

Gender Differences in Anxiety and Depression of Chronic Obstructive Pulmonary Disease Patients Submitted to Pulmonary Rehabilitation

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Abstract

Objective: To compare the benefits of Pulmonary Rehabilitation Program (PRP) between men and women with COPD regarding levels of anxiety and depression, quality of life and physical performance.

Design: Nonrandomized controlled trial. Patients were assessed by Saint George's Respiratory Questionnaire (SRQG), the six-minute walk test(6MWT), the Beck Anxiety Inventory (BAI) and the Beck Depression Inventory (BDI) before (pre-PRP) and three months after (post-PRP) PRP.

Setting: Pulmonary Rehabilitation Center.

Participants: Thirty-three patients were evaluated pre-PRP and post-PRP. Five of thirty-eight patients were excluded because they found it difficult to attend the sessions.

Interventions: Pulmonary Rehabilitation Program (PRP).

Main Outcome Measure(s): Men improved their depression and anxiety. Women improved their quality of life and both genders performed better in the 6MWT.

Results: Men patients improved their depression score (BDI: pre-PRP: 19.6 ± 9.2 , post-PRP: 15.3 ± 9.3 , $p < 0.05$), decreased their anxiety score (PRP-pre: 15.9 ± 12.8 , post-PRP: 11.8 ± 10.1 , $p < 0.05$) and didn't improve the quality of life after PRP. Women showed no improvement on their depression (pre-PRP: 20.3 ± 8.9 , post-PRP: 18 ± 8.1 , $p \geq 0.05$) and anxiety (pre-PRP: 15.2 ± 11.6 , post-PRP: 12.9 ± 13.1 , $p \geq 0.05$), but improved their quality of life (pre-PRP: 33.2 ± 12 ; post-PRP: 20.3 ± 12.6 , $p < 0.05$). Both genders improved their performance in the 6MWT (Men: pre-PRP: $349 \pm 101.4m$, post-PRP: $379.7 \pm 87.1m$, $p < 0.05$; Women: pre-PRP: $361.8 \pm .85.9$, post -PRP: 390.5 ± 61.5 , $p < 0.05$).

Conclusion: This study indicates that men and women respond differently to the PRP.

Keywords: Chronic Obstructive Pulmonary Disease; Anxiety; Depression; Quality of Life; Pulmonary Rehabilitation

Abbreviations

COPD: Chronic Obstructive Pulmonary Disease; PRP: Pulmonary Rehabilitation Program; SRQG: Saint George's Respiratory Questionnaire; 6MWT: Six-Minute Walk Test; BAI: Beck Anxiety Inventory; BDI: Beck Depression Inventory; FEV₁: Forced Expiratory Volume in the First Minute; SpO₂: Oxygen Saturation; HR: Heart Rate

Introduction

In recent years, there has been an increase in the incidence and number of deaths that are attributable to Chronic Obstructive Pulmonary Disease (COPD) among women [1,2], thereby challenging the traditional perception that this disease is more prevalent among men [3]. There is a need for more rigorous research on gender differences in the clinical presentations of COPD [4].

COPD has multiple comorbidities and anxiety and depression are two of the most common and least treated comorbid conditions [5], even among patients with mild to moderate illness [6,7]. There is an overlap between most of the somatic symptoms of severe depression and clinical manifestations of COPD. As a result, they tend to be incorrectly attributed to the pulmonary disease. There is an overlap between most of the somatic symptoms of severe depression and clinical manifestations of COPD. As a result, they tend to be incorrectly attributed to the pulmonary disease. In addition, depression adversely affects patients' quality of life and their adherence to COPD treatments [5].

Although there is strong evidence to suggest that the Pulmonary Rehabilitation Program (PRP) is effective in enhancing exercise capacity and quality of life, evidence about its impact on anxiety and depression is limited [5]. However, one study [8] found that the PRP had significantly alleviated anxiety and depression and improved quality of life and performance on the six minute walk test (6MWT; i.e. distance walked), even 24 months after the termination of the PRP. Gender differences in the PRP outcomes have not been adequately delineated [9].

