

Validity and Reliability of the WHOQOL-BREF in the measurement of the quality of life of Sickle Disease Patients in Bahrain

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Research

Keywords: WHOQOL-BREF, Validity, Reliability, Quality of Life, Sickle cell disease

Posted Date: September 17th, 2021

DOI: <https://doi.org/10.21203/rs.3.rs-892568/v1>

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Abstract

Background

Limited attention is devoted to the improvement of the quality of life of patients suffering from the negative consequences of Sickle cell disease (SCD). Our study focuses on the evaluation of the performance of the WHOQOL-BREF as a tool to measure the quality of life of SCD Patients in Bahrain.

Methods

We conducted a cross-sectional study that enrolled 273 SCD patients selected using a simple random sampling technique from primary health-care centers in Bahrain in 2019. A designed questionnaire including the WHOQOL-BREF was filled by the patients during face-to-face interviews in the health centers. The reliability of the WHOQOL-BREF was assessed by standardized Cronbach's alpha coefficient, and the validity was measured by convergent validity, principal component analysis and confirmatory factor analysis.

Results

The WHOQOL-BREF had good internal consistency as Cronbach's alpha coefficient for the overall scale was 0.91. The convergent validity results indicated that the correlation coefficients values for all scale domains are significantly correlated at $\alpha < 0.01$. Confirmatory factor analysis found that the four-domain structure produced a robust fit to the data.

Conclusions

The WHOQOL-BREF tool has high internal consistency and validity in assessing the quality of life of Sickle Disease patients in Bahrain.

Background

Sickle cell disease (SCD) is an inherited autosomal recessive blood disorder that affects the structure of hemoglobin and is characterized by sickling of the red blood cells (RBCs). It is a life-threatening condition that accounts for important morbidity load among children and adults worldwide [1, 2] SCD is most common in Sub-Saharan Africa, the Caribbean, India, the Middle East, and the Mediterranean basin [3]. However, due to migration, it expanded as a significant health problem in Europe and the United States [4]. Pain crisis of SCD and is the main cause of hospitalization, mortality and might affect the quality of life of SCD patients.

The concept of quality of life (QoL) is widely used in a highly diverse range of disciplines and contexts. Sociologists, physicians, psychologists, and economists are among those using this concept routinely, with the main aims to improve the living conditions of individuals and societies [5]. The evaluation of Quality of life (QoL), as part of mental health, is nowadays considered as fundamental in all medical specialties [6]. It has been recommended in routine practice [7], and in evaluating mental health services [8]. The WHOQOL-BREF is a tool developed by the World Health Organization to evaluate QoL in various areas of health care and different cultural settings, languages, and countries [9, 10]. It is a 26 item self-report instrument derived from the original 100-item instrument, which had demonstrated reasonable validity and reliability. The WHOQOL-BREF evaluates four dimensions of quality of life (“Physical Health”, “Psychological Health”, “Social Relationships”, “Environment”), and contains two items that are examined separately (an individual’s “overall perception of quality of life” and an individual’s “overall perception of health”) [10, 11]. The reliability and validity of WHOQOL-BREF in psychiatric patients was assessed in a limited number of studies performed on subjects affected by depression [12], alcoholism [13], chronic psychiatric disorders [14, 15] and psychiatric outpatients [16].

Numerous studies in heterogeneous samples (both in the general population and in those suffering from different diseases) showed satisfactory psychometric properties of the WHOQOL-BREF tool [17]. The collaborative assessment of the WHOQOL-BREF scale in 15 cultural settings over several years confirmed good internal consistency (Cronbach’s alpha coefficients for the domain scores ranged from 0.66 to 0.84) [18]. Also, assessment of the WHOQOL-BREF in some countries (Brazil, Iran, Spain) confirmed good internal consistency (Cronbach’s alpha coefficient > 0.7) [19]. Most of the validation studies revealed a four-factor structure of the WHOQOL-BREF scale [20]. Similar to studies in Australia [21] and China [22], one recent study showed that the WHOQOL-BREF tool is valid (four domains) and reliable (the Cronbach’s alpha coefficient was over 0.7 for the questionnaire as a whole, and for all domains) for assessing quality of life among Saudi medical students [23]. To our knowledge, only few studies addressed the performance of WHOQOL-BREF on SCD patients and this research has never been conducted on patients suffering from this condition in Bahrain. Therefore, the aim of the present study was to assess the psychometric properties (Validity and Reliability Indicators) of the WHOQOL-BREF as a tool for the evaluation of Sickle Disease Patients in Bahrain. Thus, this user friendly tool might become a recommended asset to monitor and improve the QoL of these patients.

