Construct Validation of the Health Literacy Questionnaire (HLQ) inShahrekord Cohort Study, Iran

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A B S T R A C T

Background: Health literacy promotion is considered to be an important goal in the healthcare strategic planning of every country. The present study aimed to evaluate the validity and reliability of the health literacy questionnaire (HLQ) in the participants of Shahrekord cohort study, Iran.

Methods: This cross-sectional study was conducted on 400 respondents who were selected via systematic, random sampling from the participants of Shahrekord cohort study. The content and construct validity of HLQ were determined, and the internal consistency of the questionnaire was evaluated using the Cronbach's alpha coefficient. Data analysis was performed in SPSS version 21.

Results: The internal consistency and test-retest reliability (ICC) of the factors were higher than 0.7. The construct validity of HLQ was investigated using exploratory factor analysis, Kaiser-Meyer-Olkin test (0.89), and Bartlett's test (6908.425) ($P \leq 0.001$) with VARIMAX rotation.

Conclusion: According to the results, HLQ is a reliable and valid scale for the investigation of health literacy in Chaharmahal and Bakhtiari province, Iran. Since health literacy instruments should be revised regularly, further studies are recommended in order to evaluate health literacy using the HLQ to identify its possible deficiencies.

1. Introduction

Due to the spread of unhealthy lifestyles across the world, healthcare systems are not adequately able to meet the needs of the community members. Therefore, there is an urgent need for self-management in healthcare systems, and individuals must be actively involved in obtaining proper information on health, understanding the key principles of health, taking responsibility, and make proper decisions regarding their own health, as well as the health of their families and community.

Health literacy is considered to be a key factor in the self-management and performance of healthy behaviors [1]. The efficacy of educational programs and health promotion is strongly influenced by health literacy [2]. According to the World Health Organization (WHO), health literacy is defined as the cognitive and social skills that determine the motivation and ability of individuals to access and comprehend information for the promotion and maintenance of health [3].

In addition, health literacy refers to the degree of the ability to obtain, communicate, accept, and understand health information and services, which enables individuals to make health-related decisions [4]. Health literacy is a predictor of health outcomes and healthcare utilization [5]. Low health literacy is associated with the less frequent use of preventative measures, inability to communicate with

treatments, increased mortality and hospitalization rates, poor knowledge of diseases, reduced self-care, and increased medical costs [3].

The role of health literacy in community health is of utmost importance, as well as a major prerequisite for non-communicable diseases [3]. According to the literature, the majority of people have poor health literacy [6], and it is essential to identify the individuals with low health literacy (e.g., populations with low education level and income status, the elderly, ethnic minorities, and immigrants) and provide appropriate health education in order to promote community health [7]. The accurate estimation of health literacy in communities using valid tools is considered essential to proper planning for the interventions that aim to promote individual and community health. It is believed that using appropriate tools to measure health literacy could determine the public knowledge of disease prevention, health promotion, and self-care behaviors [6]. To better recognize the effects of this indicator on health and healthcare costs [8], it is essential to develop an instrument for the assessment of health literacy [5].

The most common and reliable questionnaires that are used to assess health literacy include the rapid estimate of adult literacy in medicine (REALM; an instrument used to evaluate the ability of patients to read quickly and administered by physicians) [9], test of functional health literacy in adults (*TOFHLA; a questionnaire used to assess the ability of patients to read and understand the concepts of texts*) [6], and national assessment of adult literacy (*NAAL; an instrument used to measure general information on drugs, disease prevention, and health care*) [10].

In Iran, various studies have been focused on the health literacy of the community and the influential factors in this regard [11, 12]. However, few studies have been conducted to develop a health literacy questionnaire involving the measurement of its validity and reliability. For instance, Haghdoost et al. (2015) conducted a study in Kerman and Mazandaran provinces (Iran) to develop a valid and reliable questionnaire to investigate health literacy in Iranians, which is known as the Iranian health literacy questionnaire (IHLQ) [2]. In another study, the eHEALS questionnaire was validated in the students at Yazd University of Medical Sciences (Iran) [13]. One of the valid questionnaires in this regard is the health literacy questionnaire for Iranian adults (HELIA), which has been developed by Montazeri et al. (2014) and has been validated only in Tehran so far [14].

