Research Article

CLINICAL INVESTIGATION

Psychometric properties and validation of the Adherence to a Healthy Lifestyle Questionnaire (AHLQ) on Cardiac Syndrome X Patients (CSX)

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Abstract

Purpose: The purpose of this study was to assess the reliability and validity of the Persian version of the Adherence to a Healthy Lifestyle Questionnaire (AHLQ) between patients with CSX. Considering that, there is no validated tools that to evaluate Adherence to a Healthy Lifestyle for Cardiac Syndrome X (CSX) patients. Hence, evaluation of adherence to a healthy lifestyle is essential for planning treatments, guaranteeing their effectiveness, and deciding on future treatments.

Methods: In this study, 100 outpatients who were referred to the Clinic of Heart Centre Hospital were recruited by randomized sampling. The CSX patients were asked to fill out the demographic characteristics form and (AHLQ) questionnaire. Construct validity, internal consistency, and stability of the questionnaire were evaluated using confirmatory factor analysis, calculation of the Cronbach's alpha coefficient, and correlation coefficient, respectively.

Results: Evidence of sufficient reliability (internal consistency) and validity was observed. The reliability of the AHLQ was assessed by internal consistency and test-retest reliability. The reliability of each subscale was confirmed by Cronbach's alpha=0.943. The level of significance was evaluated at P<0.05. The tool has shown satisfactory validity.

Conclusions: The instrument has shown a good psychometric property, with high internal consistency and evidence of internal and convergent validity..

Keywords: Healthy lifestyle questionnaire • Cardiac Syndrome X • validation • adherence to a healthy lifestyle

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Introduction

Cardiac Syndrome X (CSX) is micro-vascular dysfunction or constriction that causing angina with severe chest pain [1,2]. The prevalence of CSX is considerable. Besides, the burden of cardiac heart disease, and related conditions remains high, with rates of hospitalization, disability, and cost on the rise [2,3]. Moreover, angina without Coronary Artery Disease (CAD) has substantial morbidity and is present in 20% to 30% of patients undergoing angiography [1,4]. CSX is a condition that causes the symptoms of angina, such as chest pain or tightness that increased sensitivity to pain [5,6]. It has the highest prevalence in pre or post-menopausal of women [1,6]. A study has revealed that in a 2 year follow up duration after coronary angioplasty, 30% to 40% of patients experienced repeated angina [1,7,8].

Meanwhile, according to the WHO report Coronary Artery Disease (CAD) is the first leading cause of death with 17.8 million cases in the world, and the most widespread cause of death in the local setting [9]. It is estimated that cardiovascular disease in this territory, accounts for about 46% of all major causes of death [4,10]. In addition, cardiac diseases are associated with high morbidity and mortality, frequent hospitalization, and economic strain on the family of patients and the healthcare system [11]. Moreover, Acute Coronary Syndrome (ACS) is one of the severest cardiovascular diseases in terms of the cost of interventions [12,13]. Many researchers have demonstrated that the most

common reason for cardiac heart disease is an unhealthy lifestyle and that maintenance of health levels depends on adherence to a healthy lifestyle [13,14]. Hence, evaluation of adherence to a healthy lifestyle is essential for planning treatments, guaranteeing their effectiveness, and deciding on future treatments [15,16]. Such an assessment requires valid and reliable tools [17]. In addition, the health status reported by the patient which includes symptom burden, functional situation, and HRQL, is an important measure of health [15,18]. However, there is no standard tool for adherence to healthy lifestyle estimation in the Persian language. Furthermore, there is no study yet addressed the development of the tool of adherence to a healthy lifestyle with the self-care program in the Persian setting, especially for CSX rehabilitation. Accordingly, it is an important gap in this regard and there is an insufficiency for valid and reliable comprehensive tools in order to estimate adherence to treatment and a healthy lifestyle. Since the evaluation of adherence to a healthy lifestyle is essential for planning treatments and deciding on future treatments. Therefore, it is essential to develop a psychometrically valid and reliable questionnaire to measure adherence to a healthy lifestyle in the field of cardiac Syndrome X or atherosclerosis rehabilitation. This study was undertaken to develop and evaluate the psychometric properties of the Adherence to a Healthy Lifestyle Scale (AHLQ) in the Farsi language.

Methods

Participants

This study was conducted among one hundred (100) CSX outpatients who were qualified for this study and referred to the Clinic of Heart Centre Hospital for treatment with evidence of CSX risk factors have selected *via* randomizing sampling. These outpatients for the current study have been recruited based on the diagnosis of the Cardiologist Specialist through the clinical examination, coronary angiography, and physical exercise test also Lab tests. The participants that were selected for this study have met the inclusion criteria.