Methods

Study Design and Setting

A cross-sectional study design was used in this study. It enrolled (273) representative Sickle cell disease patients (above 21 years) from primary health-care centers (PHC) in Bahrain between July and August 2019. SCD patients enrolled in the study, voluntarily accepted to fill the WHOQOL-BREF during face to face interviews in the PHCs.

Study population

The study population consisted of all Bahraini and Non-Bahraini, male and female, adult (21 years and above), who have confirmed Sickle Cell Disease (SCD) and who are followed-up at the SCD clinics at the primary health care in Bahrain.

Data Collection and Sampling Technique

The WHOQOL-BREF was administered for eligible volunteers at the PHCs during the month of June and July 2019. They represent a sample selected using systematic random sampling technique from the database of SCD patients available in the PHC. Patients were excluded if they have been diagnosed with any other health condition associated with chronic pain such as arthritis, chronic pain syndrome (CPS), low back pain (LBP), and/or psychiatric chronic diseases such as epilepsy, schizophrenia, and other mental illnesses. Vulnerable patients such as patients during the episode of pain crisis, pregnant women, or patients who refused or were unable to provide a valid informed consent were also excluded.

Instruments

The Arabic version of WHOQOL-BREF instrument was used in this study to ensure good understanding by patients. WHO Quality of Life Questionnaire contains a total of (26) items: items 3–26 represent four domains: Physical Health (7 items), Psychological Health (6 items), Social Relationships (3 items), and Environment (8 items). Two items (1 and 2) that are examined separately and refer to an individual's Overall perception of quality of life and an individual's Overall perception of general health. The answers for each item are given on a 1–5 Likert-type scale, where 1 denotes the least, and 5 is the highest agreement with a particular item. Items 3, 4, and 26 are negatively phrased and reversed during analysis. The mean score of items within each domain is used to calculate the domain score. Results on domains represent the sum of results of items. A higher sum of points represents a higher quality of life on a single domain.

Statistical Analysis

Psychometric properties of the WHOQOL-BREF were measured using the classical test theory. Reliability was measured by Cronbach's alpha coefficient to assess internal consistency. Pearson's correlation coefficient was used to investigate the association between scores of the scales' domains and perceptions of overall quality of life and overall general health. We conducted an exploratory factor analysis to evaluate construct validity using the Kaiser-Meyer-Olkin (KMO) index and Bartlett's sphericity test (BT). The principal component analysis relied on the extraction method, and the varimax rotation. A factor was considered as important if its eigenvalue exceeded 1.0. The goodness of fit was estimated by the χ^2 test, the Root Mean Square Error of Approximation (RMSEA), the Comparative Fit Index (CFI) and Goodness of Fit Index Equation Model (SEM) and the confirmatory factor analysis (CFA). An RMSEA value < 0.08 and a CFI value > 0.90 indicated a good fit, also, for GFI a value > 0.90 was an adequate model fit. A p-value less than 0.05 was considered as statistically significant for all tests. All statistical analyses were conducted using the Statistical Package for the Social Sciences (SPSS) version 27 (IBM, USA), and the Analysis of Moment Structures (AMOS) software version 23.

Results

Basic characteristics of the study sample

The study sample was composed of 137 females (50.2%) and 136 males (49.8%). Regarding the education level, 157 (57.7%) of the respondents had secondary level of education or below, while 115 (42.3%) had BSc or high studies level of education. The mean age of the participants was 37.47 ± 10.47 years (range 20–70 years). The medical characteristics of SCD patients and quality of life level and determinants were detailed elsewhere (AlSaleh et al., accepted).

Psychometric and statistical methods

Reliability

Internal consistency reliability

The Reliability of the WHO quality of life as measured (Table 1) by Cronbach's alpha coefficient (value = 0.91) was satisfactory considering all score items, and when considered separately, for 'physical Health', 'psychological', 'social relationships, and 'environmental domains' (0.83, 0.72, 0.67 and 0.76 respectively).