Since population, ethnography, self-care culture, and health literacy differ in various provinces in Iran, and no studies regarding health literacy questionnaires have been performed in Chaharmahal and Bakhtiari (Iran), the present study aimed to assess the construct validity of HELIA questionnaire and determine the health literacy status in Shahrekord cohort study (SCS), which is the largest population-based study conducted in Chaharmahal and Bakhtiari province [15], so that its application is considered to be an important variable in the measurement of health literacy.

2. Materials and Methods

In this cross-sectional, descriptive-analytical study, the data of SCS in June 2018 were used. SCS is a population-based, prospective study on a cohort consisting of individuals aged 35-70 years, which started in November 2015 in Iran. The sample size of the original cohort is a minimum of 10,000. The annual follow-ups of the cohort (200,000 cases per year) were designed to be conducted up to 2036. Detailed information regarding SCS has previously been published [15].

2.1. Data Collection Instruments

The HELIA questionnaire was used to collect the data in the present study. The questionnaire consists of five domains, including reading (four items), access (six items), comprehension (seven items), evaluation (four items), and decision-making and behavior (12 items). According to the guidelines of the questionnaire, the health literacy level of the respondents is inadequate within the score range of 0-50, moderately adequate within the score range of 50.1-66, adequate within the score range of 66.1-84, and high within the score range of 84.1-100 [14].

2.2. Sample Size

To conduct factor analysis, sample size should be over 100 [16], while some references have suggested a classification based on which the sample sizes of 100, 200, 300, 500, and >1,000 represent poor, relatively favorable, favorable, very favorable, and excellent reliability [17]. In the present study, 400 participants of SCS were selected via systematic random sampling in order to conduct interviews, complete the questionnaire, and measure its validity and reliability. In order to assess the test-retest reliability and calculate the intraclass correlation-coefficient (ICC), 30 other samples were randomly selected from the participants. After two weeks, the questionnaire was completed for these subjects again. In several studies, test-retest has been administered to 30 individuals at 12-15-day intervals so as to calculate the coefficient of the test-retest-reliability [2, 13].

2.3. Statistical Analyses

Before data analysis, the distribution of the data was evaluated using the Kolmogorov-Smirnov test, and the normality of the data was confirmed. The internal consistency of the HELIA questionnaire was determined as a measure of reliability using Cronbach's alpha. In addition, ICC was used to perform the test-retest on the selected participants. To measure the content validity of the questionnaire, we used qualitative (panel of experts) and quantitative approaches (content validity ratio/index). Since there is no consensus on the priority of these approaches, and we had access to a panel of experts, the qualitative approach was preferred over the quantitative approach.

The questionnaires were completed in the presence of the first author in order to determine the face validity, readability, clarity, and cultural appropriateness of the initial questionnaire [2]. In addition, a panel of five experts (a health educationist, two epidemiologists, and two psychologists) was recruited to conduct a comprehensive review of the instrument and identify the types of the questionnaire items, which represented various dimensions of the behaviors to measured [18].

Exploratory factor analysis (EFA) was used to summarize the obtained data and classify the items into categories, as well as for structural analysis. EFA is often conducted along with principle component analysis (PCA) in order to assess the internal correlations of variables and identify the categories of the variables with the most significant correlations.

VARIMAX rotation was used to investigate the matching and naming of the drawn variables, and the factors with an eigenvalue of more than one were selected. In order to calculate the scores of the questionnaire constructs, the items with the loading factor of more than 0.4 were selected and used [19].

Data analysis was performed in SPSS version 21 at the significance level of 0.05.

3. Results and Discussion

The mean age of the participants was 49.9 ± 8.31 years, and the majority (38.8%) were within the age range of 45-55 years and married (94%). In total, 53% of the respondents were female, and 30.8% had academic education (Table 1).

