

Comparison of spirometry data and symptoms between male and female smokers with chronic obstructive pulmonary disease

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ABSTRACT

BACKGROUND & OBJECTIVE: Chronic Obstructive Pulmonary Disease (COPD) is a heterogeneous disease, showing the exaggerated response of airways to any injurious stimulus. It is no longer considered as the disease of men as it is becoming increasingly prevalent in females. Evidence suggests that gender affects the clinical presentation of the disease. The objectives of the study is to compare spirometry data between male and female smokers with COPD and to study the association of cough, sputum, and dyspnea with gender in smokers with COPD.

METHODOLOGY: This descriptive study was conducted at the University of Health Sciences Lahore. The study sample included 41 COPD patients with a history of smoking. After taking written informed consent, patients were recruited from the outpatient departments of tertiary care hospitals of Lahore by convenience sampling technique. A complete history was taken, and spirometry was done on each subject. The subjects were divided into male and female groups, followed by the comparison of Spirometry data between the groups and association of symptoms with gender using appropriate statistical techniques.

RESULTS: The results of this study demonstrated females were significantly younger and exhibited a greater decline of lung functions with similar pack-years history compared to male smokers with COPD. The most common presentation of females was breathlessness compared to male patients, who had sputum production as the most common presentation.

CONCLUSION: Significant differences were seen in spirometry and clinical presentation of the disease in male and female COPD groups, showing the onset and symptomology of the disease.

KEYWORDS: COPD, Smokers, Spirometry.

INTRODUCTION

Chronic Obstructive Pulmonary Disease (COPD) shows post-bronchodilator irreversible airflow limitation^[1]. It is a heterogeneous disease showing variation in terms of clinical and radiological presentation in patients with similar airflow limitations^[2]. COPD is considered one of the leading causes of mortality worldwide, with increasing prevalence and mortality in the female population. This shift in the gender distribution of the disease is due to increasing trends of cigarette smoking in females along with other risk factors

such as biomass exposure and socioeconomic status^[3,4]. Females smokers show greater deterioration of lung functions, severe and early onset of COPD as compared to the male smokers with similar smoking history^[5,6]. Moreover, evidence also suggests sex dimorphism and a difference in the clinical presentation of disease in male and female COPD patients, which can also influence the response to treatment^[7,8]. The objectives of this study are to compare the spirometry data between male and female smokers with COPD and to study the association of cough, sputum and dyspnea with gender in smokers with COPD.

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METHODOLOGY

This comparative study was conducted and approved by the ethical committee of the University of Health Sciences Lahore in 2015. A sample size of 41 subjects was calculated and the subjects were recruited by convenience sampling from the outpatient department of tertiary care hospitals of Lahore. The subjects were divided into two groups, group A: Female COPD=18 subjects and group B: Male COPD=23 subjects. A complete history of the patients, including age, sex, socioeconomic status and medical history, was taken. All the study subjects were thoroughly assessed for their chief presenting complaints i.e., cough, sputum production and dyspnea and observations were recorded on the specifically predesigned performa for evaluation of these symptoms taken and recorded in the performa. All the subjects were middle to old age (40-80years), stable COPD patients diagnosed according to the GOLD criteria ($FEV_1/FVC < 70\%$)^[9]. The subjects had similar ethnicity, i.e., Punjabi, Pakistani. Subjects diagnosed with asthma, tuberculosis, or exacerbation in the previous four weeks were excluded from the study. Spirometry on the subjects was performed using an electric spirometer (Spirolab 2, SDI Diagnostics, Inc., Bristol, MA 02375, USA), after ten minutes of giving the bronchodilator (200µg salbutamol). For cigarette smokers, pack-years were calculated using the following formula:

Pack years= (No of cigarette smoking per day/20) x No of smoking years.

For subjects with a history of huqqa smoking, pack-years were calculated by the same formula except that first the number of hours of smoking per day was converted to the number of cigarette smoking per day i.e., 20 min session of huqqa smoking was equal to 25 cigarettes and 45 mins huqqa session was equal to 60 cigarettes^[10].

STATISTICAL ANALYSIS:

The complete data of this study was entered and analyzed by using IBM-SPSS version 20. The normality of quantitative data was assessed by the Shapiro-Wilk test. Mann-Whitney-U Test / students t- test was used for the comparison of demographic data (age, weight, height), pulmonary function tests, and pack-years between male and female groups. Qualitative variables like cough, sputum, and dyspnea were calculated in percentages and frequencies. A Chi-square test was applied to study the association of qualitative data with gender.