Table 1
Reliability of WHOQOL-BREF Overall and domains' scores for SDC patients in Bahrain

Domain	No. of Items	Mean (SD)	Cronbach's α Coefficient
Physical Health	7	23.27 (5.33)	0.83
Psychological	6	22.56 (3.91)	0.72
Social relationships	3	11.97 (2.47)	0.67
Environmental	8	28.54 (5.31)	0.76
Overall	24	86.43(14.62)	0.91
Validity			

Convergent validity

Table 2 shows the convergent validity for the WHO quality of life domains by using the Pearson's correlations Coefficients to detect correlation between the WHOQOL-BREF domains and with perceptions of "Overall Quality of Life", and "Overall General Health". Analysis indicated moderate correlation coefficients values for all domains, though statistically significant ($p < 0.01$).

Table 2

Convergent Validity of the WHO quality of life domains: Correlation between scores of domains and Overall Quality of Life perception of Overall quality of life and overall general health

WHO Quality of Life Domains	Perception of QoL	Perception of Overall General Health
Physical Health	0.384**	0.417**
Psychological	0.464**	0.492**
Social relationships	0.346**	0.268**
Environmental	0.424**	0.391**
**p < 0.01		

Exploratory factor analysis

Results showed the Kaiser–Meyer–Olkin (KMO) Measure to be 0.882 and the Bartlett’s Test of Sphericity (BT) to be chi-square = 1744.66 ($p < 0.001$), which confirms the suitability of the data in this study for factor analysis (Table 3). The exploratory factor analysis using principal components method revealed four factors with eigenvalues over one explaining 52% of cumulative variance in the 24 items. The rotated solution shows that each factor accounted for 10.34 to 15.1% of the total variance. The factor loadings of the 24 items onto the four factors are shown in Table 3. Factor 1 included all the (7) items of the physical domain and 3 items: one item (negative feeling), and two items of the environment domain (Leisure activity, and Health care), and it explained 15.08% of the rotated variance. Four items of the original psychology domain, and 3 items: one item (Energy of life) of the original physical health domain, and two items (Security, and Leisure activity) of the original environment domain, were included in factor 2, and it explained 14.75% of the rotated variance. Factor 3 included all the (3) items of social relationships domain, and an item (satisfaction with self) of the original psychological domain, and it explained 11.83% of the rotated variance. Six items of the original environment domain, and an item (sexual activity) of the original social relationship’s domain, were included in factor 4, and it explained 10.34% of the rotated variance.

Table 3
Rotated Factor Matrix Solution for Factor analysis of 24 items

Item number	Item description	Factor Loading			
		1	2	3	4
Physical Health					
3	Pain and discomfort	0.782	0.108	-0.093	0.236
4	Need for medical treatment	0.720	0.099	-0.111	0.141
10	Energy for life	0.362	0.648	0.174	0.027
15	Mobility	0.660	0.378	0.150	0.120
16	Sleep and rest	0.583	0.272	0.443	-0.040
17	Activities of daily living	0.555	0.449	0.446	0.023
18	Work capacity	0.516	0.393	0.299	0.190
Psychology					
5	Positive feeling	0.262	0.643	0.021	0.298
6	Personal belief	0.138	0.633	0.068	0.099
7	Concentration	0.087	0.613	0.128	0.094
11	Body image	0.159	0.555	0.257	0.098
19	Satisfaction with self	0.232	0.272	0.524	0.381
26	Negative feelings	0.459	0.133	0.043	0.278
Social relationships					
20	Personal relationships	0.085	0.159	0.752	0.289
21	Sexual activity	0.306	0.042	0.362	0.469
22	Social support	-0.149	0.116	0.777	0.176
Environment					
8	Security	-0.010	0.662	-0.045	0.364

Construct validity

The Confirmatory Factor Analysis (CFA) results showed that the four-domain structure of the WHOQOL-BREF produced a good fit to the data ($\chi^2 = 343.707$, $df = 232$, $\chi^2/df = 1.481$, $p < 0.001$); CFI = 0.944; RMSEA = 0.042 and GFI = 0.907. The factor load of each item with its respective domain ranged from 0.43 to 0.79 (figure. 1). These values were adequate, and the observed model showed good fit with the theoretical one revealing a good construct validity of the tool (Table 4).

