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COPD;
CLINICAL EVALUATION AND DIRECT COST ANALYSIS OF COPD EXACERBATION IN PATIENTS OF TERTIARY CARE HOSPITAL

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ABSTARCT... Introduction: Chronic obstructive pulmonary disease (COPD) is considered as a major public health concern to the medical community. COPD is associated with episodic exacerbations which are evident as enhanced dyspnea, worsening of lung function, cough and production of sputum. **Objectives:** To assess 126 COPD exacerbated patients in a tertiary care hospital of Karachi, Pakistan. **Study Design:** Descriptive study. **Setting:** Various wards of tertiary care Ziauddin Hospitals**. Period:** November 2016 to April 2017. **Methods:** Patients were classified into Type I, II and III exacerbation. Consent was taken from patients' caregivers, while hospital permission was also obtained. At the time of study all the patients were receiving appropriate therapy and patients were clinically in stable condition. Data collection was performed by thorough reviewing and recording the data from patients' medical records. Also, the questionnaire was filled by the principal investigator to collect three evaluation parameters including MMRC Dyspnea Scale Score, Bode Index and Dose Index Scoring System. Data was expressed in terms of percentages.Direct medical costs were also determined in Rupees (Rs.) of these patients. **Results:** Results indicated that most of the male patients were found to have exacerbation. It was found that patients having smoking habits were found to have higher frequency of COPD exacerbation (Type I, 11 (8.730 %); Type II, 36 (28.571 %); Type III, 40 (31.746 %)) as compared to non smokers. Major complaints which were found in 126 patients were shortness of breath, fever, cough and increased sputum. It was found that most common comorbid diseases found in 126 patients were hypertension, diabetes mellitus and tuberculosis. In this study, the direct cost analysis of 126 COPD exacerbated patients were also carried out. **Conclusion:** Present study indicated multiple indicators for repeated exacerbations in COPD. Which in terns increase the treatment costs for the patients.

Key words: Exacerbation, MMRC Dyspnea Scale Score, Bode Index, Dose Index Score and Direct Medical Cost.

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INTRODUCTION

Among different respiratory diseases, chronic obstructive pulmonary disease (COPD) is one of the frequently reported diseases around the world. It emerges as a major public health concern to the medical community.[1] It was reported that one of the major reasons of high mortality worldwide is COPD.[2] By the year 2020, COPD will be the third foremost death cause in the world.[3]

COPD is associated with episodic exacerbations which are evident as enhanced dyspnea, worsening of lung function, cough and production of sputum.[4] Exacerbations may alter in severity and frequency.[5] It usually typically commences suddenly and frequently take weeks to resolve. It is assessed that approximately 70–80% of COPD exacerbations cases are elicited by bacterial viral or respiratoryinfections, while 20–30% cases are associated with unknown etiology or due to

environmental pollution.[6]

Scientists have found that physical activity of the patients also reduced during severe exacerbations.[7] COPD exacerbations results in frequent hospital admissions, poor health-related quality of life and morbidity.[8] It may produce economic burden on the patients. It was found that <50% of the total medical cost is related to several services required in managing exacerbations.[9]

The goals for the health care providers are to manage the frequency of exacerbation and to delay further progression of disease.[10] Periodic assessments which usually guide the disease management is usually termed as 'monitoring'.[11] Thus monitoring should depend upon the different markers of disease progression that accurately predict the disease outcome and helps in guiding various interventionsto further improve clinical outcomes.[12] Various clinical practice guidelines exhibited monitoring directives for prognosis and status of COPD.[13] The objective of this study is to assess 126 COPD exacerbated patients using different scoring system and to estimate the direct medical cost in patients of tertiary care hospital. Similarly most commonly prescribed COPD medications for (Type I, II and III) patients were Anticholinergic Beta 2 agonists and Corticosteroids.

