Adaptation, reliability and validity of Oral Health literacy instrument for Iranian University students: A new approach

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ABSTRACT

Background and Objective: It is important to use a standardized tool that has standard questions with the power to explain people's abilities and distinguish between them. This research was conducted with the aim of designing, validating and standardizing the oral health literacy questionnaire among Iranian medical students.

Materials and Methods: This is a cross-sectional study, which was done in the Ahvaz Jundishapur University of Medical Sciences in 2021. Pre-validation and post-validation were used for validation. The quality of questions was examined by difficulty and discrimination indices. The pre-validation population included 50 students and 10 experts for validation. Post-validation population includes 354 medical students. SPSS software ver26 and Amos software ver24 were used.

Results: The tool is valid based on face validity, content validity and construct validity. Totally Cronbach`s alpha was 0.768. Explanatory factor analysis showed a model with four factors named "preventive measures", "dental care", "oral diseases", and "care and visit dentist" which can explain 57.07 percentages of oral health literacy variances. Pearson correlation coefficient showed significant correlation between factors. Confirmatory factor analysis showed model is fit and the model fit indices were as follows: IFI= 0.697, CFI= 0.702, NFI= 0.717, AGFI= 0.767, GFI= 0.824, and RMSEA=0.07. Based on DIF and DI indices, this tool can show the students with correct answers and differentiate the students with high scores from low performing ones.

Conclusion: The current research tool has paid attention to different aspects of oral health and preventive and care measures. The approved tools include 3 factors and 22 questions.

Paper Type: Research Article

Keywords: Dental health survey, Health behavior, Health literacy, Holistic health, Oral health

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Introduction

Oral health literacy (OHL) refers to the ability of individuals to acquire, process, and understand oral health information and services that are necessary for appropriate oral health decisions (1). External factors affect oral diseases, such as economic status and lack of access to preventive and curative care services, and internal factors such as personality traits and behavioral habits related to oral health determine factors and the spread of oral diseases. Level of oral health literacy is an essential factor to control oral diseases (2). It was evidenced that OHL is related to maintain oral health (3). Investigation of OHL in individuals can help identify and improve their oral health behaviors. Efforts to promote oral health literacy led people to obtain oral health information from dental professionals who have valid, accurate, and up-to-date information about oral health. It can improve the quality of life. Information gathering about OHL and behavior helps dentists and researchers to understand how patients perceive and use oral health information. Having accurate information about oral health literacy and behaviors among young people can improve the decisions and policies related to oral health measurements. Some research related to oral health literacy focused on instrument standardization (4-12).

Researches related to the validation of OHL tools in different countries have paid attention to a specific population and have mainly been conducted on patients and adults with an average age of 30 and above. All of them used multiple-choice questions (MCQs). We are seeing an increase in the use of MCQs, which can assess the knowledge of students (13). A well-constructed MCQ can be used in different professional examinations in the broad subjects area (14). As a result of minimizing individual's judgment, it reduce the evaluation bias during scoring. If an MCQ is not well constructed (without standard criteria), it reduces the students` comprehension or problem-solving skills and will increase guessing (15, 16). Adequate and accurate knowledge in medical students is essential for improving their practical skills and developing appropriate professional attitude. Assessing during teaching and learning practice assures the capability of students to grasp the knowledge given. Therefore, the assessment process must be practical and reliable (17). Pre-validation and post validation assessment methods are being used for analyzing the questions. Pre-validation is done before conduction of assessment in which a group of specialists evaluates the applicability of topics and structure of MCQs. The post validation process is a statistical method (18). It is helpful in some aspects: it can show how much the findings from the use of the tool are due to random error (accuracy of measurement) (19); how much the findings from the use of the tool are due to measurement error (Measurement accuracy) (20); it tells about the difficulty and easiness of MCQs (difficulty index: DIF); it discriminates the students` status of knowledge about the subject (discrimination index: DI) (21). Analysis gives guidelines to the evaluators for making more appropriate MCQs amend them before the subsequent examination.