RESULTS

The female smokers with COPD were younger and showed greater deterioration of lung functions (FEV_1 , FVC, PEF, PEF50 & PEF25) as compared to male smokers with COPD (p -value<0.05). Comparison of qualitative data e.g., cough, sputum production and dyspnea, were also done between the two groups. The data showed that the complain of dyspnea was more common in females (p -value= 0.00), while sputum production was more common in the male smokers having COPD (p -value= 0.04).

DISCUSSION

With the growing burden of COPD among the female population, it is very important to understand the gender related differences on spirometry and the clinical presentation of the disease. This study documents these differences in our local population. The results showed that females were younger compared to the male COPD group. The majority of the female recruited in the study were Huqqa smokers, and by conversion of huqqa smoking to pack-years, the parameter of pack-years became non-normally distributed in the female group. No significant difference of Median IQR of pack-years was seen between male and female groups. This showed that the two groups were similar on the basis of smoking status, emphasizing that gender may be an important parameter in COPD assessment and treatment. Regarding BMI, there was no significant difference in the male and female COPD groups. On spirometry, females presented more decline of lung functions compared to the male COPD group. The values of FEV_1 , FVC, PEF, PEF50 and PEF25 were significantly less in the female COPD group, whereas no significant difference was seen in the values of PEF75 and FEV_1/FVC ratio. While comparing the qualitative data, results showed that females presented more with the complaint of breathlessness (dyspnea) compared to the male COPD group ($p= 0.00^*$), whereas male COPD patients presented more with the complaint of sputum production ($p= 0.04^*$). Similar results were shown by Varela et al., in a PLATINO study on Spanish population with a sample size of 5314 subjects^[11]. The females in COPD and non-COPD groups showed more dyspnea and physical limitations compared to male groups (non-COPD: 54% versus 35%, COPD: 63% versus 44%). The reason for these differences was not very well understood, but it was suggested that it might be associated with hormonal effects on airways, or smaller size of female airways compared to males. In another study conducted on Spanish population by Ancochea et al., also concluded that females were younger, smoked less and on spirometry exhibited more decline of lung functions.

Regarding the respiratory symptoms, fewer women reported the symptoms of cough, sputum and wheeze and more reported the symptoms of dyspnea ($p<0.05$)^[12]. Watson et al in their study conducted on 3265 subjects, also presented similar results, concluding that female subjects were younger, with less pack year history compared to all male subjects^[13]. The female patients with COPD came more with the complaint of severe dyspnea (29% women and 24% male, $p<0.05$), but unlike our study there was no significant difference was seen in the presentation of other symptoms like cough and sputum production among the male and female COPD patients. However, a study conducted in China by Lu.M et al. showed different results. They confirmed that male gender, current smoking history or exposure to biomass fuel and residence in rural areas are the risk factors of severe dyspnea and chronic bronchitis^[14]. A number of studies have tried to explain this difference in expression among male and female COPD patients. Mund et al., in their study, showed that with age, the BAL fluid taken

from the lower airways of the females showed variation in the composition of the lymphocyte subgroups^[15]. This property was not seen in the males. So, it was proposed that this change might be the cause of hyper responsive airways of the women, causing greater susceptibility and deterioration of the lungs to the cigarette smoke exposure. Blecklake et al. in their study documented biological sociocultural and environmental factors affecting the presentation of COPD in

male and female patients^[16]. They reported that sociocultural factors play an important role regarding the gender related difference in perception and reporting of COPD symptoms. For female COPD patients, shortness of breath was more culturally acceptable than the males, similarly for male COPD patients, sputum production and sleep disordered breathing was more socially and culturally acceptable.

Table-I: Comparison of demographic and spirometry parameters between Group-A (Female smokers with COPD) and Group-B (Male smokers with COPD).