Item number	Item description	Factor Loading			
		1	2	3	4
9	Physical environment	-0.001	0.330	0.068	0.651
12	Financial support	0.153	0.268	0.167	0.605
13	Accessibility of information	0.286	0.250	0.149	0.366
14	Leisure activity	0.362	0.503	0.240	0.158
23	Home environment	0.165	0.149	0.146	0.646
24	Health care	0.340	0.077	0.288	0.250
25	Transport	0.212	-0.033	0.201	0.688
	Eigenvalues	7.94	1.82	1.44	1.29
	Variance explained (%)	15.08	14.75	11.83	10.34
	Cumulative variance (%)	15.08	29.83	41.66	52.00
Construct validity					
<p>The Confirmatory Factor Analysis (CFA) results showed that the four-domain structure of the WHOQOL-BREF produced a good fit to the data ($\chi^2 = 343.707$, $df = 232$, ($\chi^2/df = 1.481$, $p < 0.001$); CFI = 0.944; RMSEA = 0.042 and GFI = 0.907. The factor load of each item with its respective domain ranged from 0.43 to 0.79 (figure. 1). These values were adequate, and the observed model showed good fit with the theoretical one revealing a good construct validity of the tool (Table 4).</p>					

Table 4
Fitness statistics for the four factor-analytic models of the WHOQOL Questionnaire

Model	χ^2	df	χ^2/df	GFI	CFI	RMSEA (90% C.I)
Original model	581.203	246	2.363	0.850	0.830	0.07 (0.04–0.08)
Modified model	343.707	232	1.481	0.907	0.944	0.042 (0.01– 0.05)
χ^2 : chi-square; df: degree of freedom; CFI: Comparative Fit index; GFI: Goodness of Fit Index; RMSEA = Root Mean Square Error of Approximation.						

Discussion

The aim of this study was to examine the validity and reliability of the WHOQOL-BREF in the evaluation of the quality of life using a representative sample of (273) Sickle Disease patients in Bahrain. The results of our study confirmed the validity and reliability of the WHOQOL – BREF as a tool for the measurement of the quality of life of SCD patients in Bahrain. Indeed, Cronbach's alpha coefficients for all domains (physical health, psychological, social relationships, and environmental) were 0.83, 0.72, 0.67, and 0.76, respectively. Except for the social relationship's domain, the coefficients of the three

domains were above acceptable value 0.7, which indicates a good internal consistency of this tool [24]. A lower alpha coefficient of the social relationship's domain ranging from 0.58 and 0.66 was also reported in other studies [6, 22, 25]. Similar findings were reported in multiple quality of life studies in Pakistan[19], Saudi Arabia [23]. Lower alpha values for the social domain are most probably due to the unrelated and limited number of three items in this domain. Failing to use the recommended minimum of four items in assessment of internal consistency in this domain to obtain at least 0.70 might be the reason for this result [26].

Regarding convergent validity, our findings indicated that all values of the correlation coefficients were statistically significant. Also, the current study confirmed that the psychological domain has highly contributed for both overall quality of life, and perception of overall general health. This result disagrees with previously reported findings. Noticeably, in a study of patients with physical impairments in Korea, the psychological domain was the main contributor of overall quality of life, whereas the physical domain is highly associated with general health[27]. A study of Polish respondents has also shown that the psychological domain has the strongest contribution for overall quality of life, whereas the physical domain was the contributor of general health followed by the psychological domain[28]. However, the physical domain was found to be a strong contributor for both overall quality of life and general health in a study conducted in India among people with type 2 diabetes [29]. These discrepancies could be explained by the nature and specificities of the related health problems.

Regarding the validity, the results of exploratory factor analysis (EFA) showed the presence of four main factors with an eigen value greater than 1, explaining 52% of variance. These findings corroborate those shown in the international study (WHOQOL-BREF field trial), where the four factors explained 53% of variance[10]. However, they are slightly lower than those reported from a study conducted in China, where the four domains cumulative contribution was 69.3% [22]. The EFA results showed that factor 1 is composed of similar items with the physical health domain. The results also indicated that six items are loaded on another domain different from their original one. Among these items, those related to satisfaction and self and negative feelings were loaded on the social relationships and physical health domains, respectively. While items of sexual activity related to social relationship's domain was loaded on the environment domain. Also, items security and leisure activity of the environment domain were loaded on the psychological domain. On the other hand, item health care of the environment domain was loaded on the physical health domain. It is also important to note that the item energy for life from the original physical health domain was loaded on the psychological domain. Cross-loading of items with other domains in the context of the evaluation of the quality of life of traumatic spinal cord injury using WHOQOL-BREF was also reported elsewhere [30].