Instrument

A cross-sectional method was used in this study to evaluate the Adherence to a Healthy Lifestyle (AHLQ) questionnaire. The (AHLQ) instrument is a specific questionnaire and developed by Sanofi Aventis [19] in the English language. It measures adherence to a healthy lifestyle (such as diet, exercise, motivation, barriers, results, satisfaction, and adherence to lifestyle changes). The AHL questionnaire has been translated into Farsi according to the WHO recommendation. The questionnaire has 41 items that cover five subscales including Motivation (5 items) Barriers (9 items), Results (7 items), Satisfaction (8 items), Adherence to Lifestyle Change (7 items), The 5 domains are scored Likert-style, using a score from 1 to 5 Further questions are about patient characteristics ('About yourself'). The data was collected from participants in a cardiac clinic of a teaching Hospital. The outpatients were considered qualified and referred to the Heart Centre Hospital for visit and treatment with evidence of CSX disease as diagnosed by a cardiologist specialist. The data was collected starting in March 2018-August 2018. The questionnaire was distributed among participants, after fulfilled the questionnaire they returned it to the researcher.

Statistical analyses

Data analysis was conducted using SPSS, Version 23, and the level of significance was estimated at $P<0.05$. The calculation was done by Microsoft Excel and using a formula derived from Polite and Beck. A pilot study was carried to examine the validity and reliability of instruments former to the main study took place. In this study, the Content Validity Index (CVI) and Content Validity Ratio (CVR) were assessed. Moreover, after the Exploratory Factor Analysis (EFA) Confirmatory Factor Analysis (CFA) was conducted by using Partial Least Squares Equation modelling (PLS-SEM) [20,21] in order to test the structural model's suitability of the AHLQ. Convergent validity is assessing the degree to which a measure is associated positively with alternative measures of the same construct Convergent validity can be measured at the construct level through the Average Variance Extracted (AVE). This measure is defined as the grand mean value of the squared loadings of the items related to the construct. The Average Variance Extracted (AVE) should be higher than 0.5. However, following Fornell and Larcker an AVE of 0.4 can be accepted if the composite reliability is higher than 0.6 [22,23]. In this case, the convergent validity of the construct is considered adequate. The usual method for measuring internal consistency is Cronbach's alpha, which provides an estimate of reliability based on the inter-correlations of the observed indicator variables. However, this measure is sensitive to the number of items in the scale and leads to the underestimation of the internal consistency reliability [24,25].

Because a significant outer loading could still be fairly weak, a common rule of thumb is that the (standardized) outer loadings should be 0.708 or higher. Indicators with very low outer loadings (below 0.50) should be removed from the scale [23]. The Cronbach's alpha test for the internal reliability of a questionnaire is a statistical test that results in a coefficient called Cronbach's alpha. It is used to test the reliability of a Likert spectrum questionnaire; whose answers are multi-choice [25,26]. Discriminant validity is a method of ensuring that a construct is actually different from other constructs by empirical standards [27,28] Thus, affirming discriminant validity proposes that a construct is unique and captures phenomena not described by other constructs in the model [28,29]. Discriminant validity can be tested by evaluating the squared AVE for each construct against correlations (shared variance) between the construct and all other constructs in the model. A construct will have adequate discriminant validity if the squared AVE exceeds the correlation among the constructs [22,23]. Discriminant validity of reflective constructs was also evaluated using the Heterotrait-Monotrait ratio of correlations. If the HTMT value is more than 9 there is an issue of discriminant validity [30]

Translation process

The instruments of the AHLQ were basically written and developed in English and translated into different languages. Since the participants in this study do not speak English as their first language. Therefore, it was necessary to translate the instruments into Persian. Thus, a pilot study was started by performing the translation process of instruments guided by the World Health Organization [31] recommendation since the first language of the proposed participants is Farsi. The aim of this process was to produce a Persian version of the AHLQ which would be equivalent to the English version and acceptable by ten nursing experts and two cardiologists. The translation was done by an expert translator with more than ten years of teaching experience in English and Farsi. The second step was to create an expert panel to review the translation. Among the ten experts, was a cardiologist specialist with more than Six years' experience in a teaching hospital as a lecturer and seven senior lecturers, as well as two nurses with more than 18 years of experience. After the agreement was reached among the experts, a complete translated version resulted. The third step was Back-translation that applying the same approach as outlined in the first step. The process was quite similar to the first step, but it was a backward translation from Farsi to English by an independent translator whose mother tongue is English and who has no knowledge of the questionnaire. There were no significant discrepancies observed and a satisfactory version was achieved. The fourth step was pre-testing. The translated version was pre-tested. At the end of the process, the AHL questionnaire (version of Persian) has approved by the Cardiologist and the team of translation.

