



Original Article

# The Investigation of Psychometric Properties (Validity and Reliability Reassessment) of WHO QOL-BREF Questionnaire in Shahrekord Cohort Study

Fatemeh Salehi<sup>1</sup> , Ali Ahmadi<sup>1\*</sup> <sup>1</sup>Modeling in Health Research Center, Shahrekord University of Medical Sciences, Shahrekord, Iran

## Abstract

**Background and aims:** The purpose of this study was to revalidate the Persian version of the WHO quality of life (WHOQOL-BREF) instrument to determine the quality of life status in the Shahrekord Cohort Study (SCS) in the southwest of Iran. This study was designed to serve as one of the sources of the Prospective Epidemiological Research Studies in Iran.

**Materials and Methods:** In this cross-sectional study, 2000 people were randomly selected from the study population of the SCS. The reliability and internal consistency of the WHOQOL-BREF were measured using Cronbach alpha coefficient and Pearson's correlation. Construct validity and factors measured using Pearson's correlation matrices with each of its domains. To measure the face, content, and construct validities, the views of the panel of experts and exploratory factor analysis were used. In addition, the validity of the questionnaire was evaluated using linear regression.

**Results:** All domains of the questionnaire met the minimum reliability standards (Cronbach alpha and intra-class correlation >0.7), except for social relationships. The results of comparison analysis indicated that the questionnaire discriminated well between subgroups of the study samples differing in their health status. Regarding validity, the Kaiser-Meyer-Olkin (KMO) value was 0.94 and the value of Bartlett's test was 1699.01 ( $P \leq 0.001$ ).

**Conclusion:** The findings suggested that WHOQOL-BREF is a reliable and valid measure of health-related quality of life among SCS population.

**Keywords:** Iran, Quality of life, Reproducibility, Validity

## \*Corresponding Author:

Ali Ahmadi, Modeling in Health Research Center and School of Public Health, Department of Epidemiology and Biostatistics, Shahrekord University of Medical Sciences, Shahrekord, Iran. Email: [aliahmadi2007@gmail.com](mailto:aliahmadi2007@gmail.com)

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## Introduction

According to the World Health Organization (WHO), quality of life refers to an individual's perception of his/her position in life in the context of culture and value systems in which s/he lives and in relation to his/her goals, expectations, standards, and concerns.<sup>1</sup> Age, gender, health status, disease, and cultural factors affect people's perceptions of quality of life.<sup>2</sup> In other words, quality of life is a widespread concept influenced by physical health, psychological health, level of independence, social relationships, and environmental factors.<sup>3</sup> There are many general instruments to measure quality of life such as Short Form-36 (SF-36), WHOQOL-BREF, World Health Organization Quality of Life-100 item (WHOQOL-100) instrument, and Subjective Quality of Life Profile (SQLP). WHOQOL-BREF is one of the best-known instruments for cross-cultural comparisons of quality of life that is available in more than 40 languages. The

questionnaire is an abbreviated version of WHOQOL-BREF, which measures quality of life in four domains.<sup>4</sup> This questionnaire could be used in epidemiological and outcome studies and could provide an opportunity for future studies to compare the quality of life among the Iranian and foreign populations.<sup>3</sup>

In clinical and epidemiological studies, the measurement of variables is always accompanied by some mistakes. The main source of differences in values in a study is the presence of different individuals, but there are usually other sources of differences between observers and inside observers that can be seen as potential bias or increased effects in the analysis. Therefore, one of the major challenges of clinical and epidemiological studies is to find a reliable instrument.<sup>5</sup> The validity and reliability of the WHOQOL-BREF have already been investigated by Nedjat et al in 2007 in Tehran, Iran.<sup>3</sup> This questionnaire is sensitive to the demographic characteristics of people

and can be changed accordingly.<sup>6</sup> Since the questionnaire was administered to the population of Tehran, the capital of Iran, which is different from the populations of Chaharmahal and Bakhtiari province, it is necessary to validate the questionnaire in an appropriate target community. In addition, no study has yet been conducted to investigate the quality of life using a reliable and valid instrument in this province. The purpose of this study was to assess the validity and reliability of the Persian version of the WHOQOL questionnaire to estimate quality of life status in the Shahrekord Cohort Study (SCS) as it is considered to be an important instrument to measure quality of life.