EFA was performed on 33 items of the HELIA questionnaire, and five factors with the eigenvalue of more than one were drawn. In EFA using PCA and VARIMAX rotation, five domains with the loading factor of > 50% were clearly distinguished (Table 3), which altogether explained 52.46% of the total variance. Considering the theoretical structure of health literacy, these domains were referred to as health information access (six items), reading (four items), comprehension skills (seven items), evaluation (four items), and decision-making (12 items) (Table 2).
The Kaiser-Meyer-Olkin (KMO) test was used for the correlation matrix and obtained from the administration of the questionnaire to the participants (0.89), and the Bartlett's test was estimated at 6908.425 with a statistically significant difference ($P ≤ 0.001$).

The results of the reliability measurements indicated that the internal consistency of all the domains of the HELIA questionnaire was above 0.7 based on the Cronbach's alpha coefficient.

In addition, the Cronbach's alpha values were estimated at 0.98, 0.88, 0.83, 0.70, and 0.74 for the domains of reading, health information access, comprehension skills, evaluation, and decision-making, respectively.

In the present study, Pearson's correlation-coefficient was used to investigate the structural and validity factors of the questionnaire. According to the obtained results, the items of a specific domain had the highest correlation with that domain. The items of each domain in the HELIA questionnaire are shown in Table 4. According to the test-retest method, the ICCs of the domains of health information access and evaluation were higher than 0.7 (Table 5). Moreover, the total ICC of the questionnaire was estimated at 0.77.

The present study aimed to develop a health literacy questionnaire and evaluate its validity and reliability based on the estimated status of health literacy in SCS as the largest population-based study conducted in Chaharmahal and Bakhtiari province. According to the findings, the HELIA questionnaire had acceptable construct validity and reliability.

However scree plot supported 5 factors with eigenvalue >1 (Figure 1).

Table 1: Demographic Characteristics of participants (n = 400)

Variable		N (%)
Age (year) N (%)	<45	126 (31.5%)
	45-55 years	155 (38.8%)
	55-65 years	117 (29.3%)
	> 65	2 (0.5%)
Marital Status N (%)	single	9 (2.3%)
	Married	376 (94%)
	Widow	12 (3%)
	Divorced	3 (0.8%)
Educational level N (%)	Illiterate	100 (21%)
	Primordial	62 (16.3%)
	Guidance	41 (10.8%)
	High school	80 (21.1%)
	College	117 (30.8%)
Sex	Male	188 (47%)
	Female	212 (53%)

Table 2: Result of the principal component analysis of questionnaire

Questions	Component				
	1	2	3	4	5
HR1	0.933				
HR2	0.902				
HR3	0.936				
HR4	0.929				
HR5		0.694			
HR6		0.668			
HR7		0.760			
HR8		0.770			
HR9		0.737			
HR10		0.633			
HR11			0.539		
HR12			0.695		
HR13			0.522		
HR14			0.525		
HR15			0.466		
HR16			0.611		
HR17			0.443		
HR18				0.426	
HR19				0.632	
HR20				0.655	
HR21				0.415	
HR22					0.476
HR23					0.528
HR24					0.500
HR25					0.449
HR26					0.689
HR27					0.660
HR28					0.666
HR29					0.605
HR30					0.459
HR31					0.554
HR32					0.411
HR33					0.511

Table 3: Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	8.716	26.413	26.413	8.716	26.413	26.413	4.593	13.917	13.917
2	3.724	11.286	37.699	3.724	11.286	37.699	4.359	13.209	27.126
3	1.930	5.847	43.546	1.930	5.847	43.546	3.393	10.282	37.408
4	1.591	4.823	48.369	1.591	4.823	48.369	2.948	8.933	46.341
5	1.350	4.092	52.461	1.350	4.092	52.461	2.019	6.119	52.461

Since the elimination of the items caused no increase in the Cronbach's alpha coefficient, and this index was higher than 0.7 in all the questionnaire domains, all the items of the questionnaire had acceptable internal consistency. Furthermore, the alpha values within the range of 0.7-0.8 were considered acceptable, confirming the reliability of the instrument [20].

