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The effect of progressive muscle relaxation on the management of fatigue and quality of sleep in patients with chronic obstructive pulmonary disease: A randomized controlled clinical trial

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ABSTRACT

Objective: To assess the effect of progressive muscle relaxation (PMR) on fatigue and sleep quality of patients with chronic obstructive pulmonary disease (COPD) stages 3 and 4.
Materials and methods: The pretest posttest clinical trial recruited 91 patients COPD grades 3 and 4. Following random assignment of subjects, the treatment group (n = 45) performed PMR for eight weeks and the control group (n = 46) received routine cares. At baseline and after the intervention, fatigue and sleep quality was assessed. Data obtained were analyzed in SPSS.
Results: It was determined that PMR decreased patients' fatigue level and improved some sleep quality subscales including subjective sleep quality, sleep latency, sleep duration and habitual sleep efficiency, but no improvement was found in global sleep quality and other sleep subscales.
Conclusion: An eight-week home-based PMR program can be effective in reducing fatigue and improving certain subscales of sleep quality in patients with COPD stages 3,4. (IRCT2016080124080N3).

1. Introduction

Chronic Obstructive Pulmonary Disease (COPD) is a progressive chronic lung disease and one of the main causes of mortality worldwide. It is estimated that 210 million people are living with this disease, and COPD is anticipated to become the third leading cause of mortality in the world by 2030 [1]. A survey study conducted in Iran has reported the prevalence of COPD 5.7% [2].

Due to the obstruction in airflow, patients with COPD experience symptoms such as dyspnea, coughing, and fatigue (Cochrane). Fatigue is a complex and multidimensional stressful sensation [3] and the second most common symptom in COPD patients [4]. In a study, almost all COPD patients (95.3%) had experienced high levels of physical fatigue [3]. Tissue oxidation and muscle atrophy, changes in muscle structure, sleep disturbances, stress, medication side-effects, and eating disorders are among factors causing fatigue in COPD patients [5]. Fatigue in COPD patients is a debilitating symptom that leads to diminished exercise capacity and difficulty in performing routine daily activities [5,6]. The results of a study showed fatigue and fatigue-induced functional limitations are mainly affected by psychological and physiological factors such as insomnia, dyspnea, and symptoms of depression and surfactant protein D [4]]. Fatigue is associated with exacerbation of health status, increased burden of disease, poor social participation, reduced focus on the bodily sensation, poor sleep quality, and reduced level of physical activity [7]. In patients with COPD, fatigue is a predictor of mortality. However, it is often overlooked despite its high prevalence and important outcomes such as impaired quality of life (QOL) and increased risk of hospitalization [4].

Patients with COPD often report sleep impairment, and next to dyspnea and fatigue, disturbed sleep is the most common symptom in these patients [8]. A descriptive study reported poor sleep quality

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in 74.8% of COPD patients [9]. These patients suffer from a delay in falling asleep, a delay in onset of sleep, frequent waking, use of hypnotics, and daytime sleepiness [10].

In COPD patients, sleep can have side-effects such as significant hypoxemia and hypercapnia, especially during rapid eye movement (REM) sleep [11]. They experience abnormalities in ventilation to perfusion ratio (V/P) while sleeping, due to airflow obstruction, hyperinflation, respiratory muscle dysfunction and use of medications such as diuretics and steroids [12]. A regression analysis showed that sleep disturbance predicts both exacerbated incidence of COPD and the use of respiratory-related emergency utilities [13]. Another study showed that sleep deprivation affects Forced Vital Capacity (FVC) (−5%) and Forced Expiratory Volume (FEV) (−6%) [12]. Moreover, poor sleep quality can lead to impaired cognition [8] and impaired COPD self-management behaviors [13]. Sleep quality is an important aspect of life and determinant of physical dimension of QOL [14], and even survival in COPD patients [13]. However, like fatigue, assessment and management of sleep quality in COPD patients has been neglected, and it is necessary to address management of these two symptoms in clinical research and practice [12,15].

