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Short Communication

Observational study to characterize socio-demographic data and clinical presentation in patients with acute exacerbation of chronic obstructive pulmonary disease

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ABSTRACT

Chronic obstructive pulmonary disease (COPD) is a common inflammatory disease with high global morbidity and mortality. It is characterized by poorly reversible airway obstruction. The major risk factor associated is smoke exposure which leads to chronic respiratory failure. Various chronic medical conditions commonly coexisting with COPD include coronary artery disease, diabetes mellitus, osteoporosis and muscle weakness. Co-morbid conditions should be managed appropriately along with treatment of COPD. Present observational study was undertaken to characterize socio-demographic data, clinical presentation and possible co-morbidities (cardiac, diabetes mellitus, and hypertension) in COPD patients. The observed data was analyzed to study prevalence of all parameters gender wise and relation with diagnostic technique i.e. chest X-ray and electrocardiography (ECG) for cardiac screening. Therefore, in the following study, elderly and male patients were prominently affected by COPD with common symptoms of cough, breathlessness, expectoration, fever and chest pain. Diabetes is one of the co-morbidities observed in this set of patients. Hence, random blood sugar (RBS) and glycated hemoglobin (HbA1c) parameters were deranged in this cohort of patients. Additionally, ECG was also observed to be abnormal in few patients. Conclusively, this study highlighted various demographic features, clinical symptoms and comorbidities responsible for health burden of COPD patients.

Keywords: Respiratory, Comorbidities, Acute exacerbation of chronic obstructive pulmonary disease

INTRODUCTION

COPD is a common preventable and treatable disease. It is associated with high global morbidity and mortality, causing 3.23 million deaths in 2019 worldwide (WHO 2021). COPD is characterized by abnormalities in the small airways of lungs, leading to limited airflow, resulting in shortness of breath after physical exertion. Multiple processes are involved which are responsible for airflow limitation which leads to destruction of the part of lung, increased mucus secretion and inflammation or swelling of airway lining.[1] Most commonly it happens in response to long-term exposure to noxious particles or gases (e.g. air pollution or smoking, occupational dust, fumes or chemicals).[2] In the majority of cases, acute exacerbation of COPD (AECOPD) is triggered by respiratory tract infections. Prevalence of COPD varies according to the country, age and sex.[3] Geographic distribution of COPD prevalence in the world was studied through online data base search (2019), in which a total of 147 surveys were included with 64 from Europe, 10 from Africa, 17 from America, 53 from Asia and 3 from Oceania. The estimated mean COPD prevalence worldwide was 13.1% (95 CI). The details distribution was as follows: 12.4% in Europe, 13.9% in Africa, 13.2% America, 13.5% Asia and 11.6% Oceania.[4] According to WHO, 80% of deaths out of 3.23 million deaths worldwide due to COPD in 2019 were in low and middle-income countries (LMICs). In a meta-analysis conducted in 2021, it was reported that prevalence of COPD among population aged 30 and above in India

was 7%.[5] Additionally, according CDC data (2019) prevalence of COPD for adults aged 18 and above in USA varied from 4% to 10.7% depending on the state. Recently (2021), a review reported gender-wise prevalence in five studies. There, it showed prevalence of COPD among males and females as 11.4% and 7.4% respectively.[6]

Most common co-morbidities associated with patients of COPD include cardiac disease, chronic kidney disease, hypertension and diabetes mellitus. A study suggested that mortality rate was significantly higher in patients with acute exacerbation of COPD having poor glycemic control.[7] A study reported COPD increased the risk of mortality among patients with advanced chronic kidney disease.[8] One of the earlier studies demonstrated reduced lung function in COPD as a risk factor for development of diabetes. A recent study reported that COPD patients are more prone to have non-alcoholic fatty liver disease (NAFLD).[9] These are associated with high mortality, poly-pharmacy and increased hospital admissions. In 2017, a study evaluated the prevalence of 38 co-morbidities in the Scottish COPD population. A previous study had established that COPD is associated with hypertension and coronary heart disease (CHD). It has been also well documented that individuals with COPD compared with people without COPD were more prone to have heart failure. A study performed by Rutten et al identified prevalence of 20.5% for heart failure in COPD patients.[10]

In the present observational study, authors had characterized socio- demographic data with clinical presentation in patients with acute exacerbation of COPD.