Pre-test (content and face validity)

To determine the content validity of the presented questionnaire, the Ratio of Content Validity (CVR) to Content Validity Index (CVI) based on the Lawasheh formula was calculated. Performing so, the opinions of 10 experts and professors in the fields of cardiology and nursing of health education and health promotion, nutrition and medicine were also collected about the questionnaire. The calculation was done by Microsoft Excel using a formula derived from. To achieve the CVR, the group of experts was asked to comment on items associated with each construct. Hence, each expert made an independent assessment of content validity by rating the content relevance of each item using a 4-point ordinal scale, 1=not relevant to context and goals; 2=somewhat relevant to the context and goals, 3=relevant to the context and goals and 4=highly relevant to context and goals.

In this formula:

- n_e=The number of specialists who have chosen the "Necessary" option
- N=total number of assessors.

After calculation of CVR, 3 items were excluded since they did not obtain the necessary ratio. Results of Content Validity Ratio (CVI) index for all items of AHLQ indicated that 3 items including. In your opinion, do you think that how satisfied are you with the way you look? How much self-confidence do you have? Did not meet the cut-off point of 0.6 and one item 3. How satisfied are you with how much you eat? Did not meet the cut-off point of 0.8 for CVI. Therefore these 3 items were dropped from the questionnaire in the pilot study for construct validity. Researchers usually report S-CVI of two types; S-CVI/UA, which refers to the 'proportion of items on a scale that achieve a relevance rating of 3 or 4 by all experts', and the S-CVI/Ave, which is the 'average of the I-CVIs for all items on the scale' [29,30]. According to Lynn's criteria, as cited in recommend that have excellent content validity, instruments should attain a minimum I-CVI of 0.78 for 6 to 10 experts and an S-CVI/Ave of 0.90 or higher [20,23]. The content validity index is calculated based on the Waltz and Basel formula, which indicates that items with a CVI score of more than 0.79 are appropriate. Items with a CVI score between 0.70 and 0.79 are questionable and need to be modified and revised, and items with a CVI of less than 0.70 are unacceptable and should be deleted.

Results

Pilot study

The reliability of the AHRQ was evaluated by internal consistency and test-retest reliability. Internal consistency was assessed by Cronbach's alpha and test-retest reliability by the Intra-Class Correlation Coefficient (ICC) and Kappa. Since the second to sixth items were assessed via Likert scales, an ICC test (Interclass correlation coefficient) for each domain was used to check the reliability. The results of this analysis for each domain are shown in Table 1. The table indicates that all subdomains had acceptable reliability and that the ICC also has acceptable values for all subdomains (Table 1).

Table 1: Test- Re-test reliability for the first part of AHLQ questionnaire.

Domain	Kappa index	ICC	p-value
Motivation	0.621	0.76	<0.001
Barriers	0.806	0.91	<0.001
Results	0.896	0.99	<0.001
Satisfaction	0.902	0.94	<0.001
Lifestyle Change	0.956	0.96	<0.001

Demographic characteristics

One Hundred Cardiac Syndromes X have participated in this study. Overall, the majority of participants were female (58%). The mean age of the participants was=55.79 (Table 2).

Table 2: Demographic Characteristics of samples (N=100).

Variable	Level	N	Percentages (%)
Group	Control	50	50
	Intervention	50	50
Sex	Female	58	58
	Male	42	42
Marriage	Married	6	6
	Widow	86	86
	Single	8	8
Education	Diploma	44	44
	University	34	34
	literacy	22	22
Income	Good	12	12
	Middle	39	39
	Low	49	49
Family. History	No	43	43
	Father	17	17
	Mother	33	33
	Sister	5	5
	Brother	2	2
Unrelated. History	Yes	40	40
	No	58	58
Age Mean (SD)		55.79	12.1
height Mean (SD)		165.12	9.64
Pre. weight Mean (SD)		72.56	14.47
Child Mean (SD)		2.71	1.76

Confirmatory factor analysis

Confirmatory Factor Analysis (CFA) was performed to assess the validity of the measurement of the AHLQ as related to the theory underlying the measurement by testing the hypothesized relationships. The English version of the AHLQ has been evaluated on the basis of psychometric properties and found satisfactory. However, the Persian version of the instrument had not been evaluated for its validity and reliability in Iran prior to this study. Thus, a pilot study was conducted before distributing the final version of the translated instruments to 100 CSX outpatients who were referred to the heart clinic of the hospital.

