Assessment of Quality of life of Patients with Heart Failure-Exploratory Factor Analysis Approach

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Abstract

The Minnesota Living with Heart Failure Questionnaire (MLHFQ) is one of the most widely used health- related quality of life questionnaires for patients with heart failure (HF). In this research, a perceptions-only measure scores for two dimensions physical, emotional and total score was used to measure the quality of life. In order to evaluate the association between the variables used in the model, structural equation modeling (SEM) was used for data analysis. The findings of the research showed that, absolute fit indices fits the sample data and reveals that the proposed model has the acceptable fit, by way of satisfying the recommended values.

***Keywords** - CFI, RMSEA, NFI, Minnesota living with heart failure questionnaire, Heart Failure, Factor analysis.*

1. INTRODUCTION

Flow projections propose that India will have the biggest cardiovascular infection trouble on the planet. One fifth of the passing in India are from coronary illness. Continuously 2020, it will represent 33% everything being equal. Unfortunately, a considerable lot of these Indians will be passing on youthful. Coronary illness in India happens 10 to 15 years sooner than in the west. There are an expected 45 million patients of coronary vein sickness. India's financial improvement, industrialization and urbanization have been joined by advances that add to the expansion in Heart Failure among the population. With expanding frequency of cardiovascular ailment, India is seeing a synchronous flood in rate of cardiovascular breakdown, including among generally more youthful people who were prior considered out of the hazard section of this condition. Be that as it may, mindfulness about cardiovascular breakdown, its causes, and treatment instruments stays low, proposing that our human services framework just as society isn't set up to arrangement with this rising weight. Numerous individuals experiencing cardiovascular breakdown don't have the condition analyzed. Numerous other people who have been analyzed neglect to get proper treatment which makes them exceptionally defenseless to abrupt cardiovascular passing. As indicated by an investigation distributed in the National Medical Journal of India in 2010, the evaluated predominance of cardiovascular breakdown because of CAD, hypertension, heftiness, diabetes and rheumatic coronary illness alone went from 1.3 million to 4.6 million, with a yearly occurrence of 491, 600 to 1.8 million. However, these didn't represent other significant reasons for cardiovascular breakdown, for example, alcohol abuse, cardiomyopathies, pericardial sickness and endomyocardial fibrosis which is because of certain different factors, for example, Quality of Life (QoL). (1) Cardiovascular breakdown (HF) which is a significant reason for mortality and bleakness around the world. The seriousness and mortality of Heart Failure can be anticipated by estimating Quality of Life (QoL) since 1980s when the idea of Quality of Life (QoL) in wellbeing was presented it was colossally utilized in clinical preliminaries as a piece of result measure and routinely surveyed. It predicts viably in light of mental , passionate, social , mental measurements associated with the wellbeing related Quality of Life (HRQol). QoL isa wide feeling of all components relating legitimately or

in a roundabout way to wellbeing status. QoL is impression of the individual's psychological and physical prosperity in their everyday life on the grounds that besides the useful status of HF patients will in general influence areas of QoL (physical, mental, social, enthusiastic, sexual, and mental prosperity), by a connection between them. The fundamental objectives of HF patients treatment is to mitigate side effects, avoid medical clinic re-confirmation and improving the endurance rate. Subsequently a large portion of the clinical preliminaries additionally for the most part centres around QoL so as to treat patients.

Domains of quality of life

They vary depending on the type of questionnaire used which range from physical activity, social interaction, sexual activity, work, emotion, psychological, environmental, symptom stability, symptom burden, self-efficacy, clinical summary, gender, age, mental health, body pain, role limitations, etc.

MLHFQ (Minnesota Living with Health Failure Questionnaire) was developed in 1984 by Rector et al. in the USA which is widely used to determine quality of life of Heart Failure. (2) The scores in two dimensions such as physical and emotional, also a total score is assessed. The MLHFQ is a 21- item questionnaire by using a six-point Likert scale (0 (No)–5 (Max)). It is the most every now and again and broadly contemplated explicit instrument which evaluates the impression of patients in the impacts of HF. It is, short, straightforward, and direct as self or met with a face-face approach within 5-10 min.

Objectives:

To test the demographic profile and factors that shows association between quality of life of Heart Failure patients by Exploratory Factor Analysis with recommended value which indicates a good fit.

2. METHODOLOGY

With reference to the parent article (2) the sample size 228 was derived with population agreement of 50% , sample agreement of 70% of prevalence (proportion) 0.5 and alpha error 5% by 2-sided approved by institutional ethics committee of Sri Ramachandra Institute of Higher Education and Research.

