Psychometric properties of PSS-10 among atrial fibrillation patients

Running title: Psychometrics of PSS-10 among AF patients

Abstract

Objective: The objective of the current study was to assess the psychometric properties of Perceived Stress Scale 10 (PSS-10) among AF patients.

Methodology: A cross-sectional study was performed among AF patients using the PSS-10. Sociodemographic and patients reported clinical data were collected. Descriptive and inferential statistics were applied using the Statistical Package for Social Sciences (SPSS) version 24.0. A p-value < 0.05 was considered statistically significant.

Results: There were more male patients (n=165) than the female patients (n=111) in total of 276 studied patients. No major issues regarding internal consistency, factorial validity, convergent validity and floor and ceiling effect were observed.

Conclusion: The present study confirmed the psychometric properties validation of PSS-10 among AF patients.

KEYWORDS: *Stress, cardiovascular, psychometric, characteristics, PSS-10*

Introduction

Atrial fibrillation (AF) usually caused due to electrophysiological or structural abnormalities that produce abnormal impulses in the heart. AF usually usually results in stroke, hypertension, heart failure, valvular heart disease, systemic embolism, ischemic heart disease, depression, stress and many more [1,2]. In literature, stress is the reaction when individuals perceive a divergence in their resources and abilities to respond to a stressor, usually a stimulus or an event [3,4].

Stress is conceptualized into three different perspectives, i.e. biological stress, psychological stress, and environmental stress [5]. The response to a stressor is not an intuitive process that directly relates to the stressors or triggers, but stress usually occurs in a transactional way between the triggers and the subject [6]. The perceived stress is the subjective estimation of triggers or stressors, in a non-linear manner from the trigger to the stress response, mainly depend on various factors like gender, age, marital status, education, and experience [3-7].

The Perceived Stress Scale 10 (PSS-10) was developed by Cohen, Kamarck, and Mermelstein in 1983. It is a self-reported tool and amongst the most frequently used instruments for measuring perceived stress. Till today it is frequently used to measure perceived stress among different target populations, i.e. patients and the general public [8,9]. The PSS-10 comprised of 10 items which are used to measure "the degree to which situations in an individual's life is appraised as stressful" [10]. All 10 items of the PSS-10 (PSS-1 to PSS-10) were designed to measure unpredictability, uncontrollability, and burdens among the individuals regarding their routine activities mainly in the last month.

All of the PSS-10 items are easy to grasp, and the responses received against them are simple to interpret, which makes the PSS-10 to be used in any target population [8-10]. In the past, despite its extensive use, the PSS-10 psychometric properties had not been tested among AF patients. Therefore, this study aimed to evaluate psychometric properties of the PSS-10 among AF patients.

MATERIALS AND METHODS

A cross-sectional study was conducted at an outpatient clinic among AF patients. A total of 276 patients participated in the study. All of the study participants were adults (aged 18 years and above) and had AF. In this study, the convenience sampling technique was used to achieve the targeted sample.

As the PSS-10 was first time used among AF patients so the psychometric properties validation of the PSS-10 tool was also performed by determining its factorial and convergent validities. Factorial validation was done by measuring factor structure through Principle Component Analysis (PCA) by Exploratory Factor Analysis (EFA) with Varimax Rotation. Later on, it was reconfirmed with the same rotation using Partial Confirmatory Factor Analysis (PCFA) through Maximum Likelihood Analysis (MLA). Various fit indices were also determined to further ascertain the validity of the PSS like Root Mean Square Error of Approximation (RMSEA), Tucker Lewis Index (TLI), Comparative Fit Index (CFI), Normed Fit Index (NFI) and Incremental Fit Index (IFI). Convergent validity was accepted when the factor loadings (average) on the scale were ≥ 0.7 [11] and factorial validity was accepted when RMSEA was ≤ 0.08 and TLI, CFI, NFI, IFI were >0.90 [12].

Statistical Analyses

Means and standard deviations were calculated for continuous variables, whereas the categorical variables were presented as frequencies and percentages. Data were coded and analyzed using the SPSS version 24.0.

RESULTS and DISCUSSION

Figure 1 shows the demographic data of the study participants. There were 276 AF patients with less females than males (n=111, 40.2%, and n=165, 59.8% respectively). One hundred and eight (39.1%) were ≤ 60-years whereas one hundred and sixty-eight (60.9%) above 60-years of age. One hundred and eighty (65.2%) were married and ninety-six (34.8%) were unmarried. One hundred and ninety-three (69.9%) had income in a sufficiency level and ninety-six (34.8%) were smokers. One hundred and eighty-five (67.0%) had diagnosed AF in less than 5 years and one hundred and forty-nine (54.0%) had hyperlipidemia.