For the Adherence to a Healthy Lifestyle (AHL) questionnaire, structural equation modeling was used. Due to the small sample size (<300), Smart-PLS software Version 3.1 was used. The measurement model CFA has to follow rules governing how the latent variables are measured based on the observed variables, and it explains the measurement of the items (observed variables). To define the individual item reliabilities, the investigator analyzed the loading factors of the respective constructs. According to Chin, standardized loadings should be more than 0.707. Confirmatory Factor Analysis (CFA) for all reflective constructs was done using Smart PLS software (Figure 1).

Convergent validity of AHLQ

Regarding this study, Composite Reliability (CR) was found to be between 0.907 and 0.952. In addition, in this study, AVE is above 0.5 (Table 3). Thus, the results show that convergent validity (AVE) and Composite Reliability (CR) exist for the constructs of this study (Table 3). Based on these results, it can be concluded that all items had acceptable loading values. Therefore, all the items were retained in the model. Table 3, shows the result of the Convergent Validity

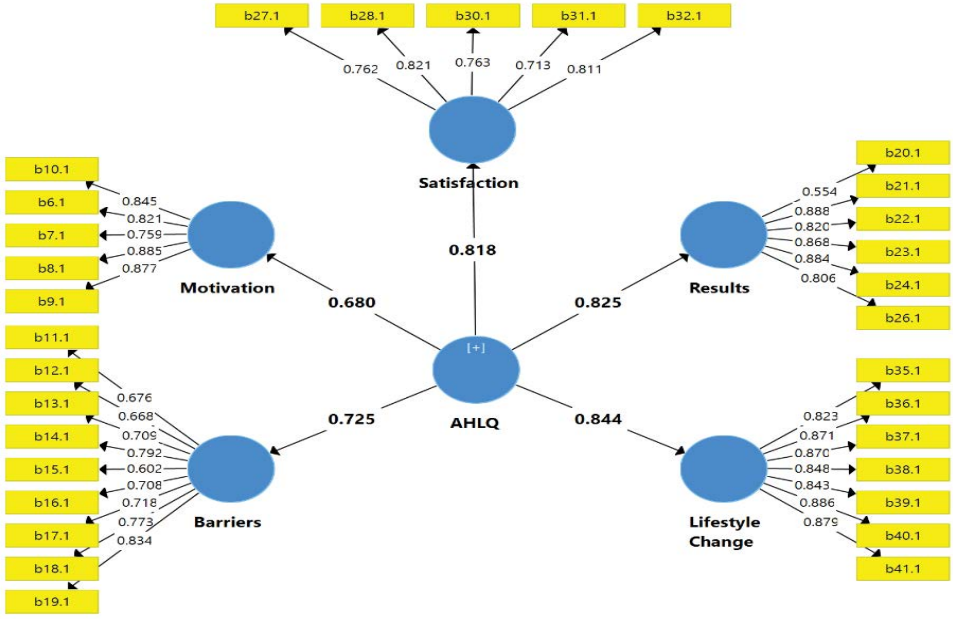

Figure 1: Measurement model of Adherence to a Healthy Lifestyle questionnaire.

Table 3: The result of Convergent Validity of AHLQ.

Construct	Cronbach's Alpha	CR	AVE
Motivation	0.894	0.922	0.704
Barriers	0.885	0.907	0.523
Results	0.892	0.919	0.659
Satisfaction	0.834	0.882	0.601
Lifestyle Change	0.941	0.952	0.74

CR= Composite Reliability, AVE = Average Variance Extracted

Table 4: HTMT discriminant Validity of AHLQ components.

	Lifestyle Change	Barriers	Motivation	Results	Satisfaction
Lifestyle Change	-	-	-	-	-
Barriers	0.457	-	-	-	-
Motivation	0.476	0.634	-	-	-
Results	0.667	0.457	0.482	-	-
Satisfaction	0.72	0.484	0.443	0.819	-

test of the translated AHLQ. The AVE for each construct is more than each of the squared correlations between the constructs.

Discriminant validity

In addition, the HTMT values (Table 4) were below 0.9. This indicates that there are no issues related to discriminant validity. Therefore, discriminant validity is adequate for all of the constructs. According to the results of cross-loading, it was found that all items loaded higher against their respective intended latent variable compared to other latent variables. Therefore, it is concluded that the measurement model has been confirmed in relation to discriminant validity.

