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RESEARCH ARTICLE

Assessment of dyspnoea and fatigue among COPD patients attending a tertiary care hospital in North India

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Abstract

Background: Chronic Obstructive Pulmonary Disease (COPD) is a highly prevalent, usually progressive illness associated with disability and early death. COPD is characterized by airflow obstruction with related symptoms such as chronic cough, exertion dyspnoea, expectoration and wheeze. Dyspnoea and fatigue are the most common complaints in COPD patients.

Objectives: To assess the symptoms of dyspnoea and fatigue and evaluate their associations in COPD patients.

Methodology: This observational, descriptive, Out Patients Department (OPD) based study was done in adult COPD patients, attending a tertiary care hospital. Dyspnoea was assessed by the Medical Research Council Scale (MRC) and fatigue was assessed by the Brief Fatigue Inventory Scale (BFI).

Results: Total 115 COPD patients were included in the study. 77.4% were males and 22.6% were females. The mean age of patients was 58.41 ± 10.15 years. Majority (44.3%) of patients were in the age group of 60 – 69 years. Mean duration of disease was 10.51 ± 5.32 years. 28.7% of the participants were having severe dyspnoea and 29.6% of the participants complained of continuous fatigue. There was a significant positive Pearson's correlation between dyspnoea and fatigue ($r = 0.957$, $p < 0.001$) and as dyspnoea scores increased so did fatigue scores.

Conclusion: Appropriate interventions should be provided considering the correlation between dyspnoea and fatigue in COPD Patients. Health care professionals should consider the associations of dyspnoea and fatigue for planning and implementing the treatment and follow-up strategies.

INTRODUCTION

Chronic Obstructive Pulmonary Disease (COPD) is not one single disease but an umbrella term used to describe chronic lung diseases that cause limitations in lung airflow. The more familiar terms 'chronic bronchitis' and

'emphysema' are no longer used, but are now included within the COPD diagnosis. COPD is a highly prevalent, usually progressive illness associated with disability and early death. It is a growing cause of morbidity and mortality worldwide (Mannino, 2003; Mannino and Braman, 2007). In the year 2012, a total of 56 million deaths occurred worldwide, of these, 38 million were due to Non Communicable Diseases (NCDs), principally cardiovascular diseases, cancer and chronic respiratory diseases. Asthma and COPD caused 4.0 million deaths, accounting to 10.7% of NCD deaths (WHO, 2014). Nearly three quarters of these NCD deaths (28 million) occurred in low- and middle-income countries (Mathers and Loncar, 2006). In India, chronic diseases where responsible for 53% of deaths in the year 2005, out of which 7% deaths were due to chronic respiratory diseases (WHO, 2015).

COPD is characterized by airflow obstruction with related symptoms such as chronic cough, exertion dyspnoea, expectoration, and wheeze (Edelman *et al*., 1992; Mannino, 2003). The most important complaint of patients with COPD is dyspnoea. Dyspnoea is the perception and experience of laboured, uncomfortable breathing, and may produce secondary physiological, emotional, cognitive, and behavioural responses (American Thoracic Society, 1999).

Fatigue is an important symptom in COPD (Yeh *et al.*, 2004). Fatigue is an unpleasant subjective symptom that affects whole body and prevents individuals from performing his functions and using his normal capacity and varies from a slight exhaustion to unbearable fatigue (Swain, 2000). Fatigue is one of the highly prevalent symptoms in COPD, as in contrast to the general population, fatigue is "almost always" experienced by patients with COPD (Kinsman *et al*., 1983; Walke *et al*., 2007).There are studies that show correlation between fatigue and impaired quality of life in COPD (Breukink *et al.*, 1998; Baghai–Ravary *et al.*, 2009).

In several studies significant correlations between dyspnoea, fatigue and physical activity among COPD patients have been reported. It was observed that when dyspnoea intensified, fatigue levels increased and physical activity was reduced (Breslin *et al*., 1998; Theander and Unosson, 2004). Individuals with COPD undergo a high amount of activity restriction and dependency due to dyspnoea or fatigue or both symptoms (Woo, 2000). Therefore, the present study was conducted to assess the symptoms of dyspnoea and fatigue, and their association among adult COPD patients attending a tertiary care hospital.

MATERIALS AND METHODS

Study Design: This observational, descriptive, Out Patients Department (OPD) based study was done in adult patients with Chronic Obstructive Pulmonary Disease (COPD), attending the TB & Chest OPD, at a tertiary care hospital. Institutional research and ethical approval was obtained and the study was conducted from January to December, 2014.

Sampling technique: Purposive sampling was done.

Study Material: Adult COPD patients aged 18 years and above, reporting to the hospital during the study period.