MATERIAL & METHODS

This was an observational study of 126 COPD exacerbated patients who were admitted in a tertiary care hospital of Karachi, Pakistan. The confidentiality of patients was highly maintained during research and ethical approval was obtained from ethical review committee of Ziauddin University. In this study, consent was taken from patients' caregivers, while hospital permission was also obtained. The inclusion criteria were patients with COPD exacerbation as described by the American Thoracic Society (ATS). Patients were classified into Type I, II, III.[14] Eligible patients must have a maximum ratio of FEV1/FVC < 0.7; a maximal FEV1 < 65% of predicted.[15] Patients having asthma with tuberculosis, paroxysmal wheezing or dyspnea, lung cancer, atopy; renal disease requiring dialysis, pneumonia and hepatic failure were excluded from the study. At the time of study all the patients were receiving appropriate therapy and patients were clinically in stable condition. Data collection was performed by thorough reviewing and recording the data from patients' medical records and also by documenting the medication charts in each of the participating wards. Different informations i.e. patient demographic features, complaints, smoking history, associated comorbidities, medications etc. were also recorded. Also, the questionnaire was filled by the principal investigator to collect three standardized evaluation parameters including MMRC Dyspnea Scale Score (to monitor physical limitation)[16], Bode Index(to measure the outcome of the drug therapy)[17] and DoseIndexScoring System. Data was expressed in terms of percentages. Direct medical costs (medication costs, hospital services costs and hospitalization costs) were determined in Rupees (Rs.) using lab bills, hospital pharmacy slip, lab reports and hospital charges.

RESULTS

In this study the patients age ranging from 41-55 years, 56 – 65 years and 76 - 85 years were found to have COPD exacerbation (Type II and III) while the patients age range from 66 - 75 years showed COPD exacerbation (Type I, (16.666 %); Type II, (8.730 %) and Type III, (11.111 %). Similarly, it was found that most of the patients were found to be male having COPD exacerbation i.e. (Type I, (8.730 %); Type II, (28.571 %); Type III, (31.746 %)) as compared to female patients. Also smoking habits of patients were determined (Type I, (8.730 %); Type II, (28.571 %); Type III, (31.746 %) as compared to non smokers (Table-I). Table-II demonstrated that most common symptoms were found to be shortness of breath (Type I, (19.841 %); Type II, (39.682 %) and Type III, (37.301 %)), Fever (Type I, (5.555 %); Type II, (11.111 %) and Type III, (8.730 %)), Cough (Type I, (3.174 %); Type II, (19.841 %) and Type III, (23.015 %)) and Increased sputum (Type I, (3.174 %); Type II, (14.285 %) and Type III, (14.285 %)) were present in patients of COPD exacerbation. Also, Dose Index Scoring system was used in this study to estimate the severity levels of the patients at the

time of hospital admission and discharge. It was found that more patients showed higher score 5,6 and f at the time of admission and as compared to their scores at the time of hospital discharge reducing to more patients having a score of 0, 1 and 2 (Table-III). The percentage of patients using MMRC scale at the time of hospital admission was higher i.e most patients exhibited grade 3 and 4 symptoms while at the time of discharge more patients had symptoms of grade 1, 2 and 3 (Table-IV). Similarly for Bode Index Score, it was found that patients showed higher score of 9 and 10 at the time of hospital admission and their scores improved with more patients scoring in the range of 0-4 at the the of discharge (Table-V). Also we determined the comorbid diseases found in patients i.e. hypertension (Type I, (11.111 %); Type II, (17.460 %); Type III, (25.396 %)), diabetes Miletus (Type I, (14.285 %); Type II, (8.730 %); Type III, (19.841 %)) and tuberculosis (Type I, (3.174 %); Type II, (3.174 %); Type III, (3.174 %)) were found as a mostly diagnosed comorbid disease in COPD exacerbated patients (Table-VI). In this study most commonly prescribed COPD medications for (Type I, II and III) patients were Anticholinergic (Type I, (17.460 %); Type II,

Characteristics	COPD Exacerbation (Type I)	COPD Exacerbation (Type II)	COPD Exacerbation (Type III)
AGE [n (%)]			
41-55	-	18 (14.285)	11 (8.730)
56-65	-	7 (5.555)	11 (8.730)
66-75	22 (16.666)	11 (8.730)	14 (11.111)
76-85	-	11 (8.730)	14 (11.111)
86-95	4 (3.174)	4 (3.174)	
Gender [n (%)]			
Male	11 (8.730)	36 (28.571)	40 (31.746)
Female	14 (11.111)	14 (11.111)	11 (8.730)
BMI (kg/m^2)			
< 21	22 (17.460)	36 (28.571)	32 (25.396)
> 21	3 (2.380)	14 (11.111)	19 (15.079)
Smoking status [n (%)]			
Smoker	11 (8.730)	36 (28.571)	40 (31.746)
Non - Smoker	14 (11.111)	14 (11.111)	11 (8.730)