## Materials and Methods

In this population-based cross-sectional descriptive-analytical study, the data of SCS in June 2018 were used. SCS is a population-based prospective cohort study consisting of people aged 35-70 years started in November 2015 in Iran. The sample size of the original cohort is at least 10000 people. Annual follow-ups (200000 people/year) of the cohort were designed to be conducted up to 2036. Detailed information about SCS has previously been published. This study was designed to serve as one of the sources of the Prospective Epidemiological Research Studies in Iran.<sup>7</sup>

### Data Collection Instruments

The WHOQOL questionnaire was used to collect data. This questionnaire was used to measure the quality of life of the respondents during the last two weeks and has a total of 26 items. The Persian version of the WHOQOL-BREF consists of four domains, namely environmental health, social relationships, mental health, and physical health, with respectively 8, 3, 6, and 7 items, which are rated on a Likert scale. The first two questions do not belong to any of the domains and generally assess the health and quality of life. The physical health domain includes physical activity, daily activities, functional capacity and energy, pain, and sleep. The psychological domain addresses negative thoughts, positive attitude, self-esteem, mentality, learning ability, memory and concentration, religion, and mental status. The social relationships domain includes questions about personal relationships, social support, and sexual life. The environmental health domain covers issues related to financial resources, safety, health and social services, physical environment, skills and knowledge acquisition, recreation, general environment (noise, air pollution, etc.), and transportation.<sup>1</sup>

WHOQOL-BREF is essentially a self-report questionnaire that each person completes. However, to avoid the selection bias due to uneducated participants and the decrease of missing data, the questionnaire items were asked and filled out by the researcher.<sup>3</sup> Each interview was carried out separately to minimize the response bias as

much as possible.

### Sample Size

To conduct factor analysis, the sample size should be more than 100 people.<sup>8</sup> However, some sources have considered 100 people weak, 200 fairly good, 300 good, 500 very good, and  $\geq 1000$  excellent to conduct a factor analysis.<sup>9</sup> A total of 2000 individuals were randomly selected from the population of the SCS for interviewing and completing the questionnaire. They were divided into two groups based on the presence or absence of a non-communicable disease (NCD). The people suffering from chronic diseases including diabetes, stroke, heart attack, hypertension, respiratory diseases, and psychiatric disorders were included in the patient group.

### Data Analysis

Before the analysis, the distribution of data was checked conducting the Kolmogorov-Smirnov test and the normality was approved.

Test-retest reliability of the questionnaire was evaluated by repeating the procedure for 30 participants after a period of 2 weeks. Moreover, the intra-class correlation coefficient (ICC) was computed to evaluate the stability over time. To assess the reliability (internal consistency), Cronbach alpha was used for both healthy and patient groups. To measure the content validity of the questionnaire, there are two approaches: qualitative (expert panel) and quantitative (content validity ratio/index). As there was no agreement on the priority between these two approaches and since the authors had access to a team of experts including a health educationist, two epidemiologists, and two psychologists, the qualitative approach was preferred to the quantitative one. To determine face validity, readability, clarity, and cultural appropriateness of the initial questionnaire,<sup>10</sup> the questionnaires were completed in the presence of the main researcher.

The ability of the WHOQOL-BREF to discriminate between healthy and patient groups was tested by performing linear regression analysis that controls the effects of confounders such as age, sex, educational level, and marital status.

In this case, the dependent variables were the scores of the domains of quality of life and independent variables included the groups (patient and healthy people), age (year), gender, marital status, and education level, and the groups in question were entered into the model as the dummy variable. In our study, being married, illiteracy, being healthy, and being female were considered baseline levels for marital status, education, health, and gender, respectively. For the two general items about quality of life and health, the score obtained for the two items was considered to be the dependent variable.

To study the construct validity of the questionnaire, the correlation matrices between the domains, as well

as the correlation of each item with each domain, were investigated. Discriminant validity represents the weak correlation between items related to one domain and other domains. In other words, the correlation coefficient of an item with other domains should be less than the correlation coefficient of the item with its own domain <sup>11</sup>.

Exploratory factor analysis (EFA) was used to summarize data, classify the items into groups, and do the structural analysis. EFA is usually conducted along with principle component analysis and examines the internal correlation of the variables to identify the classes of variables with the greatest correlation. Varimax rotation was used to investigate the matching and naming of drawn variables. Factors with an eigenvalue of more than one were selected. In addition, items with a factor loading of higher than 0.4 were selected and used.<sup>12</sup> Data were analyzed using the SPSS software version 21.0 at a significance level of 0.05.