According to the findings of Montazeri et al. (2014) the Cronbach's alpha of the studied domains of the HELIA questionnaire was 0.72 - 0.89 [21]. In addition, the mentioned research indicated acceptable ICC values (0.60 - 0.60). In the present study, the ICC values of < 0.4, 0.4 - 0.7, and > 0.7 were defined as poor reliability, acceptable reliability, and high reliability, respectively [22]. With regard to validity, the KMO test was estimated at 0.89, and the Bartlett's test was calculated to be 6908.425 ($P \le 0.001$). Closer KMO values to one represented the higher adequacy of the sampling and sample size to conduct factor analysis [16].

The results of factor analysis in 33 items resulted in the drawing of five factors with eigenvalues of higher than one. The factors with the eigenvalues of > 0.71, 0.63, and 0.55 were defined as excellent, very favorable, and favorable, respectively [23]. In addition, the five drawn factors could explain 52.46% of the variance. In the study by Montazeri et al. (2014) the results of factor analysis explained 53.2% of the variance in the five dimensions of the questionnaire [14]. The five factors drawn by factor analysis were considered as the determinants of health literacy in Iran, and reading and comprehension skills could explain 24.2% of the total variance (52.46%).

In research on health literacy, the ability to read, write, and comprehend health issues is considered to a significant determinant of this variable [24]. Similar studies have also denoted that decision-making, behavioral skills, and the ability to communicate with health authorities are among the key influential factors in health literacy, which could explain 6.12% of the total variance in factor analysis in the present study [25,26].

According to the literature, evaluation of health information in virtual media as a measure the ability of individuals to understand and evaluate the content of virtual media about health and disease is another major component of health literacy [27]. In the current research, this component could explain 8.93% of the variance. Furthermore, this factor has been recognized as an instrument to measure health literacy due to the widespread use of the internet in Iran (31.4% of the population in 2013) [2].

Another influential factor in health literacy is the availability of health information resources, which could explain 13.21% of the variance in the present study. Other studies focused on health literacy questionnaires conducted in different countries have been designed and performed by various researchers, and the findings have generally indicated that none of these instruments, including HELIA, are complete and could cover all the dimensions of health literacy (reading, comprehension skills, access to health information, evaluation, and decision-making). For instance, the TOFHLA has been used widely in different countries, including Iran, in order to measure health literacy in general, while it has not been able to measure its dimensions separately [14].
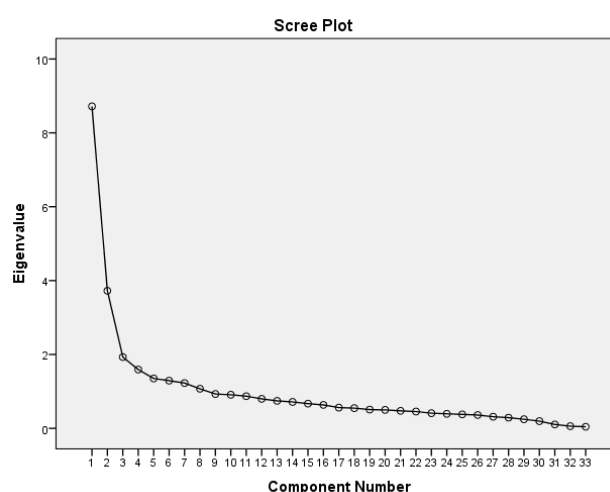