Table-I. Characteristics of the patients

COPD Symptoms	COPD Exacerbation (Type I) (%)	COPD Exacerbation (Type II) (%)	COPD Exacerbation (Type III) (%)
Shortness of breath	19.841	39.682	37.301
Fever	5.555	11.111	8.730
Cough	3.174	19.841	23.015
Flu	-	3.174	-
Bronchospasm	-	3.174	-
Fatigue	-	-	3.174
Restlessness	-	-	3.174
Chest pain	-	3.174	-
Shivering	-	-	3.174
LRT	-	-	3.174
Pulmonary edema	-	-	3.174
Wheeze]	-	3.174	8.730
Increased sputum	3.174	14.285	14.285
Headache	-	-	3.174
Chest tightness	-	-	5.555
Hypoxia	-	-	3.174
Nocturnal orthopnea	-	-	3.174
URTI	-	-	3.174

Table-II. Complaints in COPD exacerbated patients

(31.746 %); Type III, (28.571 %)), Beta 2 agonists (Type I, (14.285 %); Type II, (28.571 %); Type III, (28.571 %)) and Corticosteroids (Type I, (14.285 %); Type II, (19.841 %); Type III, (25.396 %)). Other prescribed medications are mentioned in (Table-VII). Table 8 showed the direct medical cost of patients, results indicated that for type III patients, total direct medical costs were high.

Score	No. of Patients [n (%)]
0	21 (16.66)
1	17 (13.49)
2	24 (19.09)
3	13 (10.31)
4	4 (3.17)
5	12 (9.52)
6	16 (12.69)
7	13 (10.31)
8	46 (4.46)

Table-III. Dose index score at the time of discharge

	Grade	No. of Patients [n (%)]
0	(Breathless only with strenuous exercise)	23 (18.25)
1	(Breathless when walking up a flight of stairs or hill)	14 (11.11)
2	(Stopping for breath upon walking at normal pace)	42 (33.33)
3	(Stopping for breath after few minutes)	26 (20.63)
4	(Too breathless to leave the house and do even daily chores)	21 (16.66)

Table-IV. MRC dyspnea scale at the time of discharge

Score	No. of Patients [n (%)]
0	23 (18.25)
1	13 (10.31)
2	12 (9.52)
3	9 (7.14)
4	17 (13.49)
5	5 (3.96)
6	11 (8.73)
7	16 (12.69)
8	8 (6.34)
9	7 (55.55)
10	5 (3.96)

Table-V. Bode index score at the time of discharge

DISCUSSION

The massive clinical and economic impact of COPD on patients have facilitated the health care professionals to develop extensive guidelines for COPD therapy particularly (GOLD) COPD mainly reduction in mortality and disease progression, improvement in health status, relief of complaints, and most importantly complete avoidance of COPD exacerbations and it's complications.18 In the present study it was found that geriatric individual showed higher incidence of COPD exacerbation. Similar results were reported in a study i.e. patients (61 – 70 years) showed higher incidences of COPD.[19] Scientists reported that frequency of COPD were found in both male (2.12% - 9.4%) and female (1.4% - 4.08%).[20] In this study it was found that patients having smoking habits were found to have higher frequency of COPD exacerbation.

In the present study different complaints which were found in 126 COPD exacerbated patients were determined. In this study, we used the Dose Index Scoring System to estimate the following variables (MMRC Dyspnea Scale; Obstruction FEV1 (% of predicted); Smoking Status and Exacerbations per year). In International guidelines both the MRC Dyspnea Scale and the FEV1% predicted are strongly suggested. The prediction of FEV1 is particularly needed for diagnosis and for this reason it is widely recorded. Similarly, smoking status and exacerbation frequency are important predictive markers of clinical outcome in COPD.[21] In this scoring system, to each variable a number ranging between (0 – 3) is assigned. The total score ranges from 0 – 8, the higher score indicates the severity of disease status. In the present study it was found that higher number of patients showed higher scores of Dose Index Scoring system.