METHODS

COPD patients in acute exacerbation who presented to the pulmonary outpatient department (OPD) of the institute from July 2018 to June 2020 were enrolled in the study. Total 100 COPD patients within age group of 40-70 years having no other co-morbidity were included in the present study. These patients were diagnosed as AECOPD according to Anthonisen criteria. The data on socio-economic status was collected based on a questionnaire. Baseline routine investigations were carried out in these patients. Moreover, SpO_2 levels were also determined for these COPD patients. This study was approved by the ethical board of the institute.

RESULTS

Baseline demographic characteristics of COPD patients

A total of 100 COPD patients in acute exacerbation were recruited in the present study with their baseline characteristics discussed in the following sections. The mean age was 57.8±7.6 years with a greater number of male COPD patients (n=73, 58.2±7.4 years). 32% of the patients belonged to the 61-65 years age group which is the largest group in this study and the least number of patients (6%) were in the 40-45 years age group. 72% of total patients in the study belonged to lower socio-economic status contributing to the highest number of population whereas only 4% of patients came from upper middle status. None of the patient belonged to upper socio-economic status. The detailed baseline features of COPD patients have been mentioned in Table 1. These COPD patients gave no history of diabetes, hypertension or other co-morbidities, or taken any TB treatment in past. None of the patient had family history of COPD.

Clinical data

All the patients (100) had cough, with 99% having expectoration and breathlessness. Therefore, cough (25.6%), expectoration (25.4%) and breathlessness (25.4%) contributed almost equally to COPD patient's health condition. Chest pain and fever persisted in 7.2% and 15.1% of the total population respectively. In 7.2% of total population with chest pain, there were 23 males and 5 females. Similarly, in 15.1% of total population suffering from fever, there were 36 males and 23 females. Pyogenic culture was positive in sputum of 42/100 patients. Also, out of 42 positive cultures, 26 patients were male and 16 females.

Hypoxemia was present in 62% of COPD patients in the present study. One striking observation was that a higher number of females (54%) had hypoxemia as compared to male COPD patients. 98% of COPD patients with low levels of SpO_2 had signs of breathlessness whereas 62% had cough and expectoration. 27% of COPD patients with low SpO_2 levels were observed to have chest pain. Fever was present in 58% of COPD patients with hypoxemia.

HbA1c levels of these patients showed that 68% and 30% of total population were diabetic and pre-diabetic respectively, only 2% had normal HbA1c levels. Random blood glucose (RBG) levels revealed that nearly 83% of patients with aberrant chest x-ray were in hyperglycemic state. 75% with irregular ECG finding also had high RBG levels. Only 3% of total COPD patients had abnormal liver function test (LFT) and kidney function test (KFT) parameters. Abnormal serum electrolytes were observed only in 8% of total population. 100% of patients with abnormal LFT were males, whereas abnormal KFT parameters were present in 67% males and 33% females. Similarly, in 8% of total patients with abnormal serum electrolytes, a greater number of males (75%) than females (25%) were observed.

ECG and chest X-ray were abnormal in 18% and 87% of the patients respectively with 77% being male. COPD patients with abnormal chest X-ray presented with various common respiratory and other symptoms. The symptoms such as cough, breathlessness, expectoration, fever and chest pain contributed 26%, 25.7%, 25.7%,15.2% and 7.5% respectively out of all symptoms suffered by COPD patients. Considering 87% of COPD patients with abnormal chest X-ray, symptoms under evaluation i.e. cough, breathlessness, expectoration, fever and chest pain

were observed in 100%, 98.8%, 98.8%, 58.6% and 28.7% respectively of this above-mentioned population. Thus, respiratory symptoms are more commonly seen in these individuals. Approximately 56% out of total patients with abnormal chest radiographs represented increased bronchovascular markings in bilateral region, 42% had hyperinflated lung with flattened diaphragm. Additionally, bullae were present in very less number (5%) of COPD patients in the present study.

In 18% of COPD patients with abnormal ECG, symptoms such as cough, breathlessness and expectoration contributed equally, 24.7% each out of all symptoms assessed in these individuals.

Besides this, fever and chest pain accounted for 15.1% and 11% only. Interestingly, as observed in patients with abnormal chest X-ray, symptoms specifically cough, breathlessness and expectoration were more commonly present in 100% patients with abnormal ECG, whereas 61.1% and 44.4% of this population had fever and chest pain respectively. The details of the clinical variables have been tabulated in Table 1.

Table 1: Baseline and clinical parameters of COPD patients.

