowerment 0.6) accounting for 44% of the variance.

Test–retest reliability
Twenty-five randomly selected subjects were administered the Hindi version of the scale twice 1 week apart to determine test–retest reliability. The intra-class correlation coefficient was significant for all the items in different factors (range from 0.88 to 1.00; p<0.0001; Table III).

Construct validity: Association between subscale scores
To determine the construct validity of the Hindi version of AAHLS, we investigated the relationship of subscale (functional, communicative and critical health literacy) scores to each other. Scores on critical health literacy were significantly associated with those of functional (*r*=0.274, p=0.002) as well as communicative (*r*=0.283, p=0.001). However, there was a lack of significant association between functional and communicative health literacy scores (*r*=0.145, p=0.099).

We also assessed the relationship between different subscale scores of English AAHLS. None of the scores in different subscales were found to be significantly associated with the other two: functional and communicative (*r*=0.126, p=0.51), functional and critical (*r*=0.298, p=0.11) and, communicative and critical (*r*=0.187, p=0.32).

DISCUSSION
The health literacy status of an individual has been identified as a crucial determinant for healthcare and medication outcomes, hence assessment of health literacy becomes important to plan strategies in this direction. There is lack of a validated tool to

TABLE II. Sociodemographic characteristics and educational status of the study population

Variable	*n* (%)	Mean (SD) total AAHLS score	Remarks
Age (years)			
≤30	46 (35.4)	25.58 (3.39)	One-way ANOVA
31–50	71 (54.6)	26.11 (3.97)	F=0.67
≥51	13 (10)	24.84 (5.3)	p=0.51
Gender			
Men	69 (53)	25.93 (3.92)	p=0.69
Women	61 (47)	25.65 (3.93)	
Socioeconomic status class			
I	42 (32.5)	27.26 (3.89)	One-way ANOVA
II	43 (33)	25.58 (4.11)	F=4.54
III	21 (16)	25.67 (3.35)	p=0.005
IV	24 (18.5)	23.75 (3.15)	
Education			
Illiterate	12 (9.2)	26.92 (3.26)	One-way ANOVA
Primary school	18 (13.8)	26.22 (3.33)	F=2.12
Middle school	19 (14.6)	26.53 (3.72)	p=0.06
High school	21 (16)	25.33 (4.17)	
Diploma	21 (16)	23.28 (3.81)	
Graduate	26 (20)	26.46 (4.44)	
Professional or honours	13 (10)	26.61 (2.96)	

AAHLS All Aspects of Health Literacy Scale

assess health literacy in the Hindi language. We translated the AAHLS into Hindi using WHO guidelines and validated it to promote its reliable and rational use in a Hindi-speaking population. AAHLS is a comprehensive health literacy assessment tool which highlights not only the individual's demands for auxiliary assistance in accessing healthcare but also their potential and strengths in promoting community health.[14]

The translation of the scale was done in accordance with WHO guidelines on translation and adaptation of instruments keeping into consideration conceptual and cultural equivalence. The findings of cognitive debriefing interviews indicated that the Hindi version of the translated scale was easily understandable. An excellent correlation between Hindi and English versions was observed for different factors of AAHLS assuring cross-language equivalence implying that the Hindi version of AAHLS was able to adequately capture the concepts of the original English scale.

Overall, the sample population in our study was representative of the broader Indian population with a notable exception being a smaller number of illiterates in the sample (9.2%). The literacy rate in India as reported in 2020 was 77.7%.[16] However, under-representation of illiterates might be explained by the fact that we excluded subjects unable to read or understand Hindi language. Also, only 10% of study subjects were more than 50 years old with an even lesser number belonging to the elderly group.

During test–retest, we observed an excellent correlation for all items in different factors indicating a good test–retest reliability or repeatability, i.e. consistency in the scores across time.