Also MRC Dyspnea Scale was used, as it is a strong predictor of health status. Severity of dyspnea was examined using following variables; (Grade 0: Breathless only with strenuous exercise; Grade 1: Breathless when walking up a flight of stairs or hill; Grade 2: Stopping for breath upon walking at normal pace; Grade 3: Stopping for breath after few minutes and Grade 4:

Comorbidity	COPD Exacerbation (Type I) (%)	COPD Exacerbation (Type II) (%)	COPD Exacerbation (Type III) (%)
Asthma	3.174	3.174	-
HTN	11.111	17.460	25.396
Depression	-	8.730	3.174
DM	14.285	8.730	19.841
T.B	3.174	3.174	3.174
CCF	-	3.174	-
Aortic sclerosis	-	3.174	-
Ischemic heart disease	3.174	-	5.555
Stress	-	-	3.174
Migraine	-	-	3.174
Nasal bleeding	-	-	3.174
Chest pain	3.174	3.174	-
Orthopnea	-	3.174	3.174
ExertionalDyspnea	-	-	3.174
Sinus infection	3.174	-	-
Weight gain	-	-	3.174
Artherosclerosis	-	-	3.174

Table-VI. Associated comorbidities in COPD exacerbated patients

COPD Medications	COPD Exacerbation (Type I) (%)	COPD Exacerbation (Type II) (%)	COPD Exacerbation (Type III) (%)
Anticholinergic	17.460	31.746	28.571
Beta 2 agonists	14.285	28.571	28.571
Corticosteroids	14.285	19.841	25.396
Methylxanthines	-	3.174	-
Phosphodiesterase-4 inhibitors	-	3.174	-
Aminopenicillins	3.174	3.174	
Macrolides	-	19.841	111.111
Tetracyclines	-	-	3.174

Table-VII. Prescribing trends of medications in COPD exacerbated patients

Type of COPD Exacerbation	No. of Patients	Medication Cost (Rs.)	Hospital Services Cost (Rs.)	Hospitalization Cost (Rs.)	Total Direct Medical Cost (Rs.)
TYPE I	25	128747.204	145521.825	156547.619	430816.649
TYPE II	50	97570.614	241316.836	270216.836	609104.2883
TYPE III	51	294217.612	497049.171	548036.499	1339303.283

Table-VII. Direct cost analysis of COPD exacerbated patients

Too breathless to leave the house and do even daily chores). This scale is considered as a self-reported questionnaire and is therefore useful for estimating dyspnea.[22] In the present study we used MRC Dyspnea Scale for predicting exacerbation in patients. In the present study Bode Index Score was used for estimating each of the following variables (FEV1 (% of predicted); Distance walked in 6 mins (m); MMRC Dyspnea Scale and BMI).[21]

Scientists reported that most common comorbid diseases found in COPD exacerbated patients were Hypertension and cardiovascular disease.[23] In the present study commonly found comorbid disease were hypertension and diabetes mellitus also, most commonly prescribed COPD medications for (Type I, II and III) patients

were Anticholinergic, Beta 2 agonists and Corticosteroids.

Direct medical cost includes the sum of medicine cost, hospital charges and lab test charges. Scientists reported that co – morbidities may increase the total direct medical cost.Some studies showed that medication cost may increase the direct medial cost up to 23-58%.[24] Also we determined the direct medical costs of all patients suffering from type I, II and III.

CONCLUSION

The results of this study could be helpful to determine the indicators for repeated exacerbations in COPD and in turn taper down the need for health-care resource and costs of treatment.

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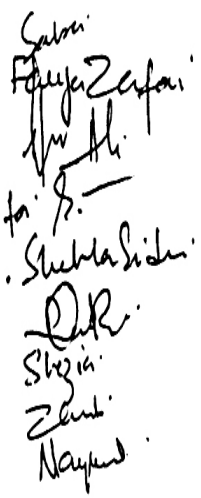
1	Saba Ajaz Baloch	Equal Contribution of all authors	
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