Inclusion criteria: Adult COPD patients who agreed to participate and were in a clinically stable condition were included in the study. The inclusion criteria were a diagnosis of COPD and a ratio of post bronchodilator Forced Expiratory Volume in 1 second (FEV_1) to Forced Vital Capacity (FVC) of < 0.70.

Exclusion criteria: Patients who refused to participate, patients with very severe dyspnoea (FEV_1 < 30%) and those suffering from other lung disease, cancer, stroke, severe ischemic heart disease, severe kidney dysfunction, and psychosocial or physical difficulties that might interfere with the assessments were excluded from the study.

Study subjects: A total of 115 adult COPD patients were included as participants in the study.

Method: Informed consent was obtained and the patients were interviewed followed by a detailed clinical examination. Participants were selected according to the following criteria; had been diagnosed of COPD, did not have any psychiatric problems, and were able to understand, and communicate. The data was collected using face to

face interview technique. A pre-designed interview schedule was used to collect the necessary information from the patients regarding socio-demographic characteristics such as age, gender, marital status, educational level and disease characteristics such as duration of disease, disease severity, health condition, and repeated hospitalization. The socioeconomic status was assessed using the Kuppuswamy Scale (Kumar, 2013).

COPD was defined by the Global Initiative for Chronic Obstructive Lung Disease (GOLD) standard. Spirometry was done post bronchodilator to assess the ratio of Forced Expiratory Volume in 1 second (FEV_1) to Forced Vital Capacity (FVC). COPD was defined as a $FEV_1/FVC < 0.70$. COPD is classified into four stages of mild ($FEV_1 \geq$ 80% predicted), moderate ($50\% \leq FEV_1 < 80\%$ predicted), severe ($30\% \leq FEV_1 < 50\%$ predicted), and very severe ($FEV_1 < 30\%$ predicted) (GOLD, 2013).

Dyspnoea was assessed by the Medical Research Council Scale (MRC). The MRC categorizes the individuals based on dyspnoea associated with specific tasks and situations. Patients are assigned to one of five grades, "Grade 1", to those who were never troubled by breathlessness except on strenuous activity, to "Grade 5", to those who were too breathless to leave the house or breathless after undressing (Stenton, 2008). The MRC is easy to administer and is useful for general screening and categorizing patients. The severity of dyspnoea was assessed by MRC score of 1 for mild, 2 – 3 for moderate, and 4 – 5 for severe dyspnoea (Paladini, 2010).

Fatigue was assessed by the Brief Fatigue Inventory Scale (BFI). The BFI has 9 items that are designed to provide a measure of fatigue. Three items ask patients to rate the severity of their fatigue at its "worst", "usual", and "now" during normal waking hours, with 0 being "no fatigue" and 10 being "fatigue as bad as you can imagine." Six items assess the amount that fatigue has interfered with different aspects of the patient's life during the past 24 hours. Depending on the purposes of measurement, this time interval can be changed to the past week. The interference items include general activity, mood, walking ability, normal work (includes both work outside the home and housework), relations with other people, and enjoyment of life. The interference items are measured on a 0–10 scale, with 0 being "does not interfere" and 10 being "completely interferes". A mean BFI score is calculated as the mean of the intensity and interference items. The severity of fatigue was assessed by the mean BFI score of 1–3 for mild, 4–6 for moderate, and 7–10 for severe fatigue (Mendoza *et. al.*, 1999).

Statistical analysis: Data from the interview schedule was transferred to a computer and SPSS Data Editor Software version 19 was used for analysis. The data was analyzed in terms of descriptive statistics mean and standard deviation (SD). Chi-square test, one way analysis of variance (ANOVA) and Pearson's Correlation Analysis was performed, and $p < 0.05$ was considered statistically significant.

RESULTS

A total of 115 COPD patients were included in the study. 77.4% were males and 22.6% were females. The mean age of patients was 58.41 ± 10.15 years. Majority (44.3%) of patients were in the age group of 60 – 69 years. Mean duration of disease was 10.51 ± 5.32 years. 83.5% were married and 72.2% were from rural areas (Table 1). 32.2% were illiterate and 37.4% were primary educated. 32.2% were retired and 13.9% were housewives. 58.3% of the participants belonged to middle socioeconomic class (Table 2). Smoking was more in males as compared to females (OR = 6.08). Environmental tobacco smoke was less associated with males than females (OR = 0.27) (Table 3).

28.7% of the participants were having severe dyspnoea and 29.6% of the participants complained of continuous fatigue. The mean dyspnoea score (MRC) was 2.63 ± 1.30, and the mean fatigue score (BFI) was 5.21 ± 2.26.There was a significant association ($p < 0.05$) between age and the dyspnoea and fatigue scores. Dyspnoea and fatigue scores were seen to increase with age. Males were having a slightly higher mean dyspnoea score and females were having a slightly higher fatigue score, but these were not statistically significant. The duration of disease was positively associated with dyspnoea and fatigue scores, and these were statistically significant ($p < 0.05$). Severity of COPD was associated with the dyspnoea and fatigue scores. Frequency of fatigue complaint was having significant association ($p < 0.05$) with severity of dyspnoea. The dyspnoea and fatigue scores were less among those participants who were on regular medication (Table 4).