## Results

The mean (SD, standard deviation) age of subjects was 49.11 (8.68). The highest percentage of participants were married (98.9%) and female (57.1%) and had academic education (33.3%). Demographic characteristics of the participants in the study are shown in Table 1.

The Cronbach's Alpha for Questionnaire domains in Healthy and ill individuals were shown in Table 2.

In the test-retest, the ICC of the whole questionnaire was 0.79. The ICCs of physical health, psychological health, social relations, and environmental health domains were 0.81, 0.72, 0.87, and 0.84 respectively. Pearson correlation coefficients of the items and each domain are shown in Table 3. The items of each domain had the highest correlation with their respective domains. The discriminant validity of

this questionnaire was demonstrated by the difference in the scores attained by healthy and sick people in different domains, which was confirmed by the significance of the coefficient of the group after controlling for the potential confounding factors using linear regression (Table 4).

In the physical and mental health domains, in addition to the significant difference between healthy and patient groups, which indicated the power of discrimination of the instrument in these dimensions, the coefficients of education, marital status, and sex variables were also significant. In the domains of social relationships and environmental health, in addition to the significant difference between healthy and patient groups, the coefficients of marital status and education were also significant.

The scores on the first and second general questions that examine the health status and quality of life in general were significantly different between the healthy group and the patients. The coefficients of education and marital status were also significant. Regarding the first and second questions, which address the health status and quality of life in general, the association between the four domains of the questionnaire and the scores on two general items was significant, and the scores on the two questions were also significantly associated. The coefficients of this model are shown in Table 4. The KMO value for the correlations matrix derived from the administration of the questionnaire to our participants was reported to be 0.94 and the value for Bartlett's test was 1699.01, which is statistically significant ( $P \leq 0.001$ ). Four factors with more than one eigenvalue were drawn, including physical health, mental health, social relationships, and environmental health, all of which accounted for 51.47% of the variance.

**Table 1.** Distribution of Age, Sex, Marital Status and Educational Level of Participants in Healthy and Patient Groups

Variable	Groups	Healthy individuals (n=1000)	Mean (SD) of total QOL in healthy individuals	Ill individuals (n=1000)	Mean (SD) of total QOL in Ill individuals
Age (year) N (%)	<45	496 (49.6)	69.88 (16.61)	290 (29)	61.59 (17.30)
	45-55 years	326 (32.6)	68.79 (17.40)	383 (38.3)	58.16 (17.94)
	55-65 years	145 (14.5)	68.71 (15.87)	273 (27.3)	56.96 (20.69)
	>65	33 (3.3)	69.70 (13.99)	54 (5.4)	52.08 (23)
Marital status N (%)	single	5 (0.5)	45 (32.59)	4 (0.4)	37.50 (30.62)
	Married	989 (98.9)	69.60 (16.41)	987 (98.7)	58.62 (18.86)
	Widow	3 (0.3)	41.67 (26.02)	4 (0.4)	56.25 (7.22)
	Divorced	3 (0.3)	54.17 (7.22)	5 (0.5)	52.50 (31.12)
Educational level N (%)	Illiterate	95 (9.5)	69.08 (15.45)	231 (23.1)	56 (20.35)
	primordial	132 (13.2)	66.48 (17.01)	169 (16.9)	54.28 (22.07)
	Guidance	125 (12.5)	64.20 (18.12)	122 (12.2)	58.20 (17.29)
	High school	255 (25.5)	69.21 (17.14)	206 (20.6)	60.25 (16.62)
	College	393 (39.3)	72.10 (15.54)	272 (27.2)	62.04 (17.31)
Sex N (%)	Male	545 (54.5)	70.39 (16.92)	314 (31.4)	68.10 (16.30)
	Female	455 (45.5)	59.11 (20.43)	686 (68.6)	58.21 (18.28)

**Table 2.** Mean Score and Standard Deviation (SD) of QOL and Cronbach's Alpha of Items

Questionnaire domains	Healthy individuals		Ill individuals	
	Mean Score (SD)	Cronbach's alpha	Mean Score (SD)	Cronbach's alpha
Physical health	73.30 (16.30)	0.74	59.89 (19.89)	0.78
Psychological health	67.15 (15.07)	0.72	57.80 (17.33)	0.73
Social relations	66.90 (17.67)	0.60	61.92 (19.01)	0.54
Environmental health	67.39 (15.20)	0.78	64.45 (15.59)	0.72
Total	69.35 (16.67)	0.82	58.50 (18.97)	0.80