Based on the searches, validated oral health literacy questionnaires in different countries and Iran focused on adult (mean age 30 and older) and patients. No standardized and validated Persian oral health literacy questionnaire for the students was found. Some teachers cannot assess the quality of questions (22) due to the lack of standard tools for oral health literacy for their students. Likewise. Unstandardized MCQs can be added to examinations and researches. So, it is essential to use a standardized tool

that has standard questions with the power to explain people's abilities and distinguish between them. Regarding all above mentioned, the current research was conducted to validate and standardize the OHL questionnaire among medical students. The designed tool resulting from the present research can play an influential role in the standardization and more concentration in research related to oral health.

Materials and Methods

A cross-sectional study design with random sampling was used to recruit participants. The pre-validation population included 50 students (without re-participation) and ten experts for validation. The post-validation sample included 354 medical students of Ahvaz Jundishapur University of Medical Sciences. Sampling was randomly done. The inclusion criteria were engaging in education, and the students who were on academic leave were excluded. Kaiser-Meyer-Olkin (KMO) is measure of sampling adequacy. If P-Value was less than 0.0, the sample for factor analysis is adequate (30). Normalized chi-square is used to evaluate structural modeling. An acceptable value is less than 5 (32).

The test was developed based on Priya et al. (23), Scaglia and Niknamdeh (24), Ahamd et al. (25), Bhat and Kumar (26), and Doshi et al. (27) research questionnaires. The questionnaire has 26 multiple-choice questions (MCQs), which consist of demographic information such as gender, education, age groups (3 items), and oral health literacy (23 items). Oral health literacy questions were set as correct and incorrect answers with 1 and 0. The minimum score is 0 and the maximum is 23.

The steps of validation were pre-validation, post-validation, and analyzing the quality of question. In the pre-validation process, face validity and content validity will be determined (28). Face validity was determined based on the opinions of 10 experts; content validity determined based on the opinions of 10 experts and measuring Content Validity Ration (CVR). Experts must select three options for each question: “necessary, useful but not necessary, and not necessary (29). According to Lawshe’s opinion, when the number of evaluators is ten people, the minimum value of CVR for content validity is 0.62.

We used construct validity, Cronbach`s Alpha, Kuder-Richardson reliability coefficient, and Correlation coefficient in the post-validation process (28). The internal consistency of factors is determined using Cronbach’s alpha. An alpha value ≥ 0.7 indicates instrument validity (31). Kuder-Richardson’s (KR) test includes two tests KR 20 and KR 21. This test checks the consistency between the questions, and considers the ratio of right to wrong answers in the test. Therefore, it is helpful for tests that have true-false answers. When the questions are similar in difficulty, the formula KR 21 is used (33). The test or tool is acceptable when KR coefficient is ≥0.64 (34). This article used the Pearson correlation coefficient. We also used the correlation index within the clusters as the one of the methods to determine the stability of the test (35).

Construct validity was determined with explanatory factor analysis using principal component analysis (PCA) and varimax rotation. Exploratory factor analysis with the principal component analysis was used to investigate the internal relationship between variables. In this method, classes of variables with significant relationship with each other are identified (30). Total variance explained and the model summary was reported. The Amos graphic was used to show the relation between factors and items, and model fit indices includes IFI, CFI, NFI, AGFI, and GFI are interpreted. Their optimal value is

between 0 and 1. Closing to 1 indicates a better fitting model (32). Root Mean Square Error of Approximation (RMSEA) is taken for accounting model fit. If the value of this index is less than 0.1, the model`s fitness is excellent (36).

The MCQs quality was evaluated using the difficulty index (DIF) and the discrimination index (DI). These indices were used for the quality of MCQs. The difficulty index shows the students with correct answers. A higher value of DIF shows the students had the correct answers and a lower value proves that questions are easy to attempt. The range of DIF is from 0-1, and DIF Criteria were ranged from Too easy (DIF>0.7), Good (DIF b/w 0.5-0.6), Average (DIF b/w 0.3-0.7), and Too difficult (DIF<0.3). DIF formula is (14):

$$DIF= [(H+L)/N]$$

H= Number of students who gave correct options in the high score group

L=Number of students who gave correct options in the low score group

N=Total number of students in both groups

The discrimination index shows the capacity of an MCQ for differentiating the students with high-scores from low-performing ones. It was ranged from 0 to 1. Its criteria are classified as follow: Poor (DI≤0.2), Acceptable (DI b/w 0.21-0.24), Good (DI b/w 0.25-0.35), and Excellent (DI≥0.36). The formula used to calculate DI is (14): $DI= 2\times[(H-L)/N]$

The data were analyzed using the SPSS software version 26 and the Amos version 24.