There was a significant positive Pearson's correlation between dyspnoea and fatigue ($r = 0.957$, $p < 0.001$) and as dyspnoea scores increased so did fatigue scores. There was a significant negative Pearson's correlation between the measured FEV_1 values of the participants and dyspnoea scores ($r = -0.973$, $p < 0.001$) and fatigue scores ($r = -0.974$, $p < 0.001$).

Table 1: Socio-demographic characteristics of participants.

Characteristics		Number of participants (N= 115)	Percent
Age	< 40 years	05	4.3%
	40 – 49 years	19	16.5%
	50 – 59 years	29	25.2%
	60 – 69 years	51	44.3%
	≥ 70 years	11	9.6%
Sex	Male	89	77.4%
	Female	26	22.6%
Marital Status	Married	96	83.5%
	Single	19	16.5%
Residence	Rural	83	72.2%
	Urban	32	27.8%

Table 2: Distribution of participants according to education, employment, and socioeconomic status.

Variables		Number of participants (N= 115)	Percent
Educational Status	Illiterate	37	32.2%
	Primary	43	37.4%
	Secondary	21	18.3%
	University	14	12.2%
Employment Status	Unemployed	11	9.6%
	Employed	51	44.3%
	Retired	37	32.2%
	Housewife	16	13.9%
Socioeconomic Status	Upper Class	27	23.5%
	Middle Class	67	58.3%
	Lower Class	21	18.3%

Table 3: Distribution of participants according to risk factors.

Risk factors	Sex		Total (N=115) (100%)	* p value	**Odds Ratio (95% CI)
	Male (N=89) (77.4%)	Female (N=26) (22.6%)			
Smoking					
Yes	78 (84.8%)	14 (15.2%)	92 (100%)	< 0.001	6.08 (2.24-16.46)
No	11 (47.8%)	12 (52.2%)	23 (100%)		
Environmental tobacco smoke					
Yes	47 (69.1%)	21 (30.9%)	68 (100%)	0.011	0.27 (0.09-0.77)
No	42 (89.4%)	5 (10.6%)	47 (100%)		

* Chi square test was applied, degree of freedom = 1, p value < 0.05 statistically significant.
** Unadjusted Odds Ratio. CI = Confidence interval.

Table 4: Distribution of participants according to dyspnoea and fatigue scores.				
Characteristics	**Dyspnoea Score (MRC)**		**Fatigue Score (BFI)**	
	Mean ± SD	**F test, p value**	**Mean ± SD**	**F test, p value**
Age				
< 40 years	1.80 ± 1.30	F = 3.121 p = 0.018	2.80 ± 2.68	F = 7.642 p < 0.001
40 – 49 years	2.11 ± 1.24		3.63 ± 2.41	
50 – 59 years	2.38 ± 1.08		4.86 ± 1.85	
60 – 69 years	2.88 ± 1.29		5.94 ± 1.88	
≥ 70 years	3.36 ± 1.50		6.55 ± 2.25	
Gender				
Male	2.61 ± 1.29	F = 0.086 p = 0.769	5.13 ± 2.29	F = 0.418 p = 0.519
Female	2.26 ± 1.35		5.46 ± 2.16	
Disease duration				
1 – 4 years	1.44 ± 0.81	F = 23.89 p < 0.001	2.25 ± 1.81	F = 37.55 p < 0.001
5 – 8 years	2.18 ± 0.95		4.43 ± 1.53	
9 – 12 years	2.31 ± 1.12		5.09 ± 1.59	
> 12 years	3.69 ± 1.08		7.08 ± 1.61	
Disease severity				
GOLD Stage 1 (Mild)	1.00 ± 0.00	F = 471.17 p < 0.001	2.08 ± 0.89	F = 380.79 p < 0.001
GOLD Stage 2 (Moderate)	2.36 ± 0.48		5.04 ± 0.79	
GOLD Stage 3 (Severe)	4.36 ± 0.89		7.97 ± 0.81	
Fatigue frequency				
Sometimes	1.26 ± 0.44	F = 340.04 p < 0.001	2.57 ± 1.15	F = 302.24 p < 0.001
Often	2.41 ± 0.49		5.22 ± 0.69	
Always	4.32 ± 0.54		7.91 ± 0.87	
Medication				
Irregular	4.10 ± 0.70	F = 283.65 p < 0.001	7.59 ± 1.07	F = 182.30 p < 0.001
Regular	1.81 ± 0.69		3.89 ± 1.56	
GOLD: Global Initiative for Chronic Obstructive Lung Disease MRC: Medical Research Council Scale. BFI: Brief Fatigue Inventory Scale F test : One way analysis of variance (ANOVA), p < 0.05 was considered statistically significant.				