In order to bridge these gaps in the literature, this study aimed to examine gender differences in the effect of the PRP on the physical and psychological (including quality of life) functioning of COPD patients.

Methods

This study was conducted at the Pulmonary Rehabilitation Clinic. This study was approved by an Ethics and Research Committee. All the participants provided signed informed consent.

Patients with moderate to severe COPD (forced expiratory volume in the first minute: $FEV_1 \leq 80\%$) were evaluated before and after the three-month period of PRP. At the time of the study, the patients were using medications to manage the disease. The PRP sessions were conducted thrice a week, and each session lasted for approximately 50 minutes. In each session, the participants performed bicycle exercises (i.e. aerobic exercises) for 30 minutes, and the load was determined based on the tolerance of the participant. With regard to anaerobic exercises, two sets of 15 repetitions each were conducted using 1 - 3 kg dumbbells, a light-resistance elastic band, and 2 or 3 kg medicine balls. Elastic band training [10,11] differentially targeted the deltoid muscles, brachial biceps and triceps, femoral quadriceps and hamstrings.

The participants were clinically stable for at least 3 months and were evaluated before and after the PRP. The inclusion criteria were as follows: (1) patients with moderate to severe COPD ($FEV_1 \leq 80\%$) and (2) patients who were naïve to the PRP. Patients who were receiving oxygen therapy and those with any of the following conditions were excluded from the sample: musculoskeletal limitations, neurological diseases, pulmonary hypertension, and a diagnosed advanced systemic disease.

The following measures were used:

1. The Beck Anxiety Inventory (BAI) assesses the common symptoms of anxiety. It consists of 21 questions, each of which provides 4 response options. This questionnaire has been approved to use in clinical research by the Brazilian Federal Council

of Psychology [10,11]. Total scores can be classified as follows: minimal (0 - 11), mild (11 - 19), moderate (20 - 30) and severe (31 - 64) anxiety. Mild, moderate, and severe anxiety are considered to be clinically relevant [8].

2. The Beck Depression Inventory (BDI) assesses the common symptoms of depression. It consists of 21 questions, each of which offers 4 response options. This questionnaire has been approved by the Brazilian Federal Council of Psychology. Total scores can be classified into the following categories: minimal (0 - 11), mild (12 - 19), moderate (20 - 35) and severe (36 - 63) depression. Mild, moderate, and severe depression are considered to be clinically relevant [8]. Both these inventories were administered by a psychologist.
3. The Saint George's Respiratory Questionnaire (SGQR) was translated to Portuguese and validated among Brazilian samples [12]. It assesses three dimensions: symptoms, activities, and the psychosocial factors that impact the quality of life of COPD patients [12].
4. Throughout the 6MWT (distance = 38 meters), oxygen saturation (SpO_2) and heart rate (HR) were measured using a Moriya 1005 portable oximeter. The following variables were measured before and after the test: blood pressure, HR, SpO_2 , dyspnea (using the Modified Borg Dyspnea Scale) [13].

The patients were divided into two groups based on their gender. The effects of the PRP on anxiety and depression, quality of life, and performance on the 6MWT were separately examined among men and women. Subsequently, effect sizes were inspected to identify the group that had demonstrated the best response to the PRP.

Sample calculation and statistical analysis

To obtain the 80% study power, the Alpha error = 0.05 (with a 95% confidence interval) and the beta error = 0.2 (for the 80% study power) were considered. A difference of 5 points was expected before and after PRP with a known standard deviation of 6.3 [8] and the sample calculation was made for 12 patients per group (12 men and 12 women).

First, a descriptive analysis was performed. The results are written as mean \pm standard deviation for samples with normal distribution or median (25% - 75%), for samples with non-normal distribution. Statistical tests were used to analyze this study. Paired t test was used to assess patients' response after an intervention (three months of PRP) and the effect size to compare the magnitude of the response between men and women. For those results in which the distribution was not normal, the Mann-Whitney test was used.

