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ORIGINAL ARTICLE

Assessment of functional capacity and sleep quality of patients with chronic heart failure

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KEYWORDS
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Abstract *Background:* Adequate sleep improves physical and mental alertness. However, there is a dearth of empirical data on functional capacity (FC) and sleep quality (SpQ) in patients with chronic heart failure (CHF).
Objective: This study investigated the relationship between FC and SpQ of patients with CHF and apparently healthy controls (HCs).
Methods: This case-control study recruited 50 patients with CHF whose left ventricular ejection fraction (LVEF) was <40%, attending cardiac clinics of selected government hospitals in Osun State. Furthermore, 50 age- and sex-matched healthy individuals were recruited as controls. Socio-demographic characteristics and cardiovascular parameters were assessed. The FC (VO_2 max) and SpQ were assessed using the 6-minute walk test (6-MWT) and Pittsburgh Sleep

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Quality Index (PSQI), respectively. Data were analysed using descriptive and inferential statistics. Alpha level was set at $p < 0.05$.
Results: Patients had a significantly lower FC and poorer SpQ than HCs, 4.6 ± 0.5 versus 11.3 ± 1.6 mL/kg/min ($t = -3.452$; $p = 0.001$) and 8.74 ± 1.6 versus 3.8 ± 1.3 ($t = -5.371$; $p = 0.001$), respectively. HCs were about five times more likely to walk longer distance [odds ratio (OR), 4.8; confidence interval (CI), 2.0—11.1] and had a better heart rate (OR, 2.8; CI, 1.4—5.3) than patients. SpQ had a significant negative correlation with FC of patients ($r = -0.362$; $p = 0.001$) but a significant positive correlation with HCs ($r = 0.481$; $p = 0.041$). Furthermore, there were significant correlations between FC and body mass index in both groups (CHF: $r = 0.247$, $p = 0.022$; HCs: $r = 0.321$, $p = 0.040$).
Conclusion: Patients with heart failure demonstrated lower functional capacity and poorer sleep quality.

Introduction

The prevalence of chronic heart failure (CHF) is on the rise due to ageing population and improved medical and healthcare services worldwide [1,2]. Surprisingly, the mortality rate from CHF is still high despite recent advances in treatment and care [3]. In sub-Saharan Africa, the epidemiological transition from communicable diseases to chronic non-communicable diseases has contributed to high prevalence of cardiovascular disease, including CHF [4]. Although the actual prevalence of CHF is unknown in Nigeria, reports from hospital admissions and mortality rates have shown that prevalence of CHF is on the increase according to Adedoyin and Adesoye [5] and Ojji et al [6] reporting prevalence rates of 3.5% and 4.3%, respectively.

Chronic heart failure is characterized by progressive fatigue, pedal and abdominal oedema, and exertion dyspnoea during minimal exercise and then later on progresses to dyspnoea at rest [7,8]. Furthermore, patients with CHF usually experience a characteristic breathing pattern called Cheyne—Stokes respiration [9]. It is a series of increasingly deep breaths followed by a brief cessation of breathing, thus causing sleep-disordered breathing (SDB), including obstructive sleep apnoea (OSA) or central sleep apnoea (CSA), which often leads to poor sleep quality (SpQ) [10,11]. Sharma et al [12] also confirmed that poor SpQ further complicates CHF by contributing to hypertension, myocardial infarction, stroke, and nocturnal arrhythmias that could be very deleterious in patients with CHF.

Sleep complaints are common in patients with CHF and may include fragmentation of sleep and excessive daytime sleepiness [11]. Sleep disorder may affect functional performance causing fatigue and confusion and leading to a vicious cycle of poor health status and worsening prognosis. It may also predict mortality [13]. Due to progressive deconditioning and persistent poor SpQ commonly seen in patients with CHF, regular assessment of SpQ and functional capacity have become imperative in order to identify patients at risk and provide a better guide to therapeutic procedures for effective rehabilitation. It is now evident that the treatment of sleep disorder requires a multidisciplinary approach in order to enhance prognosis [14,15].

Functional capacity is the ability of the body to utilize oxygen and a known measure of cardiorespiratory fitness, as well as a strong predictor of survival in CHF. Oxygen deprivation during sleep may have negative consequences on the cardiovascular health of patients with CHF. Although studies have shown that improvement in functional capacity has direct and multiplier effects on cardiovascular health in patients with CHF [16,17], the relationship between sleep quality and functional capacity remains unclear. More importantly, few studies have examined the relationship between SpQ and functional capacity in Nigerian patients with CHF and compared with apparently healthy controls. *A priori*, we hypothesized that patients with CHF have a different SpQ compared to healthy subjects, which is related to low functional capacity independent of severity of the cardiac condition. This study investigated the relationship between SpQ and functional capacity of Nigerian patients with CHF and apparently healthy controls.

Methods

Participants and setting

This is a case-control study that employed purposive sampling technique to recruit 50 patients (16 male and 34 female) with chronic heart failure (CHF) who were receiving treatment at the cardiac care units of selected government hospitals in Osun State. Furthermore, 50 apparently healthy individuals (20 males and 30 females) were recruited as controls. The sample size for this study was based on comparative research studies comparing two equal groups as advanced by Eng [18]. The sample size formula goes thus: $N = [4\sigma^2(z_{crit} + z_{pwr})^2]/D^2$, where N is the total sample size (the sum of the sizes of both comparison groups), σ is the assumed standard deviation (SD) of each group (assumed to be equal for both groups), the z_{crit} value is the desired significance criterion, z-value (z-value for 95% confidence level, 1.96), while the z_{pwr} value is the desired statistical power, 80% (0.842). D is the minimum expected difference (effect size) between the two means of primary