Demographic features	**Age (in years)**		
Total (n=100)	57.8±7.6		
Male (n=73)	58.2±7.4		
Female (n=27)	56.6±8.2		
Age groups			
40-45	4		
45-50	13		
50-55	22		
55-60	7		
60-65	28		
65-70	26		
Socio-economic status			
Lower	7		
Upper lower	72		
Lower middle	17		
Upper middle	4		
Upper	0		
Duration of COPD (onset) (in years)			
1	**7**		
2	13		
3	20		
4	27		
5	33		
Clinical parameters	Total (N)	Male (N)	Female (N)
Symptoms			
Cough	100	73	27
Breathlessness	99	72	27
Expectoration	99	72	27
Fever	59	36	23
Chest pain	28	23	5
Biochemical parameters			
HbA1c	98	71	27
Pre-diabetic	30		
Diabetic	68		
RBS	80	58	22
Abnormal ECG and chest X-ray			
ECG	18	14	4
Chest X-ray	87	64	23
Chest X-ray feature			
Normal	13		
Bilateral increased bronchovascular markings	49		
Hyperinflated lung flattened diaphragm	37		

Continued.

Demographic features	Age (in years)
Bullae present	5
Vertical cardiac silhouette	0

DISCUSSION

This was a prospective observational study which demonstrated demographic, clinical and radiological findings of COPD patients. COPD is an internationally important leading cause of morbidity and mortality. It has been considered as a disease affecting elderly people predominantly in smokers. In the current study, we also observed the maximum number of patients in the age group of 61-65 years. According to a study, the prevalence of COPD was less among the people under the age of 40 years. There was an incremental rise in the prevalence with increasing age in the proportion of COPD patients, and reaching a peak in those aged 60-69 years followed by decrease in patients older than 70 years.[11] The present study showed males (73%) being predominantly affected by COPD reflecting prevalence of smoking among males. Nowadays, COPD is more commonly seen in females due to progressive increase in smoke exposure. Younger population and women COPD individuals are sometimes under diagnosed or misdiagnosed. A range of symptoms in COPD patients including dyspnoea, cough, sputum production; with less common being wheezing, chest tightness and congestion impact the daily burden of COPD individuals. However, varied frequencies of these symptoms are reported depending on the patient population and severity of disease.[12] Cough has been reported as the most common symptom in patients with mild COPD. Similarly, in our study we observed cough in all 100 patients. Other symptoms being studied and reported maximally in present study were expectoration, breathlessness followed by chest pain and fever. The risk of alveolar hypoxia and consequent hypoxemia increases as the disease progresses and pulmonary function deteriorates.[13] The present study also reported hypoxemia in 62% of total population. Chronic hypoxemia contributes to pulmonary hypertension, secondary polycythemia, skeletal muscle dysfunction, and systemic inflammation leading to adverse sequelae of COPD.[13] A distinctive observation of this study was a higher number of females having hypoxemia as compared to males. Women have smaller lung, airways will small diameter and decreased capacity for lung diffusion compared to age and height matched men.[14] Also, exercise induced arterial hypoxemia occur readily in women than men.[15] In a previous study, in which 2500 COPD individuals were recruited in Denver, logistics regression model showed female gender to be independent risk factor for hypoxemia.[16] Chest X-ray is a standard part of clinical evaluation of subjects with COPD. However, abnormal chest x-rays were obtained in high number of patients (87/100) in the present study. As patients with COPD are at increased risk of cardiovascular disease, ECG was included in workup of COPD patients. In a previous study, rightward deviation of the P wave and QRS axis was observed.[17] Consistently, present study also demonstrated P pulmonale deviation in 18% of COPD patients. Furthermore, COPD patients have multiple comorbidities which may affect liver and kidney function. Previous reports have established elevated levels of their respective parameters, with NAFLD and CKD prominently coexisting in COPD individuals.[8,9] But in the present study, a very smaller number of patients had abnormal serum liver, kidney functional parameters and electrolytes. COPD and diabetes are considered a threat for each other. Uncontrolled diabetes deteriorates prognosis of patients with AECOPD. A previous study depicted the significant effect of HbA1c and RBS on prognosis of AECOPD patients.[18] In line with these results, RBS levels of COPD patients were abnormally high in a large proportion of patients. These patients also had abnormal chest X-ray and ECG characteristics.

CONCLUSION

In conclusion, important findings of our present study, referring to the COPD population suggested that there are significantly higher numbers of elderly and male COPD patients. These patients had abnormal lung characteristics as depicted by chest radiographs. Co-morbidities are commonly present in COPD patients increasing the overall burden on health. Diabetes is one such disease which must be considered seriously for better COPD patient survival. Present study is just a preliminary study to outline COPD patient characteristics. Further extended analysis is required for better management of COPD patient treatment.

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