As BAI and BDI variables, they were analyzed quantitatively and later, qualitatively.

The level of significance used for the tests was $p < 0.05$.

Results

Between January and June 2013, 38 patients who were naïve to the PRP were enrolled in the study. Five of them were excluded because they found it difficult to attend the sessions.

The final sample ($n = 33$) consisted of 19 men (58%) and 14 women (42%). Their mean age was 66 ± 9 years, and their mean FEV_1 value was $47\% \pm 16\%$; in other words, a majority of the patients had severe COPD [11,12] (Table 1).

Sample	(n = 33)
Gender (%)	
Male	19 (58)
Female	14 (42)
Age (years)	66 ± 9
Marital Status (%)	
Married	18 (55)
Divorced/separated	6 (18)
Widower	9 (27)
Schooling (%)	
Illiterate	5 (13)
ElementarySchool C/I	21 (55)
High School C/I	11 (29)
University	1 (3)

Table 1: Demographic data.
C: Complete; I: Incomplete.

On average, men and women had reported moderate depression prior to the PRP (Table 2). After three months of the PRP, both men and women demonstrated an improvement in the severity of depression (the effect size was large among men and small among women) (Table 2).

Gender	Instruments	Initial	Final	P value	Cohen (effectsize)
Male	BAI (Pts.)	15,9 ± 12,8	11,8 ± 10,1	0,02	0,4
	BDI (Pts.)	19,6 ± 9,2	15,3 ± 9,3	0,02	0,46
	SGQR (Pts.)	34,2 ± 13,8	30 ± 12	0,08	0,35
	6MWT' (m)	349 ± 101,4	379,7 ± 87,1	0,03	0,35
Female	BAI (Pts.)	15,2 ± 11,6	12,9 ± 13,1	0,48	0,17
	BDI (Pts.)	20,3 ± 8,9	18 ± 8,1	0,28	0,28
	SGQR (Pts.)	33,2 ± 12	20,3 ± 12,6	0,002	0,86
	6MWT' (m)	361,8 ± 85,9	390,5 ± 61,5	0,005	0,47

Table 2: Comparison between genders for anxiety, depression, quality of life and six minutes walking test
BAI: Beck Anxiety Inventory; BDI: Beck Depression Inventory; SGRQ: Respiratory Questionnaire of Saint George;
TC6: Six Minutes Walking Test; Pts.: Points; m: Meters.

On average, men reported mild anxiety prior to the intervention and they demonstrated improvement after three months of the PRP (effect size: moderate) (Table 2). Although their scores continued to be indicative of mild anxiety, they had decreased as a result of the PRP. On the other hand, women reported mild anxiety prior to the PRP, but did not demonstrate any improvements at the end of the intervention. In contrast, there was an improvement in quality of life among women but not among men, and the effect size was large (Table 2).

Both men and women demonstrated improved performance on the 6MWT, but the improvement was more pronounced among women than among men (i.e. effect size: women > men) (Table 2).

Discussion

In this study, the PRP alleviated anxiety among women and depression among men. There was an improvement in the severity of anxiety and depression among men. In contrast, women reported lower levels of depression and better quality of life after 3 months of the PRP. The fact that patients reported lower levels of anxiety and depression after the PRP supports the hypothesis that the program also has a positive effect on psychological functioning.

Both men and women demonstrated improved performance on the 6MWT, and this observation is consistent with the findings of other studies [8,14]. Specifically, in this study, the PRP improved patients' aerobic capacity and quality of life and alleviated their symptoms of anxiety and depression. As past studies have demonstrated, physical activity can have a positive impact on psychological symptoms and improve quality of life [15,16].