Results

Demographic information

In this study 251 female and 103 male were participated. They included 90 undergraduate students, 77 master students, 175 MD students, and 12 PhD students.

Translation and cultural adaptation

The face validity was evaluated qualitatively. The initial version of the questionnaire was prepared based on the previous related researches that mentioned in the methodology section and included 28 items. The initial version of the questionnaire was prepared in English. Then Persian translation and re-translation into English were done. These two versions were compared with each other and approved by an English language expert. Then, it was given to specialists and 5 items were removed due to overlap in other items.

Validity and Reliability

Content validity was quantitatively evaluated based on the opinions of 10 experts in the field of health literacy, and CVR index is used to ensure that the most important and correct item is selected. The value of CVR for the current questionnaire was 0.74 and KMO is 0.759, Approx. Chi-Square is 2086.363, and P-Value is 0.000. Normalized chi-square is 4.57 and showed this is a valid model. Exploratory factor analysis was based on Eigen value=one, absolute value ≥0.3, and Varimax rotation. The results of exploratory factor analysis led to the identification of four factors (All items except item number 8 placed in groups). The factors were named based on related researches and the nature of the items were as follow: Factor 1: preventive measures, Factor 2: dental care, Factor 3: oral diseases, and Factor 4: caring and visiting dentists. The internal consistency of factors is determined using Cronbach's alpha. Alpha value 0.768 and indicates instrument validity. This is a valid instrument and can explain 57.07 percent of oral health literacy variance. Table 1 showed exploratory factor analysis results, Cronbach's alpha, and explained variance.

Table 1: Exploratory factor analysis results, Cronbach`s alpha and explained variance

Item no		Factor1	Factor2	Factor3	Factor4
13	Cleaning teeth to prevent caries	0.807			
22	Ways to prevent tooth decay	0.797			
10	Impact of oral health on body health	0.770			
23	Gum disease prevention methods	0.676			
11	Appearance of decayed teeth on other teeth	0.633			
12	Role of tooth color in its cleanliness	0.592			
14	Effect of oral hygiene in preventing bleeding gums and tooth loss	0.575			
21	Preventive role of dentists	0.457			
19	Effect of toothbrush being hard on teeth and gums		0.532		
4	Effect of remaining sugary substances on teeth		0.525		
18	Cleaning teeth without using toothpaste		0.524		
1	Main purpose of brushing		0.514		
5	Effect of fluoride on teeth		0.403		
20	Need for immediate replacement of artificial teeth instead of missing teeth		0.359		
3	Meaning of bleeding gums			0.671	
6	Oral cancer Causes			0.510	
7	Oral cancer prevention methods			0.389	
15	Effect of sugary substances on tooth decay			0.381	
2	Meaning of dental plaque			0.353	
9	Suitable tools and materials for washing mouth				0.672
17	Visit the dentist regularly				0.660
16	The role of regular dentist visits in preventing oral problems				0.535
	Cronbach's alpha (totally: 0.768)	0.772	0.764	0.756	0.753
	Variance explained (totally: 57.07)	17.3	14.7	12.22	12.85

The conceptual model obtained from the analysis of exploratory factors was fitted using AMOS software. The results showed that if factor 4 is removed, the fit of the model increases. Therefore, the fourth factor was removed and 3 factors were confirmed. Figure 2 shows graphic export for the model.

The k21 formula was used, and the value was 0.765, which indicated the reliability of the test.

Pearson correlation coefficient showed a significant correlation between factors. The result showed in table 2.

Table 2: Pearson correlation coefficient results

		Factor1	Factor2	Factor3
Factor 1	Pearson Correlation	1	.228**	.266**
	Sig. (2-tailed)		.000	.000
Factor 2	Pearson Correlation	.228**	1	.220**
	Sig. (2-tailed)	.000		.000
Factor 3	Pearson Correlation	.266**	.220**	1
	Sig. (2-tailed)	.000	.000	

Table 3 shows the result of quality of MCQs based on DIF and DI indices.