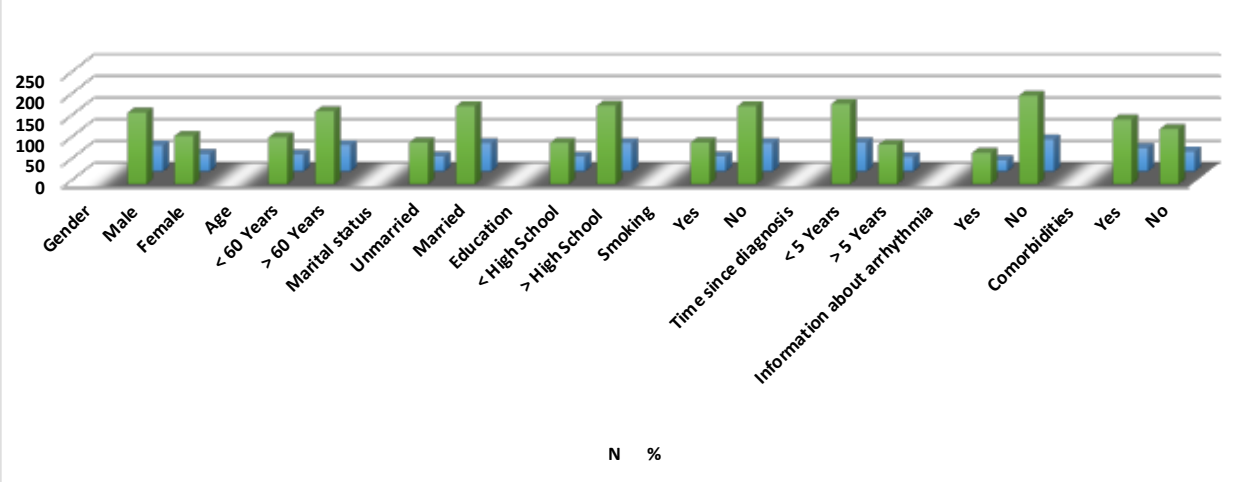

Figure 1: Demographic data of the study participants

Table 1 shows Chronbach alpha value, which was obtained to ascertain the reliability of the PSS-10 among cardiovascular patients. The internal consistency of the PSS-10 was measured by Cronbach's alpha and the value was 0.896.

Table1: Reliability (internal consistency) of the PSS-10

Item	**Value**
Chronbach alpha	0.896

Table 2 represents the factor structure of the PSS-10 among AF patients. The PSS-10 was first time used to measure stress level among AF patients in current study settings. Complete validation of the psychometric properties of the PSS-10 was conducted. EFA was conducted using PCA with Varimax Rotation that highlighted a 2-factor solution based on eigenvalues >1.0. Non-salient factor loadings <0.3 and salient factor loadings >0.3 were recognized as a single factor solution. The KMO and Bartlett's test value was 0.909. The 2-factor solution was later confirmed using PCFA using MLA with the same rotation. The null model ($\chi 2$) value reported was 1689.098, df = 45, while implied model ($\chi 2$) value was 118.129, df = 26. The fit indices namely, NFI = 0.930, TLI = 0.903, CFI = 0.943 and IFI = 0.944, i.e., $\geq$0.90 while RMSEA = 0.08, i.e., $\leq$0.08. All these values indicated an appropriate factor structure [13]. This established the factorial validity of the PSS-10 among AF patients. Convergent validity was also established as the average factor loadings were calculated by adding all individual factor loadings and dividing the total by 10. The average factor loadings were 0.7, i.e., $\geq$0.7 and hence, the convergent validity of the PSS 10 was also established [14].

Table 2: Factor structure of PSS-10

Items	Factor Loadings	
	1	**2**
1	0.717	
2	0.656	
3		0.783
4		0.714
5	0.723	
6	0.743	
7	0.665	
8	0.780	
9	0.788	
10	0.725	

Extraction Method: Principal Component Analysis.

a. 2 components extracted.

The current study assessed the psychometric properties of PSS-10 among AF patients. Stress especially physiological stress during chronic diseases especially heart diseases can have long-term effects on the overall health of the patients [15,16]. This was the first study to assess psychometric properties among AF patients. A study done by Westcott *et al.* (2018) reported that several stress triggers like negative emotions are directly linked to the development and progression of AF while positive feelings and reframe from the stressors are considered as

protective from AF [17]. In their study, they investigated the effect of psychosocial stressors on AF among women and found that the females were in greater stress especially in their old age.

The psychometric properties validation of the PSS-10 was done to ascertain its validity and reliability among AF patients. This psychometric investigation found an adequate level of the internal consistency, factorial validity, convergent validity and floor and ceiling effect of the PSS-10 among AF patients. PCFA evaluated the 2-factor model for the PSS 10 among AF patients. The majority of the earlier studies showed the 2-factor model [18,19], some of them represented a 1-Factor model [19,20] and few presented with bi-factor model [21-23] but they were all in a different population than AF patients. In literature, the internal consistency of the PSS-10 by the Cronbach alpha and McDonald's Omega values were adequately acceptable values of 0.70 and we obtained Cronbach alpha of 0.923. Floor and ceiling effects absence further entails the psychometric characteristics of the PSS-10 among AF patients and endorsed that the variance of the measurement is not unaccounted [24]. It is observed that the PSS-10 psychometric properties were quite adequate among the study population and had no major issues of the internal consistency, factorial validity, convergent validity and floor and ceiling effect among AF patients.

CONCLUSION

The current study confirmed the psychometric poperties validation of the PSS-10 among AF patients which was first time measured among the studied population.

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