The confirmatory factor analysis (CFA) provided an acceptable fit to a four-factor model in the sickle disease patient's sample. Regarding the CFA, the original model has shown indices of (CFI = 0.830, GFI = 0.85 and RMSEA = 0.07), which indicates that the domains in model did not fit for the sickle disease patients. However, the model gained acceptable goodness of fit (CFI = 0.944, GFI = 0.907 and RMESA = 0.042) after three pairs of error variance were allowed to covary (i.e., item 19 (psychological) and item 20

(Social relationship); item 5 (psychological) and item 14 (Environment); item 16 (physical health) and item 24 (Environment); and after three pairs of items were allowed to cross-load on other domains: physical health domain and item 14 (Environment); social relationship domain and item 19 (psychological); psychological domain and item 8 (social relationship). Overall, the four-domain model fitted reasonably well the model in the sickle disease patient's sample. This is in line with the findings of different studies which used WHOQOL-BREF. In a validation study conducted among substance users in northern Taiwan, the modified model has shown acceptable goodness of fit of indices CFI = 0.92, NNFI = 0.91, and RMSEA = 0.06 [31]. In a study conducted among older people in Taiwan, the CFI was increased to 0.90 from 0.85 when three pairs of error variances could covary and two items were allowed to cross-load on other domains [32]. A study which was conducted in Ethiopia among patients with diagnosed type 2 diabetes has found the model gained acceptable goodness of fit (CFI = 0.94, NNIF = .95, and RMSEA = 0.05), after removing 2 items (item 7 from psychological domain, and item 23 from environmental domain), and after item 9 (Physical environment) from environment domain are allowed to cross-load on physical health and social domains, respectively[33].

Strengths and limitations

This is the first study to measure the psychometric properties of the WHOQOL-BREF for SCD patients in Bahrain, and this area has never been addressed previously although SCD is highly prevalent. The study was limited by the retrospective character of the cross-sectional design which might lead to a recall bias as well as the impossibility to examine the instrument's test-retest reliability. Young patients and the most severe ones were not included in the present study for ethical and feasibility reasons which might compromise the generalizability of findings. Future prospective studies using larger samples and enrolling patients from secondary care are required to have a more valid and representative evaluation of the tool.

Conclusion

This study confirmed the usefulness of the WHOQOL-BREF in the measurement of the quality of life of SCD patients using a representative sample from Bahrain. It revealed good psychometric properties (Reliability & Validity) and should be recommended for future use in this health condition impact assessment on patients. However, more studies are required to improve the reliability results in the 'social relationship' domain. This gap might be addressed using a qualitative study design approach which is favored because of its inductive nature in generating items within constructs. Quantitative prospective studies on larger samples of patients including the whole severity spectrum of SCD are required.

Abbreviations

QoL

Quality of life

SCD

Sickle cell disease

PHCs

Primary Health-Care centers

CPS

Chronic Pain Syndrome

LBP

Low Back Pain

EFA

Exploratory Factor Analysis

CFA

Confirmatory Factor Analysis

KMO

Kaiser-Mayer-Olkin

CFI

Comparative Fit Index

GFI

Goodness of Fit Index

RMSEA

Root Mean Square Error of Approximation

BT

Bartlett's sphericity test

AGU

Arabian Gulf University

CMMS

College of Medicine and Medical Sciences

χ^2

chi-square

df

degree of freedom

Declarations

Ethics declarations

This study was approved by the Ethical Committee in the College of Medicine and Medical Sciences, Arabian Gulf University (approval number: E002-pi-4/19) and the ethical committee of the ministry of health in the kingdom of Bahrain (approval number: AURS/325/2019). All participants provided informed written consent before participation.

Consent for publication

All authors have read the manuscript and agreed to all its contents. All authors gave their consent for publication.

Availability of data and materials

The datasets used during the current study are available upon request from the corresponding author.

Competing interests

The authors declare that they have no competing interests.

Funding

This research received no external funding.