**Table 3.** Pearson Correlation Coefficient Matrix Between Items and Four Domains for Each Item

Items (item numbers)	Physical health	Psychological health	Social relations	Environmental health
3-Pain	0.613	0.26	0.14	0.15
4- Dependence of medical aids	0.57	0.21	0.11	0.06
5- Positive feeling	0.42	0.74	0.45	0.49
6-Personal belief	0.39	0.72	0.38	0.46
7- Concentration	0.41	0.62	0.31	0.37
8- Security	0.34	0.50	0.35	0.58
9- Physical environment	0.28	0.39	0.30	0.57
10 -Energy	0.71	0.49	0.32	0.41
11- Bodily image -	0.39	0.65	0.36	0.40
12 -Financial support	0.34	0.40	0.34	0.60
13- Accessibility of information	0.31	0.32	0.28	0.63
14- Leisure activity	0.32	0.33	0.28	0.61
15 -Mobility	0.63	0.40	0.33	0.48
16 -Sleep and rest	0.67	0.49	0.37	0.41
17-Activities of daily living	0.77	0.55	0.43	0.49
18 -Work capacity	0.77	0.56	0.43	0.46
19 -Self-esteem	0.47	0.67	0.44	0.39
20-Personal relationship	0.32	0.42	0.71	0.41
21-Social support	0.26	0.34	0.76	0.33
22-Sexual activity	0.39	0.45	0.74	0.42
23-Home environment	0.32	0.39	0.41	0.68
24-Transport	0.33	0.36	0.35	0.70
25-Health care	0.28	0.27	0.29	0.60
26-Negative feeling	0.38	0.61	0.26	0.27

\* Pearson correlation (*r*) equal to or greater than 0.40 was considered satisfactory.

\*\* Two first questions are not in any of the domains. Questions include: 1. How do you assess your quality of life? 2. How satisfied are you with your health status?

## Discussion

This study was conducted in the light of a prospective cohort study of health and non-communicable diseases in southwestern Iran, namely SCS, by which the necessity of conducting accurate measurement of variables, including quality of life as a basic variable in measuring the exposures, was taken into account. Since this questionnaire examines various domains, it is better to examine the validity and reliability of each domain separately, and the analysis of the whole items is not recommended.<sup>13</sup> Therefore, each domain of the study was analyzed separately in this study.

After 2 weeks, the ICC analysis was performed using test-retest to estimate the reliability of the WHOQOL-BREF. The ICC is an estimate of the overall measured change due to diversity among individuals.<sup>14</sup> This index was higher than 0.7 in all four domains, indicating the repeatability of this test. In a study conducted by Nedjat et al, the ICC was also above 0.7 for all domains.<sup>3</sup> Cronbach alpha coefficient was also used to assess the reliability of the questionnaire. This index was greater than 0.7 in three domains, namely physical, mental, and environmental health, but in the social relationships dimension, this index was less than 0.7. Nedjat et al reported the Cronbach alpha coefficients to be above 0.70% for all domains except for the social

**Table 4.** Linear Regression Coefficients, Standard Deviation, and Confidence Intervals in the Four Domains

Model	Questionnaire domains	B (SE)	Significance	CI
<b>Physical health</b>				
1	Disease	-11.55 (0.83)	<0.001	(-13.17 , -9.93)
	High school	3.31 (1.03)	<0.001	(1.28 , 5.33)
	College	6.81 (0.94)	<0.001	(4.96 , 8.64)
	Single	-13.82 (5.94)	0.02	(-25.48 , -2.16)
	Widow	-18.32 (6.74)	<0.001	(-31.55 , -5.09)
	Sex	3.77 (0.83)	<0.001	(2.13 , 5.40)
<b>Psychological health</b>				
2	Disease	-8.32 (0.74)	<0.001	(-9.77 , -6.86)
	College	3.32 (0.77)	<0.001	(1.80 , 4.84)
	Single	-17.70 (5.37)	<0.001	(-28.22 , -7.17)
	Divorced	-14.30 (5.70)	0.01	(-25.47 , -3.14)
	Sex	2.70 (0.75)	<0.001	(1.22 , 4.17)
<b>Social relations</b>				
3	Disease	-4.86 (0.81)	<0.001	(-6.45 , -3.26)
	Single	-22.91 (6.07)	<0.001	(-34.82 , -11.01)
	Divorced	-26.23 (6.44)	<0.001	(-38.86 , -13.61)
	Primordial	-2.74 (1.15)	0.02	(-5 , -0.48)
	Guidance	-4.23 (1.25)	<0.001	(-6.68 , -1.77)
<b>Environmental health</b>				
4	Disease	-3.30 (0.72)	<0.001	(-4.72 , -1.88)
	High school	1.82 (0.92)	0.04	(0.02 , 3.62)
	College	3.97 (0.85)	<0.001	(2.31 , 5.64)
	Single	-18.40 (5.10)	<0.001	(-28.40 , -8.40)
	Divorced	-16.71 (5.40)	0.02	(-27.31 , -6.11)
	45-55 years	2.01 (0.81)	0.01	(0.41 , 3.61)
	55-65 years	2.88 (0.99)	0.004	(0.92 , 4.84)
	>65	4.76 (1.80)	0.008	(1.23 , 8.28)
	Sex	-1.63 (0.72)	0.02	(-3.05 , -0.20)