Discussion

This study aimed to ascertain the reliability and validity of a questionnaire designed to evaluate the Persian version of the Adherence to a Healthy Lifestyle Questionnaire (AHLQ) between patients with Cardiac Syndrome X. The results indicated that the mentioned questionnaire had acceptable reliability and validity accordingly, that it can be used in studies related to Cardiac disease patients. Regarding this study, Composite Reliability (CR) was found to be between the lowest 0.901 and the highest 0.940. Associations between the questions and total score indicated that each of the items was highly correlated with the total score. Convergent validity can be measured at the construct level through the Average Variance Extracted (AVE). This measure is determined as the grand mean value of the squared loadings of the items related to the construct. The AVE for each construct is more than each of the squared correlations between the constructs. In addition, the HTMT values (Table 4) were below 0.9. This indicated that there are no issues related to discriminant validity. Therefore, discriminant validity is adequate for all of the constructs. Furthermore, the common method for measuring internal consistency is Cronbach's alpha, which provides an estimate of the reliability based on the inter-correlations of the observed indicator variables. Hence, the result of Cronbach's alpha was 0.943.

According to these results, it can be found that all items loaded higher against their respective intended latent variable compared to other latent variables and therefore concluded that the measurement model has confirmed its discriminant validity. In addition, in this study, AVE is nearly above 0.5. Thus, the results demonstrate that convergent validity (AVE) and Composite Reliability (CR) exist for the constructs of this study. Based on the results it can be concluded all items had an acceptable value for loading. In this study, to be consistent with the choice of multivariate analysis used in this study, confirmatory factor analysis CFA for all reflective constructs was done using Smart PLS software [29]. Confirmatory Factor Analysis was conducted to investigate the internal consistency and construct validity of the questionnaire. CFA was used to examine the internal consistency and construct validity of the questionnaire. Psychometric experts believe that the correlation between subscales of a test is an indication of internal consistency and construct validity of a test [32,33]. In this study, the obtained correlation coefficients showed that the subscales were more or less interacting with each other. Regarding shared values and factor loadings, the findings of this study suggested that the questions' factor loadings were high. In addition, accepting 0.4 as a threshold for factor loadings, [24,28] it was specified that all questions had acceptable factor loading. This indicated that based on factor analysis, every one item in the questionnaire was equally important [20,28].

Similar to other related studies, to determine the content validity of the questionnaires, a panel of experts was used [33]. In some studies, quantitative criteria are used to validate a questionnaire; in the prospect of that, experts are asked to quantitatively represent their ideas about each item, and finally, a number is reported as a CVI [30]. The results of the Content Validity Index (CVI) for all items of AHLQ indicated that 3 items have been excluded. According to the 10 specializes viewpoints on the cut-off point, these 3 items were not valid. These 3 Items were the lowest score of I-CVI as six experts estimated it. The experts suggested being adjusted the questionnaires according to the Iranian culture and with attention to the administering the prescriptive to the patients. Hence, these 3 items were dropped from the questionnaire in a pilot study for construct validity. Between the limitations of this study were that the diagnosis of CSX disease by a cardiologist still is a big challenge and complicated and the samples were limited. On the other hand, randomized sampling that has been frequently suggested as a way to improve generalizability was one of the powers of this study [22,23]. In sum, employing this instrument for CSX patients and atherosclerosis is recommended in order to improve the quality of life and adhere to a healthy lifestyle in cardiac patients.

Limitations

- Firstly, it is the first study that has been examined the adherence to a healthy lifestyle instrument among CSX and coronary atherosclerosis patients with the aim of closing this gap. Hence, little evidence is available on CSX and its associated risk factors for prevention or treatment
- Secondly, the diagnosis of Cardiac Syndrome X by a cardiologist still is a big challenge and complicated, thus the sample size was limited
- Thirdly, the clinic was very crowded and the collaboration process between the hospital and staff with the researcher at the time was very difficult

Conclusion

The instrument has shown a good psychometric property, with high internal consistency and evidence of internal and convergent validity. AHLQ is a valid and reliable tool for the assessment of adherence to a healthy lifestyle among CSX and coronary atherosclerosis patients. Due to its comprehensiveness, and easy applicability in different healthcare settings, AHLQ can be used by different healthcare providers, including nurses, for assessment of adherence to a healthy lifestyle among patients with CSX.

Ethical considerations

- This study was approved by the University and teaching hospital. The approval number was 201839-6110 & MEDICINE.REC.1398.901
- Moreover, informed written consent was received from the participants

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Declaration of Conflicting Interests

The authors of this article declare that they have no conflicts of interest.

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