Several studies have shown that patients benefit not only physically but also psychologically from the PRP [17-19]. The symptoms of depression and anxiety are directly associated with quality of life [15,16]. On the other hand, the psychosocial morbidities of patients who participate in the PRP are often not adequately addressed, even in the absence of another complementary psychological intervention. The PRP has also been found to have a positive impact on exercise tolerance and quality of life [18]. In this study, women reported better quality of life at the end of the PRP, even though their anxiety levels had not decreased.

In the past, COPD predominantly affected men. However, this trend has been changing, and the number of women with COPD has been increasing [1,2]. Indeed, even in the present study, the number of female participants was only marginally lower than the number of male participants. Past studies have shown that, among individuals with COPD, there are significant gender differences in the severity of COPD, age and the level of anxiety [2,20,21]. Specifically, female patients tend to be younger and more symptomatic, have better FEV₁ scores and more medical comorbidities [22] and report higher levels of anxiety and depression and worse quality of life [6,7].

In this study, there was no gender difference in anxiety and depression before the PRP. Both men and women reported mild anxiety and moderate depression. The existing literature on gender differences in the psychiatric comorbidities of COPD is ambivalent. For example, in one study, women with COPD reported higher levels of anxiety, but there was no gender difference in depression and quality of life [6,7]; however, in another study, the symptoms of anxiety and depression were more frequently reported by women [2]. Further, other studies have found that there are significant gender differences in not only anxiety and depression (i.e. higher anxiety and depression rates among women with COPD than among men with COPD) but also clinical characteristics, disease management, quality of life, and COPD treatment costs [2,4].

In this study, only men demonstrated a statistically significant improvement in psychiatric symptoms at the end of the PRP. Further, the severity of women's depressive symptoms decreased from a moderate to a mild level. These findings suggest that the PRP has a positive impact on the symptoms of anxiety and depression among COPD patients.

It is known that dyspnea limits exercise in patients with chronic obstructive pulmonary disease (COPD) and may induce anxiety. Consequently, it is important to observe anxiety during exercise which can worsen dyspnea [23]. The results of one study indicate an association between the effect of dyspnea-related fear, anxiety and exercise-related dyspnea [24]. In the present study anxiety was evaluated before and after the three-month period on the PRP. However, during the exercise period the health professionals were very aware of any anxiety-worsened dyspnea that could be dangerous for the patient.

The quality of life of both men and women was similar before the PRP; in contrast, past studies [6,20] have found that women tend to report poorer quality of life than men. Women tend to experience more exacerbated symptoms of COPD and report poorer quality of life across all domains of the SGQR [6,7]. However, in the present study, women demonstrated a greater improvement in their quality of life, when compared to men. Gender differences in the effects of the PRP and physical activity have not been adequately delineated [25]. About their performance, both men and women improved in distance in the 6MWT, a result that was also verified in other studies [8,26], that is, PRP improved the patients aerobic capacity, the quality of life and decreased symptoms of anxiety and depression.

A systematic review [22] revealed that some of the included studies had found significant gender differences in the effects of the PRP on dyspnea, quality of life, physical ability, psychological and functional status, and coping strategies, but other studies had found no such differences.

The PRP has been found to alleviate depression and anxiety and improve the quality of life of patients with COPD, irrespective of their age, sex, and disease severity, the study year, and the duration of the PRP [27]. However, one study did not find a significant correlation between these variables [15]. Interestingly, in the present study, there was a significant gender difference in the effect of the PRP on quality of life, anxiety, and depression.

Past studies have yielded insufficient evidence about gender differences in the effect of the PRP [25]. However, the present results suggest that there are gender differences in the effect of the PRP.

Study Limitations

This study has a few limitations. The sizes of the two groups that were compared were small. Further, anxiety and depression were assessed using the BAI and BDI, respectively. However, psychiatric illnesses should be diagnosed only by a psychiatrist.

Conclusion

In conclusion, the PRP alleviated depression and anxiety among men and improved quality of life and alleviated anxiety among women. These results indicate that men and women respond differently to the PRP.

The PRP increased the aerobic capacity of both men and women, thereby indicating that it has a positive effect on physical performance.

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