Some guidelines have introduced pulmonary rehabilitation as the first line in the management of COPD symptoms [9], and several studies have shown the effect of pulmonary rehabilitation in improving QOL, exercise tolerance, and reduced daily symptoms [16]. In a study conducted by Zakeri-Moghadam et al. the effect of breathing exercises in reducing the severity of fatigue [17] and In another study, the effect of breathing exercises in improving sleep quality in COPD patients was determined [18]. Although the benefits of pulmonary rehabilitation in COPD patients is clear, its costs, a lack of staff and equipment, and patients' inadequate compliance and participation in these programs are reasons why complementary medicine and alternative exercises such as controlled PMR or home-based exercises have been recommended [16]. PMR was developed by Jacobson in 1920s [19], and its effects such as reduced anxiety, diverting attention from pain, relieving muscle strain and contractions, facilitating sleep, and reducing sensitivity to fatigue made it an inseparable part of complementary medicine and holistic care of patients with COPD [20]. The effects of PMR have been recognized in reducing anxiety and depression in a variety of conditions including asthma, coronary artery bypass surgery, and chemotherapy-induced nausea in cancer patients also improving QOL of patients with endometriosis under Gonadotropin-Releasing Hormone (GnRH) agonist therapy [21]. In another study, the effects of acute PMR and music were observed in improving anxiety, dyspnea, breathing rate, pulse rate, and systolic blood pressure in COPD patients [22].

However, only a few studies have examined the effect of PMR and other relaxation techniques in improving sleep quality and fatigue in COPD patients [19]. The effectiveness of these techniques in the management of COPD symptoms is not clear, and only some studies have examined the effects of techniques such as Yoga, Tai Chi, and biofeedback on mental health, respiratory capacity, respiratory muscle strength, and QOL [23,24]. Moreover, rehabilitation studies, especially in Asian countries, have so far mainly focused on medications, training, oxygen-therapy, and respiratory and traditional exercises [9]. Thus, given the prevalence of COPD-related sleep disturbances and fatigue and the effect of these symptoms on the QOL and health outcome measures [15], and also given contradictions relating to the effect of relaxation techniques on COPD symptoms, short period of intervention, methodological differences in these studies [22,24,25] and single-group participants [19], the present study was conducted to assess the effect of PMR (as a complementary medicine method) on sleep quality and severity of fatigue in patients with COPD stages 3 and 4. PMR can improve adaptation of these patients to fatigue and poor sleep quality.

2. Materials and methods

2.1. Study design

This pretest-posttest clinical trial was conducted on two groups.

2.2. Participants

A total of 91 COPD patients attending the respiratory clinic of Shohada Teaching Hospital in the city of Khorramabad affiliated to Lorestan University of Medical Sciences (West of Iran) between July 2016 and March 2017 were recruited for this randomized controlled study.

The inclusion criteria were COPD diagnosed by the physician (based on physical examination and spirometry indices), living in the city (Khorramabad) for more than six months, fatigue score≥36 based on Fatigue Severity Scale (FSS), sleep disturbance score of 21 based on Pittsburgh Sleep Quality Index (PSQI), patients with COPD stage 3 or 4 (based on GOLD 2007), no comorbidities such as neurological diseases, acute myocardial infarction, or cancer, 45–70 years of age, BMI<30, no psychiatric disorders such as anxiety or severe cognitive impairment, having a CD player at home, no hearing problems, the ability to read and write, and willingness to take part.

The exclusion criteria were hospitalization during the study, exacerbation of the disease, stressful life events (death of a family member, etc.) participation in other rehabilitation, relaxation and meditation programs, such as Yoga, and discontinuation of exercises. The present study was approved by the Ethics Committee of the Lorestan University of Medical Sciences (ID: Lums.-REC.1395.107) and performed in accordance with the Declaration of Helsinki. Informed consent was obtained from all participating patients. The trial was registered on the Clinical Trials Registry (ID: IRCT2016080124080N3).

A total of 155 eligible consecutive patients were interviewed, and 55 patients were excluded for various reasons (Fig. 1). A total of 100 patients met the inclusion criteria and consented to take part in the present study. Before randomization, all patients' clinical assessment and pulmonary function measurements had been performed by a pulmonologist at the respiratory clinic.

The patients were randomly assigned to PMR (n = 50) and control (n = 50) groups using block randomization with randomly selected block sizes of 4 and an allocation ratio of 1:1. PMR and control group patients were matched in terms of severity of the disease. Based on two-sided $\alpha = 0.05$, power = 0.8, and an effect size = 0.65, the sample size was determined 40 patients for comparison of means between the two groups [26]. With an anticipated 25% dropout rate and to ensure adequacy of final sample size, 50 patients were selected per group. However, a total of 91 patients took part in the study, including 45 in the PMR group and 46 in the control. The reasons for participants' dropping out were patient's death in the course of the study (n = 3 from control group and n = 2 from PMR; 2) and loss of contact (n = 1 from control group and n = 3 from PMR).

2.3. Blinding

Neither the researcher who collected data before and after PMR nor patients had knowledge of allocations into treatment and control groups. Treatment and control groups were trained and exercised in different times and places.