Construct validity was tested by the extent to which the construct, i.e. health literacy, when measured in different ways or for different components (functional, communicative, critical health literacy) yields similar results. A good correlation between various subscale scores indicates the presence of construct validity. In our study, significant associations observed between different subscale scores, viz. critical scores with functional and communicative scores suggest a good construct validity. Chinn *et al.* reported a significant association between all subscale scores of the AAHLS English version, this was however not observed in our study.[14] Such difference can be possibly explained by the availability of data from limited, i.e. 30 bilingual subjects in our study as compared to 146 subjects in the study by Chinn *et al.*

Due to the lack of established variables influencing health literacy, we could not assess the translated scale for the presence of discriminant validity. However, this requires studies in this direction to identify such variables and provide conclusive proof for the discriminant validity of health literacy assessment scales. Further, due to the non-availability of a validated Hindi version of any health literacy assessment tool, we could not assess the criterion validity, which was a limitation of our study. However, evidence from the Hindi version of AAHLS as translated in this study shows good cross-language concordance, test–retest reliability, internal consistency and discriminant validity, favours its use as a validated tool to assess health literacy.

Conclusion
Findings from our study show that the Hindi translated version of the AAHLS scale is a valid instrument and can be applied with

TABLE III. Test–retest reliability of Hindi version of All Aspects of Health Literacy Scale (AAHLS)

Number, item	Baseline assessment	Assessment after 1 week	Paired t-test (p)	Intra-class correlation (ICC)		
				ICC value (95% CI)	F-test	p value
FQ1, How often do you need someone to help you when you are given information to read by your doctor, nurse or pharmacist?	1.56 (0.65)	1.56 (0.58)	1	0.88 (0.73–0.95)	8.16	<0.0001
FQ2, When you need help, can you easily get hold of someone to assist you?	1.68 (0.75)	1.8 (0.76)	0.08	0.94 (0.87–0.97)	19.78	<0.0001
FQ3, Do you need help to fill in official documents?	1.92 (0.7)	1.96 (0.67)	0.66	0.88 (0.73–0.95)	8.19	<0.0001
COMQ1, When you talk to a doctor or nurse, do you give them all the information they need to help you?	2.68 (0.63)	2.64 (0.64)	0.32	0.97 (0.94–0.99)	39	<0.0001
COMQ2, When you talk to a doctor or nurse, do you ask the questions you need to ask?	2.36 (0.7)	2.36 (0.7)	1	0.91 (0.79–0.96)	10.76	<0.0001
COMQ3, When you talk to a doctor or nurse, do you make sure they explain anything that you do not understand?	2.4 (0.64)	2.44 (0.65)	0.57	0.97 (0.94–0.99)	41	<0.0001
Cr1, Are you someone who likes to find out lots of different information about your health?	2.36 (0.7)	2.4 (.64)	0.57	0.93 (0.84–0.97)	13.7	<0.0001
Cr2, How often do you think carefully about whether health information makes sense in your particular situation?	2 (0.64)	1.96 (0.67)	1	0.92 (0.83–0.96)	13.16	<0.0001
Cr3, How often do you try to work out whether information about your health can be trusted?	2.2 (0.81)	2.2 (0.81)	0.32	0.97 (0.93–0.98)	31	<0.0001
Cr4, Are you the sort of person who might question your doctor or nurse's advice based on your own research?	2.08 (0.81)	2 (0.7)	0.32	0.92 (0.83–0.96)	13.5	<0.0001
Emp1, Do you think that there plenty of ways to have a say in what the government does about health?	2.16 (0.68)	2.12 (0.72)	0.32	0.98 (0.95–0.99)	49	<0.0001
Emp2, Within the last 12 months have you taken action to do something about a health issue that affects your family or community?	1.48 (0.51)	1.48 (0.51)	–	1.00	–	–
Total AAHLS score	24.88 (4.08)	24.92 (3.68)	0.88	0.97 (0.92–0.98)	29.94	<0.0001

utmost reliability to assess the individual health literacy status among the Hindi-speaking population.

Conflicts of interest. None declared

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