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Clinical Profile of Acute Exacerbation of Chronic Obstructive Pulmonary Disease Patients Admitted in Tertiary Care Hospital

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Key words:
Clinical Profile, Exacerbation, Obstructive Pulmonary Disease

Abstract:

Background: *COPD is one of the most widespread noncommunicable diseases, and its incidence is on the rise in developing countries. Acute COPD exacerbation is linked to a higher financial burden on the health system, as well as a negative impact on patients' health in terms of lost working days, functional capacity, and mortality. COPD exacerbation is characterized by a worsening of symptoms such as cough and dyspnea, as well as a considerable risk of type-II respiratory failure. An understanding of the symptoms and signs, as well as the causes linked to acute COPD exacerbation in our population, is thought to aid in the prevention of such exacerbations, reducing the burden on patients and the community.*

Aim: *This study is meant to bring forth the clinical profile and variables related with acute exacerbation of COPD among our community, taking into account the specific symptoms preceding an exacerbation of COPD and the variety of factors associated with it in different parts of the world. This study characterizes the clinical signs and symptoms of COPD acute exacerbations, as well as investigates the involvement of a respiratory tract infection in COPD exacerbation establishing a relationship between smoking and COPD exacerbation.*

Method: *This is a hospital-based cross-sectional observational study. The study was conducted at the Dhaka Medical College Hospital's Department of Medicine (DMCH). A method of purposive sampling was applied. The study took place from November 2012 until June 2013. The sample size computed for this study is 75.*

Result: *Age above 7th decade increases mortality risk by 2.32 times. Meanwhile, comorbidity, low BMI (<18.5 kg/m2), smoking and frequent acute exacerbation increases risk by 1.29 times, 1.16 times, 0.03 times and by 2.07 times respectively in patients having COPD.*

Conclusion: *Chronic obstructive pulmonary disease (COPD) is more frequent in the 6th decade of life and is male predominant. Recovery period has been found longer in the presence of dyspnea or symptoms of a common cold at exacerbations onset, higher PaCO2 and lower pH has been found in the patients admitted in ICU. Low BMI, RTI, Smoking and Comorbidity are more frequent in patients with chronic obstructive pulmonary disease (COPD).*

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Introduction:

COPD is a significant global public health issue and is the fourth-leading cause of mortality in the United States (Bethesda, 2006), and it is expected to be the third-leading cause of death globally by 2020. (Murray and Lopez, 1996). While COPD is a chronic, slowly progressing condition, many people have acute worsening of symptoms or exacerbations. COPD patients are predicted to have 1–4 exacerbations each year (Miratvilles et al. 1999). Exacerbation events contribute for nearly 60% of the disease's worldwide expense, with severe acute exacerbations demanding hospitalization (Hilleman et al. 2000). During an exacerbation, patients may suffer a wide range of symptoms. According to the National Guideline for Asthma, Bronchiolitis, and COPD in Bangladesh (3rd Edition 2005), the symptoms of an acute exacerbation of COPD are classified as Type-I (mild exacerbation), Type-II (moderate exacerbation), and Type-III (severe exacerbation). Dyspnea and cough, with or without sputum production, chest congestion, chest pain and sleep disruption, feelings of weakness, weariness, anxiety, or concern are all frequent symptoms that intensify during an exacerbation (Global Initiative for Chronic Obstructive Lung Disease, 2011). While discussing factors associated with acute exacerbation of COPD, infection is a substantial contributor. In 50%–70% cases of acute exacerbations of COPD, the pathophysiological basis has been found to be infectious (Schäfer, Ewig, 2000 and Ball, 1995). The most common bacteria recovered in all series is *Haemophilus influenzae*, followed by *Streptococcus pneumoniae, Moraxella catarrhalis*, and *Pseudomonas aeruginosa* (Ball, 1995 and Miratvilles et al. 1999). In recent years, there have been some findings on the role of *Chlamydophila pneumoniae* and *Mycoplasma pneumoniae* in acute exacerbations of COPD (Mogulkoc et al. 1999 and Lieberman et al. 2001). Viruses, notably influenza/Para influenza viruses and adenoviruses, may contribute for 15–25 % of all infective exacerbations. In new findings, rhinovirus, respiratory syncytial virus and human metapneumovirus was linked to moderate to severe COPD exacerbations (Seemungal, et al. 2000), (Falsey et al. 2005 and Hamelin et al. 2005). Again, smoking has long been recognized as a risk factor for the development of COPD, severe exacerbations, delayed recovery, and longer hospitalization. This might be aggravated by a number of reasons, including bacterial infections, immune-mediated reactions, and systemic inflammation (Simon Charles Bourne et al, 2008). According to the Centers for Disease Control and Prevention (CDC), the most significant factor in the successful treatment and prevention of exacerbations is the avoidance of smoking and second-hand smoke, traffic congestion, industrial pollutants, and occupational dust and chemicals (Sunyer et al. 1996). It has been established that 10% of exacerbations are caused by environmental pollution, depending on the season and geographical location(Connors et al. 1996). While considering risk factors, low BMI and weight loss are also linked to an acute exacerbation of COPD (Pouw et al. 2000 and Garcia-Aymerich et al. 2001). Weight loss in COPD patients is thought to follow a stepwise pattern connected to acute illness exacerbations (Wilson et al. 1985). Meanwhile, comorbid disorders such as right heart strain on ECG, coronary artery disease, left ventricular failure, and diabetes mellitus have been identified as substantial risk factors for COPD exacerbation (Lau et al. 2001).