relationships domain.<sup>3</sup> In a study to determine the validity and reliability of the WHOQOL-BREF questionnaire in old and depressed individuals, three domains, namely physical, mental, and environmental health had a completely acceptable reliability, but the social relationships domain had a low reliability.<sup>15</sup> In addition, in a study conducted in Bangladesh, this value was 0.28 in the field of social relations.<sup>16</sup> The social relationships domain consists of only 3 questions and one of the reasons for its small size in different countries is the small number of questions in this domain. Another justification is that one of the items in this domain addresses sexual satisfaction and is considered a challenging question in Iranian culture.<sup>3</sup> However, the elimination of the item regarding sexual intercourse had no effect on the Cronbach alpha for the social relationships domain in our study.

According to Table 3, because 21 out of the 24 questions of the questionnaire had the highest correlation with their respective domain, the correlation coefficient above 0.4

was considered acceptable in these domains<sup>2</sup>. Therefore, the structural factor of the questionnaire is generally acceptable, which is consistent with the study by Nedjat et al, where 20 out of the 24 items in each domain had the highest correlation with their respective domain.<sup>3</sup>

According to Table 4, the discriminant validity of this questionnaire is acceptable in four domains of physical health, mental health, social relations, and environmental health as well as two general questions. Therefore, after removing the confounding variables in each of the domains, there was still a significant difference between the healthy and patient groups. The association between the score of each domain and the independent variables was acceptable.

However, the significant difference in the scores of domains between men and women or among the people with different education levels, marital status, and age can represent the power of discrimination in other ways. In the study by Nedjat et al, the validity of this questionnaire was demonstrated to be acceptable in four domains and



there was a significant difference between the healthy and patient groups.<sup>3</sup>

Based on the results of factor analysis, the four factors including physical health, mental health, social relationships, and environmental health accounted for 51.47% of the variance in this study. Before factor analysis, for construct validity, the correlation of items should be investigated using Bartlett's and KMO tests. The KMO value should not be lower than 0.5.<sup>17</sup> The closer the value to one, the more appropriate the sampling and the more adequate the sample size will be to perform the factor analysis.<sup>8</sup> In our study, the KMO value was reported to be 0.94, which was suitable for factor analysis.

### Conclusion

The findings suggested that WHOQOL-BREF is a reliable and valid measure of health-related quality of life among Iranians and in the SCS. Since the number of items in this questionnaire is low, it can be used in studies conveniently. This instrument has also been used in different parts of the world, which makes it possible to compare the results of national research projects with those of other regions. Due to its appropriate validity, the questionnaire can be used in different healthy and patient groups.

### Ethical Approval

This study was conducted with observance of the Declaration of Helsinki and the National Ethical Guidelines in Biomedical Research in Iran. In addition, the cohort study proposal was approved by the Ethics Committee of the SKUMS (IR.SKUMS.REC 1394.286) at regional and national scales. All participants provided signed and fingerprinted consent form according to the guidelines enforced by the Ethics Committee of the SKUMS. The participants could withdraw from the study whenever they wished. Data were stored in a codified confidential database.

### Conflict of Interest Disclosures

No conflict of interests has been declared by the authors.

### Authors' Contributions

FS wrote the draft of manuscript and contributed to data analysis. AA wrote the study proposal, concept, data management and design and revised the manuscript. AA generated hypothesis for this study. All authors approved the final manuscript.

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