Figure 1: Scree plot for factor analysis of data

Table 4: Pearson correlation matrix for the five dimension of health literacy

Questions	Reading	Health information access	Comprehension skills	Evaluating	Decision making
Reading the written materials (books, etc.) on health and disease is easy for me.	0.98	0.45	0.57	0.30	0.05
Reading the written instructions of health professionals is easy for me.	0.95	0.44	0.51	0.26	0.05
Reading the medical and dental forms is easy for me.	0.98	0.42	0.54	0.25	0.05
Reading the written worksheets before performing lab tests/ultrasound/radiology is easy for me.	0.97	0.44	0.57	0.29	0.02
I can get the health information I need.	0.44	0.79	0.50	0.47	0.21
I can get healthy nutrition information.	0.40	0.80	0.52	0.49	0.26
I can get mental health information.	0.32	0.80	0.48	0.46	0.29
I can get information about the disease.	0.31	0.82	0.46	0.42	0.29
I can get health information and illnesses.	0.33	0.82	0.52	0.39	0.36
I can get information about the risks of smoking.	0.37	0.74	0.47	0.38	0.22
I understand the recommendations for healthy eating.	0.27	0.49	0.59	0.28	0.27
I understand the explanation of physician about my illness.	0.29	0.39	0.61	0.21	0.22
I understand the meaning of the material written in medical and dental forms.	0.46	0.43	0.76	0.32	0.18
I understand the concepts of guide boards in the hospitals.	0.54	0.38	0.77	0.29	0.13
I understand drug usage prescribed by the company or pharmacist on the package.	0.52	0.42	0.72	0.31	0.16
I understand the benefits and disadvantages of the therapeutic methods prescribed by the physician.	0.33	0.43	0.74	0.39	0.26
I understand the concepts of guide worksheets before performing lab tests/ ultrasound/radiology.	0.34	0.50	0.71	0.33	0.18
I can evaluate the health information presented on the Internet.	0.31	0.37	0.30	0.67	0.04
I can evaluate the health information presented on the Radio or TV.	0.13	0.42	0.36	0.70	0.40
I can evaluate recommendations presented by friends and relatives on health and disease.	0.11	0.34	0.25	0.76	0.24
I can transfer my health information to the others.	0.17	0.40	0.32	0.64	0.25
I know where to go to see the symptoms of the disease.	0.13	0.28	0.33	0.33	0.38
I use prescribed antibiotics completely in spite of resolved symptoms.	0.04	0.16	0.15	0.16	0.37
I do not stop medications prescribed by physician without his permission.	0.07	0.10	0.07	0.03	0.35
I refer to physician for check up in the case of having close relatives with cancer.	0.04	0.23	0.09	0.17	0.52
I refrain from doing things or substances that increase my blood pressure.	0.03	0.17	0.17	0.15	0.65
I refer to physician for annual checkup even if there are no symptoms for having cancer.	0.02	0.13	0.07	0.08	0.63
I take care of own health in any situation.	0.01	0.11	0.19	0.16	0.62
If I have had a question about my illness, I will ask a medical and healthcare practitioner.	0.03	0.28	0.17	0.35	0.60
I buy dairy products depending on the percentage of fat in it.	0.07	0.22	0.15	0.19	0.50
I refrain from doing things that increase weight.	0.01	0.15	0.07	0.08	0.52
I use a seat belt during my driving.	0.03	0.21	0.19	0.18	0.44
During buying food, I pay attention to their nutritional value.	0.01	0.16	0.21	0.16	0.54

Table 5: Interclass correlation coefficient of Questionnaire

Questionnaire domain	No. of items	Score Range min	Score Range max	Interclass correlation coefficient
Reading	4	20	4	0.66
Health information access	6	30	6	0.76
Comprehension skills	7	35	7	0.60
Evaluating	4	20	4	0.71
Decision making	12	60	12	0.68

4. Conclusion

According to the results, the validity and reliability of the HELIA questionnaire were acceptable, so that the instrument could be used to measure the health literacy status in the participants of SCS. In the present study, some aspects of validity were evaluated as well. Therefore, it is strongly recommended that a complete validation study of the HELIA questionnaire be conducted. Considering that health literacy instruments should be revised regularly, further investigations are required in order to evaluate health literacy using the HELIA instrument to identify its possible deficiencies.

Authors' Contributions

F.S., drafting of the manuscript, contribution to data collection and data analysis; A.A., study concept and design, manuscript revision. All the authors approved the final manuscript.

Conflict of Interest

None declared.

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