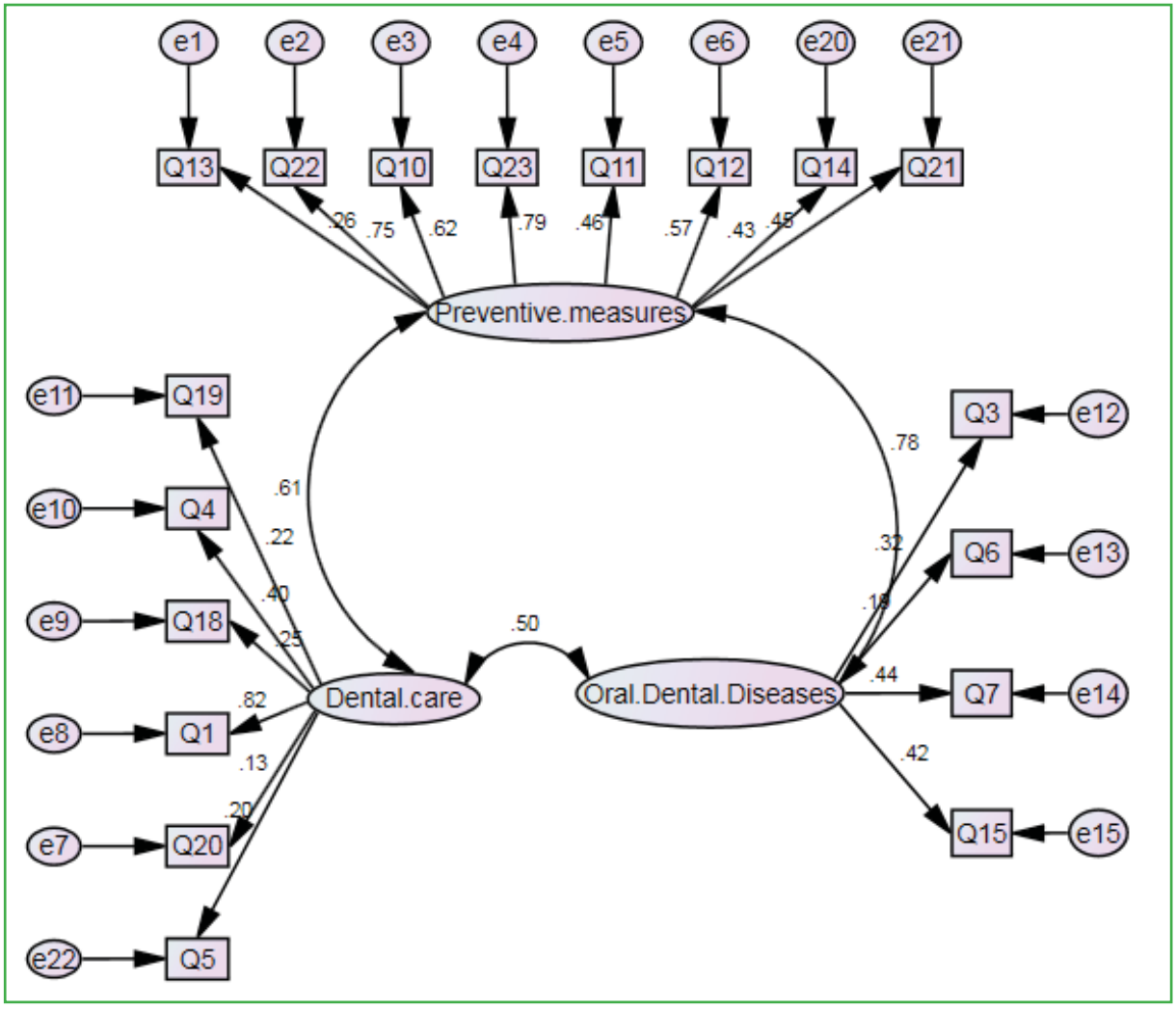

Figure 1. Graphic export for model (AMOS)
IFI= 0.697, CFI= 0.702, NFI= 0.717, AGFI= 0.767, RMSEA =0.074, and GFI= 0.824 show model fit.