Minnesota Living with Heart Failure Questionnaire was adopted by translating in regional language (Tamil) through google forms as an software application tool for data collection in android tablet after obtaining Ethical Committee approval from the Institutional Ethics committee. In this research, a perceptions-only measure scores for two dimensions physical, emotional and total score was used to collect data from the patients. A six-point scale (5 indicating very much and 1 indicating no). In this study, about 230 patients with the heart failure presence at least mild level with no age bar visiting Sri Ramachandra Medical Centre of Sri Ramachandra Institute of Higher Education & Research [DU],Chennai, for treatment was recruited as the main source of the samples in the study after obtaining a informed consent as a form to participate in the study.

Data analysis

Collected data were analyzed with the help of software package SPSS 16- Statistical Package for the Social Sciences and analysis of moment structure (AMOS) 16. Statistical techniques like descriptive analysis, reliability analysis, exploratory factor analysis, were used to evaluate the different social factors proposed. Structural equation modeling (SEM) was used for data analysis.

3. RESULTS AND DISCUSSION

Table 1. Demographic profile of the patients (n=230)

S.No	Characteristics	Categories	Number of Patients	(%)
1	Gender	Male	152	66.1
		Female	78	33.9
2	Residence	City	152	66.1
		Town	19	8.3
		Village	59	25.7

Demographic profile

Table 1 shows the demographic profile of the patients involved in this study. As per the Table 1, out of 230 patients, 66.1% were male and 33.9% were female. With regard to the residence, 66.1% were from city, 8.3% were from town, and 25.7% were from village.

Reliability and Validity Analysis

Table 2. Mean, Std. deviation, corrected item-total correlation.

S.No	Mean	Std. Deviation	Corrected Item- Total Correlation
Q1	1.45	1.52	0.44
Q2	1.87	1.62	0.51
Q3	2.33	1.6	0.44
Q4	2.18	1.73	0.57
Q5	1.88	1.66	0.44
Q6	2.07	1.87	0.42
Q7	1.54	1.63	0.47
Q8	2.34	2.11	0.45
Q9	1.34	1.49	0.35
Q10	0.85	1.36	0.36
Q11	2.63	1.7	0.41
Q12	2.22	1.52	0.32
Q13	2.2	1.57	0.48
Q14	1.74	1.52	0.47
Q15	3.54	1.72	0.38
Q16	1.4	1.64	0.36
Q17	1.51	1.7	0.55
Q18	2.11	1.68	0.38
Q19	2.94	1.72	0.32
Q20	1.8	1.61	0.35
Q21	2.45	1.61	0.39

Table 2 represents the mean, standard deviation value of each items assessed in the study. The values in the column labeled Corrected Item-Total Correlation are the correlations between each items and the total score from the questionnaire. In a reliable scale all items should correlate with the total. So, we are looking for items that don't correlate with overall score from the scale: if any of these values are less than about 0.35 cut-off value suggested by Saxe and Weitz (1982) (3) (depends slightly on sample size–with bigger samples smaller correlation coefficients are

acceptable) it means that a particular item does not correlate very well with the scale overall. Items with low correlations may have to be dropped. For these data, all items have item- total correlations above .3, which is encouraging. The item- total correlations for the perceptions scale are ranging from 0.32 to 0.51.

Table 3. Result of Overall reliability analysis.

Cronbach's Alpha	No of items	Cronbach's Alpha Based on Standardized Items
0.851	21	0.851

It is always a suggestion to study about reliability and validity of collected samples using Cronbach's alpha coefficient for reliability and consistency during the use of Likert scale questionnaire study. Table 3 shows the result of using Cronbach's alpha=0.851. "According to George and Mallery (2003) (4) the following rules of thumb of Cronbach's alpha: > .9 – Excellent, .8 – Good, > .7 – Acceptable, > .6 – Questionable, > .5 – Poor, and < .5 – Unacceptable (. 231)". Thus the result is considered to be Good internal consistency of reliability as it falls between .8 to .9.

Table 2 shows means, standard deviations and corrected item-total correlations where the scale ranging from 0.322 to 0.578 which is higher than the 0.35 cut-off value suggested by Saxe and Weitz (1982) (3).

Exploratory Factor Analysis

Exploratory Factor analysis is a statistical technique which uncovers larger number of observed variables underlying in a smaller number of factors. Table 4 shows Kaiser-Meyer-Olkin (KMO) and Bartlett's Test. The KMO ranges from 0 to 1, with higher values indicating greater suitability. Ideally, this value is to be greater than 0.7. According to Kaiser, a KMO measure of 0.9 to 1.0 is marvellous, 0.8 to 0.9 meritorious, 0.7 to 0.8 middling, 0.6 to 0.7 mediocre and 0.5 to 0.6 miserable (Marcus et al., 2006) (5). Kaiser- Meyer-Olkin measure of sampling adequacy (MSA) is 0.841, Bartlett's test of sphericity is significant [Chi-square x^2 (55)= 1102.192].