DISCUSSION

In our study, among 115 participants with COPD, dyspnoea was significantly associated with disease severity. Dyspnoea is predominantly related to a reduction in vital capacity of lungs. Various studies have reported dyspnoea as the most common symptom in COPD patients (Gift and Shepard, 1999; Rabe *et al.*, 2006; Blinderman *et al.*, 2009; Wong *et al.*, 2010). Skumlien *et al.*, (2006) reported that 82% of the women and 70% of the men suffering from COPD had dyspnoea complaint.

Fatigue is a disruptive symptom that inhibits normal functional performance of COPD patients in daily activities (Theander and Unosson, 2004). There is growing interest and attention on the substantial impact of fatigue on quality of life of COPD patients (Guyatt *et al.*, 1987; Baghai–Ravary *et al.*, 2009; Baltzan *et al.*, 2011). Studies have reported that fatigue was significantly higher in COPD patients than in healthy elderly people (Baghai–Ravary *et al.*, 2009; Theander K and Unosson, 2004). Wong *et al.*, (2010) found that fatigue was experienced by almost all participants with COPD. Kapella *et al.*, (2006) reported that fatigue complaint was significantly correlated with age.

In our study fatigue was associated with disease severity. Fatigue was more in women as compared to men. Similar finding was reported by Janaudis-Ferreira *et al.*, (2006), who found more pronounced thigh muscle dysfunction, including muscle fatigue, among women than among men with COPD. A study reported that fatigue was associated with exercise capacity and severity of the disease in both men and women (Tödt *et al.*, 2014). However, another

study found lack of difference between men and women in the presence of fatigue as well as in the frequency, duration, and severity of fatigue among COPD patients (Theander and Unosson, 2011). Gift and Shepard (1999) reported that men and women did not differ in their level of fatigue. Kapella *et al.*, (2006), reported that there were small differences between women and men; however, these differences were not statistically significant. Baghai-Ravary *et al.*, (2009) and Wong *et al.*, (2010) reported that they did not find a correlation between severity of COPD and fatigue.

Breslin *et al.*, (1998) reported that physical dimensions of fatigue correlated with an increase in the severity of pulmonary impairment and reduction in exercise tolerance. This provides some explanation as to how therapies that improve exercise tolerance can have an impact on fatigue in COPD (Lacasse *et al.*, 2007). In a study it was found that fatigue differs according to GOLD staging, however this was relevant only for physical fatigue and reduced activity (Lewko *et al.*, 2009).

Fatigue may be affected by dyspnoea and is frequently told by the patients (Janson-Bjerklie *et al.*, 1986; Reishtein, 2005). Fatigue and dyspnoea are the most prominent disabling symptoms in COPD (Man *et al.*, 2003; Kapella *et al.*, 2006). Fatigue and dyspnoea are both subjective symptoms of COPD and some of the pathophysiological-mechanisms of fatigue may be common for those of dyspnoea. Therefore, this may explain the close association between these symptoms. Previous studies have also showed close associations between dyspnoea and fatigue (Kapella *et al*. 2006; Baghai-Ravary *et al*., 2009). Reishtein (2005) found out that mean scores for dyspnoea and fatigue were moderately high in patients with COPD.

In our study a significant positive correlation between fatigue and dyspnoea was found, as dyspnoea scores increased so did fatigue scores. Kapella *et al.*, (2006) also reported significant positive correlation between dyspnoea and fatigue scores among the COPD patients. In this study we found significant negative correlations between the measured FEV_1 values of the patients and dyspnoea scores and fatigue scores. Breslin *et al.*, (1998) found that there was a significant negative correlation between fatigue and predicted FEV_1 values. Reishtein (2005) reported that there was moderately negative correlation between dyspnoea and fatigue and functional lung capacity among the COPD patients. Baghai-Ravary *et al.*, (2009) found that fatigue was associated with reduction in FEV_1.

CONCLUSION AND RECOMMENDATIONS

The present study was conducted to assess the symptoms of dyspnoea and fatigue and to find out their correlation in COPD patients. Both dyspnoea and fatigue were significantly associated with severity of disease. Also there was a positive correlation of dyspnoea and fatigue experience by the COPD patients. Therefore, appropriate interventions should be provided considering the correlation between dyspnoea and fatigue in COPD Patients. Hence, it is recommended that clinicians and nurses taking care of COPD patients should assess dyspnoea and fatigue severity among patients using appropriate scales. Health care professionals should consider the associations of dyspnoea and fatigue for planning and implementing the treatment and follow-up strategies.

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