Materials and Methods:

This cross sectional hospital based observational study included all patients admitted to the Medicine ward at DMCH who had symptoms consistent with an acute exacerbation of COPD, from a period of November, 2012 to June, 2013 (8 months). Of the 103 cases in the initial screening, 10 were excluded due to severe acute asthma, 4 were excluded due to congestive heart failure, 1 was excluded due to pregnancy, and 5 were excluded because they had a smoking history of less than 10 pack years, and 3 men were excluded because they were under 40 years old, and 5 were excluded due to loss to follow up. Finally, the study included a total of 75 participants. The recruited patients were thoroughly examined, and clinical signs and their symptoms of exacerbations were classified as mild, moderate, or severe according

to national guidelines. During their hospital stay, all patients were given a structured questionnaire when they were clinically stable. Baseline data on demographics, respiratory illness history, frequency of hospital admissions for COPD in the previous year, current respiratory medicines, and co morbidities were carefully sought. The frequency of symptoms between COPD exacerbations was divided into two categories: frequent and infrequent (Donaldson et al. 2002). The MRC scale was used to assess dyspnea. At the time of admission, 5 to 10 ml of blood was collected from the patient and submitted for hematological (Complete Blood Count) investigation in the DMCH's department of hematology by using the Sysmex 5000 system. An AGFA CR 85 X-ray equipment had been used to do a chest X-ray. Other diagnostic examinations linked to the co-morbid conditions and for monitoring treatment were carried out when needed. After initial stabilization, all patients had a 12-lead electrocardiogram (ECG) done within 24 hours of admission. In addition, if respiratory failure is suspected, Arterial Blood Gas, Serum Electrolytes, and Echocardiography were performed. Cor-pulmonale was diagnosed if the ECG (p-pulmonale; right axis deviation; right ventricular hypertrophy) and echocardiographic evidence of right ventricular hypertrophy/ dilatation both were present. Spirometry was performed in a small number of instances in the department of physiology. Sputum cultures for pyogenic organisms and sensitivity were obtained in individuals with probable infective etiology. BMI was calculated and smoking status was reported as non-smoker, ex-smoker (left smoking for more than ten years and quit within ten years), or current smoker. The number of pack years smoked was also taken under consideration. Oxygen was supplied using a normal dual-prong nasal cannula or face mask. Salbutamol (5 mg every 15 minutes to every 8 hours) and ipratropium bromide (0.5 mg every 15 minutes to 0.5 mg every 8 hours) were initially delivered by nebuliser. They were administered injectable corticosteroids (hydrocortisone /methylprednisolone) for 72 hours before receiving oral prednisolone at a dose of 0.75 mg/kg body weight for seven days. The clinical response was used to optimize the pharmacological therapy. The linked comorbid diseases were monitored and treated as needed. Clinical signs and symptoms were consistently recorded, as was the management that was offered. Outcome variables such as alleviation of symptoms, development of complications such as respiratory failure, and required ventilation were also noted. The whole hospital stay as well as the mortality were monitored. All of the data was entered into a structured case record form. The acquired data was analyzed using the Statistical Package for Social Sciences (SPSS) version 16.0 application (Inc. Chicago-III). Data was analyzed using descriptive and inferential statistical approaches including frequency, percentage, means, and standard deviation (S.D.). The differences were assessed using the unpaired t-test and the Chi-square(x2) test. If necessary, multiple logistic regression analysis was used to investigate the associations between demographic variables and clinical variables. A two-tailed P-value of 0.05 or less was deemed to be statistically significant.