Table 3: Results of DIF and DI

	Difficulty Index	Discrimination Index
Q1	0.67	0.56
Q2	0.55	0.49
Q3	0.65	0.54
Q4	0.70	0.48
Q5	0.65	0.46
Q6	0.52	0.71
Q7	0.53	0.74
Q8	0.58	0.49
Q9	0.66	0.55
Q10	0.70	0.47
Q11	0.70	0.48
Q12	0.67	0.59
Q13	0.61	0.64
Q14	0.59	0.77
Q15	0.70	0.51
Q16	0.70	0.52
Q17	0.67	0.63
Q18	0.58	0.66
Q19	0.59	0.55
Q20	0.51	0.54
Q21	0.51	0.72
Q22	0.67	0.59
Q23	0.61	0.76

Based on DIF criteria, questions 1,3-5, 9-13, 15-17, and 22-23 are average and questions 2, 6-8, 14, 18-21, are Good. Based on DI criteria, all of the questions are excellent. So, this tool can show the students with correct answers and can differentiate the students with high-scores from low-performing ones.

Discussion

This research was conducted to validate a tool for examining oral health literacy status among Iranian medical students. To determine pre-validity, the opinions of one English language expert and ten health literacy experts were used. After preparing the initial version of the questionnaire, it was redistributed among 50 students on the condition of non-participation. After the approval of the questionnaire, it was distributed among 354 medical students to implement post-validation and determine reliability and stability. Face validity, Content validity, and construct validity were confirmed. The results of the explanatory factor analysis showed a model with four factors "preventive measures, dental care, oral diseases, and caring and visiting dentists". Preventive measure pays attention to maintain oral health, risk prevention methods, the effect of oral hygiene in preventing bleeding gums and tooth loss, gum diseases prevention, the preventive role of dentists, and the impact of oral health on body health. Dental care deals with literacy related to the effect of brushing and using fluoride, using toothbrushes, remaining substances on teeth (maybe not clean tooth), and literacy about immediate replacement of artificial teeth instead of missing teeth. This factor has attention to literacy related to oral health behavior. Oral diseases include people`s literacy about bleeding gums, oral cancer, tooth decay, and dental plaque (as a dental problem). Caring and visiting dentists deals with students` literacy in need to visit the dentist regularly and the role of it in preventing oral problems and some suitable tools for washing mouth (paying attention to washing your mouth and brushing your teeth). These factors can explain 57.07 percent of oral health literacy variance. The results of confirmatory factor analysis showed that if fourth factor (caring and visiting dentists) is removed, the fit of the model increases. Therefore, the fourth factor was removed and three factors were confirmed. Based on the indicators used, the model with three factors has a good fit. The quality of questions can show the students with correct answers and can differentiate the students with high-scores from low-performing ones.

In this research, a tool for examining oral health literacy among students was designed and validated. In most of the researches that have been conducted so far with the aim of examining oral health literacy, the focus has been on listening skills, reading skills, writing skills, numeracy, and word recognition. While in the present research, according to the identified factors, it can be said that oral and dental health literacy can be done according to preventive measures in oral health, dental care that affect oral health and oral diseases which are outcomes of low health literacy. Oral health literacy can play an effective role in improving the oral and dental health of people by improving preventive indicators, strengthening oral, gum and dental care, and raising awareness about oral and dental diseases. In the context of all these factors, there is oral and dental health behavior and people's attitude.

Conclusion

Oral health tools mainly have discussed conceptual knowledge (listening skills, reading skills, writing skills, numeracy, and word recognition).

However, the current research tool focused on different aspects of oral and dental health and preventive and care measures; it can be a new approach and can be considered a beginning for conducting additional research in oral and dental health. The approved tools have 3 factors and 22 questions. Pre-validation and post-validation showed that this valid tool is useful for oral health investigation among medical students and can evaluate the student's oral health status and differentiate students with high-scores from low-performing ones. The present study has faced some limitations. Since this research has been conducted in the student community, the generalization of its results to the whole community should use with caution. Since the student is mainly different in terms of literacy level from other people, this feature can also affect their health literacy outcomes. In addition, students are mainly in the same age group, making them different from the age homogeneity in the entire society. Therefore, it is suggested that similar research could be done considering different age and educational groups in the society and the results be compared with each other.

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