Table 4.Kaiser-Meyer-Olkin (KMO) and Bartlett's test

Kaiser-Meyer-Olkin measure of sampling adequacy	0.841
Bartlett's test of sphericity Approx. Chi-square	1102.19
Degrees of freedom	210
Significance	0.0005

Structural Equation Modelling (SEM) : Model fit assessment

SEM is majorly used during assessing the causal relationship between variables correspondingly to verify the used model compatibility. First the reliability was analyzed. Later by using AMOS 16 the structural model was analyzed. It evaluates whether the collected data fit a theoretical model. As per the result in the (Table 5) we get p-value=0.090 which show the good fit of the model. In order to evaluate the model further interpretation, emphasis was given to metrics for Good Model Fitness by AMOS.

Table 5.Metrics for Good Model Fitness.

Measure	Threshold	Model Outcome
Chi-Square/df (CMIN/DF)	<5	1.255
p-value	<0.05	0.09
CFI	>0.90	0.97
NFI	>0.90	0.871
IFI	>0.90	0.971
TLI	>0.90	0.96
RFI	>0.90	0.829
RMSEA	<0.5-good; 0.5-1.0 moderate	0.033

"The criteria for an acceptable model are as follows: RMSEA of 0.08 or lower; CFI of 0.90 or higher; and NFI of 0.90 or higher (Gerbing and Anderson (1992) (6))",. The data fit between the proposed measurement model can be tested with a measures fitted satisfactorily; CFI=0.970, TLI=0.960, IFI=0.971, RFI=0.829 and NFI=0.871 with x^2/df <5 at 1.255 and RMSEA=0.033 (Bagozzi and Yi, 1988) (7) indicate a good fit of the model. Goodness of fit indices support the model fit and these emphasized indices indicate the acceptability of this structural model.

Hypothesis

To identify the best goodness of model we fixed the hypothesis to get the better model.
As per the table 5 it is clear that values of all the items are above the suggested threshold except RFI."The higher the probability associated with Chi-square, the closer the fit between the hypothesized model and the perfect fit (Bollen (1989a) (8))". The test of our null hypothesis H0, that QoL- Heart Failure is a two-factor structure as shown in Figure 1, yielded a chi-square value of 74.060 with 59 degrees of freedom and a probability of 0.090(p >0.05). It is suggesting that the fit of the data to the hypothesized model is entirely adequate. As per the result, Chi square= 0.090 show a good fit of the model. As per Schumaker and Lomax (1996) (9), a sample size of over 200 (240 in this study), could affect Chi-square statistics to indicate a significant probability level (p=0.090). Furtherly, The fitted model interpreted goodness of fit measures with consideration.

"Chi-square statistic equals (N-1) Fmin,, (sample size-1, multiplied by the minimum fit function) this value tends to be substantial when the model does not hold and when sample size is large (Jöreskog and Sörbom (1993) (10))". "It is stated that, researchers have addressed the chi-square limitations by developing goodness-of-fit indices that take a more practical approach to the evaluation process (Barbara (2009) (6))". "The value for the fit statistic minimum discrepancy/degrees of freedom (CMIN/DF), otherwise chi- square/ degrees of freedom as ≤ 5 suggested by (Hair et al. (1998) (6))".According to Table 5 the value of chi-square/df =1.255 ≤ 5 which is acceptable.

Table 6.Regression weights: (Group number 1 - default model)

			Estimate	S.E.	C.R.	P
P12	<-	Physical	1			
P7	<-	Physical	1.74	0.45	3.78	***
P6	<-	Physical	1.619	0.42	3.79	***
P5	<-	Physical	1.771	0.46	3.78	***
P4	<-	Physical	2.442	0.60	4.06,	***
P3	<-	Physical	1.476	0.36	4.07	***

P2	<-	Physical	1.946	0.49	3.91	***
E21	<-	Emotional	1			
E20	<-	Emotional	0.912	0.20	4.51	***
E19	<-	Emotional	0.815	0.17	4.74	***
E18	<-	Emotional	0.921	0.19	4.83	***
E17	<-	Emotional	1.443	0.26	5.53	***
P13	<-	Physical	1.676	0.44	3.79	***
*** Highly Significant at P < 0.01 level						

Significance tests of individual parameters

Table 6 shows the unstandardized coefficients and associated test statistics. Table 6 shows the unstandardized estimate, its standard error, and the estimate divided by the standard error. Under the column P, the probability value associated with the null hypothesis that the test is zero is exhibited.