Result:

While observing the clinical symptoms of the study patients, it was found that 56(74.7%) patients had dyspnea with 95% CI 0.65-0.85 and 15(20.0%) patients had colds with 95% CI 0.11-0.29 (Table I). Almost three fourth (74.1%) patients had tachypnoea, 44(58.0%) had prominence of Accessory Respiratory Muscle, 33 (44.0%) had Rhonchi and 40(53.1%) patients had purse lip breathing showing signs in favor of COPD (Table II). Mild exacerbation was found in 10(13.3%) patients, moderate exacerbation was found in 28(37.3%) patients and severe exacerbation was found in 37(49.4%) patients. The Mean age was found 61.1±7.6 years with a range from 40 to 75 years age. Males were predominant. It was found that more than half (53.3%) patients had low BMI, 46(61.3%) patients had RTI. More than two third (66.7%) patients were current smokers, 7(9.3%) patients had exposure to air pollution and 17(22.7%) patients had comorbid disease (Table I). Among the co-morbid conditions it was found that 12 (70.6%) had Hypertension, 9 (52.9%) had Diabetes Mellitus, 8 (47.1%) had Coronary Artery Disease, 4(23.5%) had Chronic Kidney Disease and 3 (17.6%) had Chronic Liver Disease.

Table I: *Distribution of the study patients by risk factors (n=75)*

Riskfactors	No. of patients	Percen-tage	95% CI(Lower-Upper)
BMI			
Low	40	53.3	0.42-0.65
Normal	33	44.0	0.33-0.55
Overweight	2	2.7	0.0-0.06
Respiratory Tract Infection			
Yes	46	61.3	0.50-0.72
No	29	38.7	0.28-0.50
Smoking			
Current- smoker	50	66.7	0.56-0.77
Ex-smoker	20	26.7	0.17-0.37
Non smoker	5	6.7	0.01-0.12
Exposure to air pollution			
Yes	7	9.3	0.03-0.16
No	68	90.7	0.84-0.97
Co-morbid disease			
Yes	17	22.7	0.13-0.32
No	58	77.3	0.68-0.86

3-7 days recovery of patients was found in 52(69.3%), 8-14 days recovery for 14 patients(18.7%) and 9 (12.0%) patients died during their hospital stay. It was observed that recovery period was longer in the presence of dyspnea or symptoms of a common cold at exacerbations onset, though there was no effect of sputum purulence or increased sputum volume on recovery time. Exacerbations associated with wheeze and sore throat had shorter recovery time (Table II).

It was seen that mortality was higher in patients requiring ICU admission, 4 out of 12 died (33.33%) whereas 5 out of 63 in non ICU (7.94%) and ICU patients had higher $PaCO_2$, lower pH value in comparison to non ICU patients. From the results of bivariate analysis of independent variables recorded in the stable phase in the model of frequent exacerbation it was found that men were more likely to have suffered from frequent exacerbations than women, 97.4% versus 91.9% (Table III). Mean age was found to be 57.2±5.3 years in less than 2 exacerbations and 60.9±7.5 years in 2 or more exacerbations. Low BMI was found in 11(29.7%) patients in less than 2 exacerbations and in 29(76.3%) patients in 2 or more exacerbations. Current smokers were found to be 15(40.5%) in less than 2 exacerbations and 35(92.1%) in 2 or more exacerbations. Age, Low BMI and current smoker difference was statistically significant ($p<0.05$) between two groups. Meanwhile from the result of factors associated with univariate analysis it was seen that age belonged to >70 years increased mortality risk by 2.32 times with 95% CI 0.53%-1.68% in patients having COPD (Table IV).

Table II: Multivariate analysis with recovery time as outcome variable (n=75).

Symptom	Effects on Recovery (95% CI)(days)	P value
Increased dyspnea	2.79 (2.3-3.8)	<0.001
Increased sputum purulence	0.79 (0-0.72)	>0.05
Increased sputum volume	0.42 (0-0.57)	>0.05
Cold	2.1 (1.3-3.2)	<0.001
Increased wheeze	1.6 (1.1-2.53)	<0.001
Sore throat	2.4 (1.5-3.7)	<0.001
Increased cough	0.32 (0.61-0.82)	<0.001

Table XI: *Variables in the model of frequent exacerbations recorded at stable phase (n=75).*

Patients profile	Less than 2 exacerbation (within one years) (n=37)		2 or more exacerbation (within one years) (n=38)		P value
	n	%	n	%	
Sex					
Male	34	91.9	37	97.4	[a]0.297[ns]
Female	3	8.1	1	2.6	
Age (years)					
Mean±SD	57.2	±5.3	60.9	±7.5	[b]0.016[s]
Range (min-max)	40	-70	40	-75	
BMI (kg/m^2)	24.7	±3.7	24.9	±4.1	
Low	11	29.7	29	76.3	[c]0.001[s]
Normal/overweight	26	70.3	9	23.7	
Current smoker	15	40.5	35	92.1	[c]0.001[s]
Co morbidity	5	13.5	12	31.6	[c]0.061[ns]

s=significant; ns=not significant
[a]P value reached from fisher's exact test
[b]P value reached from unpaired t-test
[c]P value reached from chi square test