Author's Contributions

AA and AS conceived and designed the study; AE, AQ, FA, MS and MS performed the research process and collected the data; AA performed the statistical analyses; AA, AS, SC and MG wrote the original draft of the manuscript; AA, AS and SC prepared the figures and tables; AS, HA, LA, NF, MY and AA edited and revised the manuscript; AA, AS was the project manager; AA, AS and MK approved the final version of the manuscript.

Acknowledgements

The authors would like to thank the Sickle Disease Patient in Bahrain for their participation in this study.

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Figures

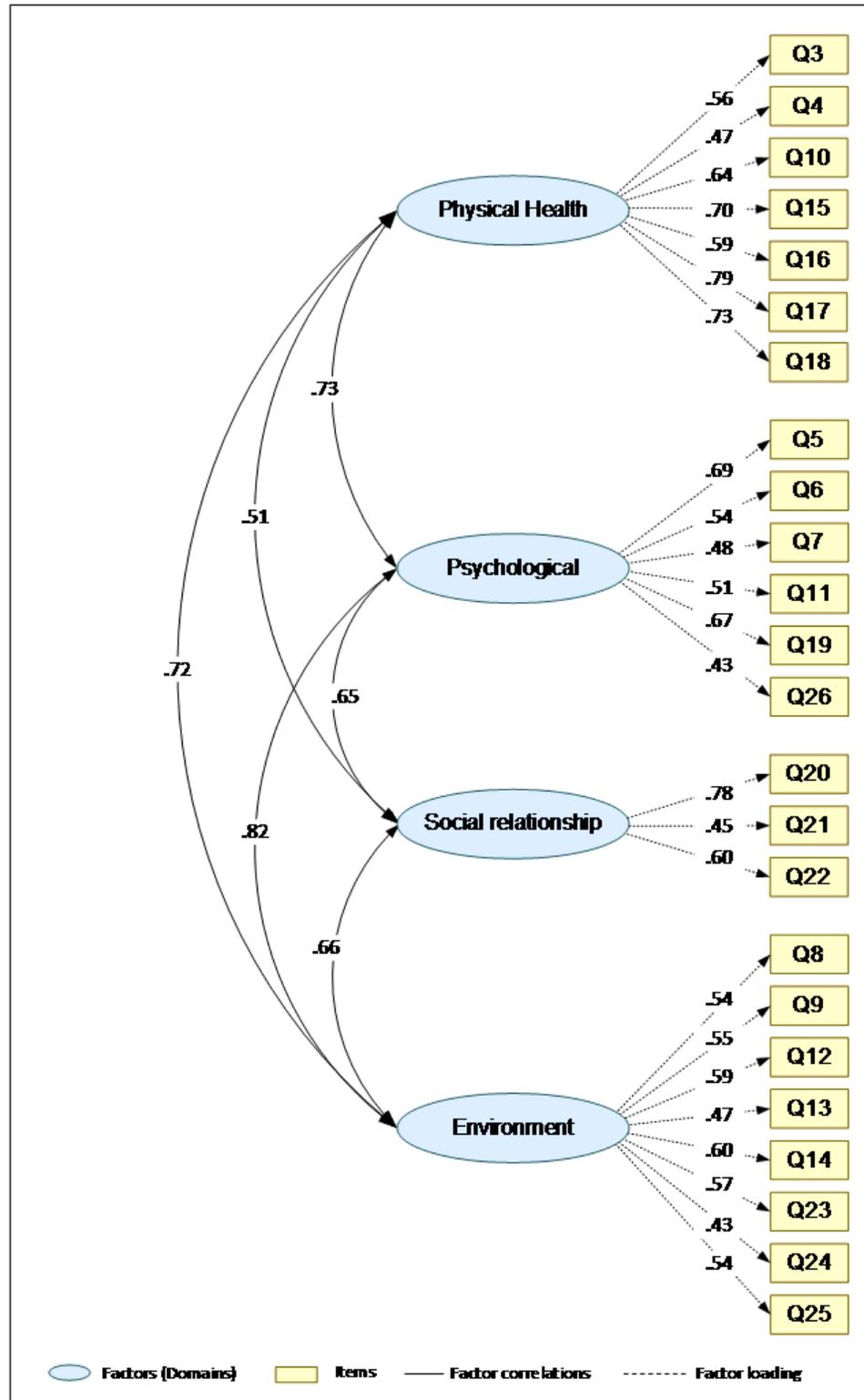


Figure 1

The structure of the WHOQOL-BREF based on confirmatory factor analysis.