Level of significance for regression weight

The probability of getting a critical ratio of E17 as large as 5.534 in absolute value is less than 0.001.The probability of getting a critical ratio of E18 as large as 4.836 in absolute value is less than 0.001.For large samples under suitable assumptions, these statements are approximately correct.

Table 7. Standardized regression weights: (Group number 1 - default model).

			Estimate
P12	<---	Physical	0.314
P7	<---	Physical	0.506
P6	<---	Physical	0.411
P5	<---	Physical	0.508
P4	<---	Physical	0.672
P3	<---	Physical	0.44
P2	<---	Physical	0.571
E21	<---	Emotional	0.474
E20	<---	Emotional	0.434
E19	<---	Emotional	0.363
E18	<---	Emotional	0.42
E17	<---	Emotional	0.651
P13	<---	Physical	0.509

Scalar estimates (group number 1 - default model) Maximum likelihood estimates

Table 7 shows estimates which is standardized for the fitted model. Each predictor variable relative contributions to each outcome variable can be evaluated using standardized estimates. Figure 1 shows the QoL of patients with heart failure structural model all the 21 items were assessed with exploratory factor analysis. RMSEA shows us by what means the model, with unknown parameter estimates which fits population covariance matrix (Byrne, 1998) (11). To calculate model fit measurement CFI,RMSEA fit indices can be used along Chi-square test. Normed fit index can be used to evaluate the model by means of comparing the Chi-square value with null model Chi-square value (Bentler and Bonnet, 1980) (13).CFI measure is most important in SEM since it is least affected over sample size (Fan et al., 1999) (14).The fit indices such as CFI,GFI,NFI and NNFI are mostly used fit indices in SEM as stated by McDonald and Ho (2002) (15).

Figure 1. Structural model -Exploratory Factor Analysis.
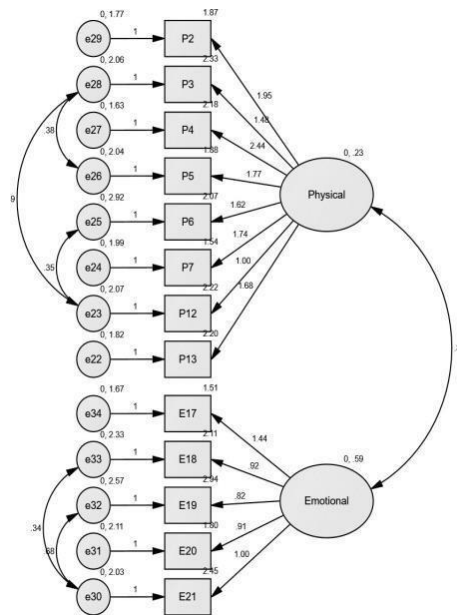
The structural model was validated using MLHFQ (Minnesota Living with Health Failure Questionnaire) into two domains Physical domain, Social domain. In physical domain the first maximum influencing question is difficulty in household works and the least influencing is short of breath the error corrections have been adjusted in physical domain with the aid of connecting several questions such as short of breath with difficulty in sleeping well during night, Difficulty in travelling with difficulties in walking as well climbing and short of breath with difficulties in walking as well climbing. Similarly in the social domain the first most influencing question is feeling themselves as burden to others and the least influencing is worried about the illness the error corrections were adjusted in social domain with the aid of connecting several questions such as depression feeling with worried about the illness and feeling depressed with losing self control.

CONCLUSION

Lifestyle changes, lack of physical workout, strain, were located to have a poor impact at the first-class of existence amongst heart failure sufferers. Programs addressing the bodily and emotional needs of patients are vital to enhance their fine of life. Health training have to be catered to all. A more holistic healthcare machine that looks into the psychological factor of the patients ought to be taken into consideration. Given the disease is now distinctly seen throughout all sections of society within India, there's now the call for urgent research and intervention - at nearby and national degrees to try to mitigate the potentially catastrophic boom in coronary vein illness this is expected for the imminent years. The statistics have been particularly completed vivid domain names: position challenge because of bodily health, physical staying power, standard fitness, treatment pleasure, signs, economic concerns, emotional/mental worries, food regimen satisfactions. The sample size of this study is 230, that is determined the usage of MLHFQ (Minnesota Living with Health Failure Questionnaire) from Sri Ramachandra Medical Centre of Sri Ramachandra Institute of Higher Education & Research [DU], Chennai.

In this exploratory factor analysis, SPSS AMOS enables in predicting the maximum influencing area in coronary heart failure. This study additionally indicates the social- demographic factors

which affects in the occurrence price of heart failure. The model anticipated from AMOS satisfies the Incremental Fit Index wherein the fee closely procedures to 1.Further take a look at can be carried out by means of the usage of huge dataset samples, and additionally to growth the accuracy of the expected version via gratifying rest of the fit indices.

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