Table IV: *Factors of mortality univariate analysis (n=75).*

Factors	OR	95% CI	P value
Age (years)			
≤60	0.77	0.43-2.31	0.042[s]
61-70	1.17	1.67-7.31	
>70	2.32	0.53-1.68	0.001[s]
Current smoking	0.03	0.00-0.16	0.001[s]
Co-morbidity	1.29	1.68-3.75	0.023[s]
Low BMI <18.5 (kg/m^2)	1.16	0.83-1.92	0.038[s]
Acute exacerbationgroup			
Infrequent	0.23	0.37-1.82	0.536[ns]
Frequent	2.07	1.42-6.39	0.019[s]

s=significant; ns=not significant

Current smokers increased mortality risk by 0.03 times with 95% CI 0.00% to 0.16% in patients having COPD. Again, comorbidity index increased mortality risk by 1.29 times with 95% CI 1.68%-3.75% and low BMI (<18.5 kg/m^2) increased mortality risk by 1.16 times with 95% CI 0.83%-1.92%, frequent acute exacerbation increased mortality risk 2.07 times with 95% CI 1.42%-6.39% in patients having COPD. From table IV it is evident that mortality increases with the frequency of severe exacerbation of COPD.

Discussion:

This cross sectional hospital based observational study was carried out to observe the clinical profile and the factors associated with acute exacerbation of COPD and to determine the demographic profile of the study population admitted with acute exacerbation of COPD. Majority (44.0%) patients were in the 6th decade and the mean was 61.1±7.6 years varied from 40 to 75 years with predominant male subjects having male to female ratio of about

18:1. Most (98.0%) of the patients came from poor socioeconomic level, followed by 25.3% middle class level and only 6.7% from rich socioeconomic status. More than three fourth (78.7%) of the patients came from rural areas and 21.3% came from urban areas. More than half (53.3%) of the patients had low BMI (95% CI 42.0%-64.6%), 61.3% patients had RTI (95% CI 50.3%-72.3%). More than two third (66.7%) patients were current smoker (95% CI 56.0%-77.4%), 9.3% patients had exposure to air pollution (95% CI 56.0%-77.4%) and 22.7% patients had co-morbid disease (95% C 13.2%-32.2%. About the clinical symptoms of the study patients, it was observed that majority of patients, 56(74.7%), had dyspnea followed by cough 47(62.7%), increased sputum volume 43(57.3%), wheeze 10(13.3%), purulence of sputum 33(44.0%), fever 27(36.0%) and 19(25.3%) had pedal oedema. Regarding the signs in favor of COPD, almost three fourth patients(74.1%) had tachypnoea, 44(58.0%) had prominence of Accessory Respiratory Muscle, 33 (44.0%) had Rhonchi and 40(53.1%) patients had purse lip breathing. Mild exacerbation was found in 13.3%, moderate exacerbation in 37.3% and severe exacerbation in 49.4% of the patients. Frequent (e"2) exacerbation was found in 34.7% and infrequent (<2) exacerbation was in 65.3%. Recovery of patients was found in 56(74.6%), 12(16%) patients were transferred to ICU and death occurred in 9 (12%) patients. According to admission status, patients were divided into two groups: patients admitted first time and patients who had a history of at least one admission previously and it was found that current smoker, low BMI and comorbidity was statistically significant ($p<0.05$) between both the groups. According to exacerbations status, patients were divided into two groups: frequent and infrequent. Advanced age, low BMI and current smoker were found significant in frequent exacerbations. When the characteristics of ICU patients and non-ICU patients were compared, PaCO2, pH and length of stay were significant ($p<0.05$) between two groups. Recovery was longer in the presence of dyspnea or symptoms of a common cold at exacerbations onset, though there was no effect of sputum purulence or increased sputum volume on recovery time. Exacerbations associated with wheeze and sore throat had shorter recovery times. In this present study it has been observed (Table VI) that, age above 7th decade increases mortality risk by 2.32 times, comorbidity by 1.29 times, low BMI (<18.5 kg/m2) by 1.16 times, smoking by 0.03 times and frequent acute exacerbation by 2.07 times risk in patients having COPD.

Conclusion:

The clinical profile and the factors associated with acute exacerbation of COPD observed in this current study revealed that chronic obstructive pulmonary disease (COPD) was more frequent in the 6th decade and male predominant. Low BMI, RTI, Current smoker, and Co-morbid disease were more frequent in patients with chronic obstructive pulmonary disease (COPD). COPD exacerbations are best defined as worsening of respiratory symptoms. However, some symptoms are more important than others in the description of exacerbation and study of clinical profile of COPD patients can identify the severity of COPD exacerbation and decide the intensity of therapy that can be effectively employed at the time of exacerbation.

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