Parameters		Group-A N=18	Group-B N= 23	p-value
Age (years)	Mean \pm SD	53.88 \pm 10.8	63.34 \pm 11.76	0.01 ^{a*}
	Median (IQR)	53.00(45.00-60.75)	65.00(55.00-72.00)	
Weight (Kg)	Mean \pm SD	56.05 \pm 11.64	61.39 \pm 9.82	0.26 ^b
	Median IQR	62.50(44.50-65.00)	60.00(54.00-66.00)	
Height (cm)	Mean \pm SD	157.44 \pm 5.14	168.30 \pm 7.41	0.00 ^{a*}
	Median IQR	157.00 (153-162)	169.00(165-174)	
BMI (Kg/m2)	Mean \pm SD	22.67 \pm 5.00	21.63 \pm 2.92	0.71 ^b
	Median IQR	24.01(17.13-26.29)	20.42(20.04-23.38)	
Smoking in pack years	Mean \pm SD	145.62 \pm 226.04	60.33 \pm 103.79	0.63 ^b
	Median IQR	42.5(11.87-187.50)	34.00(19.50-62.50)	
FEV1 (Liters)	Mean \pm SD	0.94 \pm 0.28	1.59 \pm 0.49	0.00 ^{a*}
	Median IQR	0.93(0.77-1.14)	1.63(1.21-1.93)	
FVC (Liters)	Mean \pm SD	1.65 \pm 0.52	2.66 \pm 0.66	0.00 ^{a*}
	Median IQR	1.70(1.22-2.07)	2.70(2.05-3.21)	
FEV1/FVC Ratio	Mean \pm SD	57.54 \pm 8.94	59.19 \pm 7.91	0.53 ^b
	Median IQR	60.20(49.32-64.62)	60.80(56.30-66.30)	
PEF (Liters)	Mean \pm SD	1.33 \pm 0.44	2.90 \pm 1.24	0.00 ^{a*}
	Median IQR	1.38(1.06-1.59)	2.63(2.01-3.71)	
PEF75 (Liters)	Mean \pm SD	0.43 \pm 0.16	0.45 \pm 0.18	0.74 ^a
	Median IQR	0.39(0.30-0.59)	0.40(0.30-0.60)	
PEF50 (Liters)	Mean \pm SD	0.74 \pm 0.30	1.15 \pm 0.41	0.01 ^{a*}
	Median IQR	0.69(0.51-0.92)	1.26(0.75-1.43)	
PEF25 (Liters)	Mean \pm SD	1.01 \pm 0.39	2.06 \pm 0.91	0.00 ^{a*}
	Median IQR	0.99(0.79-1.25)	2.16(1.35-2.38)	

^{*}p-value \leq 0.05 is considered statistically significant

^b p-value is generated by Mann-Whitney U Test

CONCLUSION

This study shows that with similar exposure of cigarette/huqqa smoke females show greater deterioration of lung functions. Our study has also highlighted the difference in the manifestation of the disease in male and female smokers with COPD. Relative to male patients, females presented more with breathlessness and males presented more with the complaint of sputum production. Our results verify that gender has a very important role in the heterogenic nature and presentation of COPD.

LIMITATIONS & FUTURE RECOMMENDATIONS:

The study has some limitations:

1. The sample size of 41 subjects is not large enough to substantiate the results for whole Pakistani population.
2. There is a dearth of female patients diagnosed with COPD and with predominant smoking history.

^a p-value is generated by Independent Sample 't'-Test

Further studies with a much larger sample size are required to completely comprehend the role of gender in the heterogenicity of this disease in our population.

Table-II: Association of gender with presenting complain of smokers having COPD. Values are given in frequencies and percentages.

Variables		Group-A Female COPD (n=18)	Group-B Male COPD (n=23)	p-value
Cough	Yes	12(66.7%)	15(65.2%)	0.92
	No	6(33.3%)	8(38.8%)	
Spectrum	Yes	6(33.3%)	15(65.2%)	0.04 [*]
	No	12(66.7%)	8(34.8%)	
Dyspnea	Yes	18(100%)	8(34.8%)	0.00 [*]
	No	-	15(65.2%)	

^{*}p< 0.05 was considered statistically significant.

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Authors Contribution:

Rida Ajmal Khan: Made substantial contributions to the conception and design of the study and wrote the original draft of the manuscript.

Hafiz Muhammad Waseem: Data collection and contribution towards data analysis.

Sadia Nazir: Performed data analysis and revision of initial manuscript.

Shumaila Dogar: Designed the analysis and corrections.

Mohsin Ali Cheema: Conceived and designed the analysis. Proof reading of the manuscript.

Khalid Parvez Lone: Overall supervisor of the project.

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