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RESEARCH ARTICLE

ASSESSMENT OF LENGTH OF HOSPITAL STAY (LOS): PATIENTS IN DEPRESSION WITH ACUTE EXACERBATIONS OF COPD

***,[1]Kapil Sharma, [2]Sheena Taneja, [3]DPS Sudan, [4]Monica Sharma, [5]Tarachand Wadhwa and [6]Birendre Kumar Yadav**

[1]Assistant Professor, Department of Pulmonary Medicine, SGT Medical College & Hospital, Gurgaon, Haryana, India
[2]Junior Resident, Department of Pulmonary Medicine, SGT Medical College & Hospital, Gurgaon, Haryana, India
[3]Professor, Department of Pulmonary Medicine, SGT Medical College & Hospital, Gurgaon, Haryana, India
[4]PhD Scholar, Department of Microbiology, SGT Medical College & Hospital, Gurgaon, Haryana, India
[5]Junior Resident, Department of Pulmonary Medicine, SGT Medical College & Hospital, Gurgaon, Haryana, India
[6]PhD Scholar, Department of Biochemistry, SGT Medical College & Hospital, Gurgaon, Haryana, India

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ABSTRACT

Background & Objectives: Chronic Obstructive Pulmonary Disease (COPD) is prone to acute exacerbations which may lead to enhanced morbidity and mortality**.** By compromising health status, mood disorders may lead to an increased risk of hospitalization and re-hospitalization. Information on the time course and recovery from COPD exacerbation is important in standardizing the length of treatment, in planning appropriate follow up and decreasing loss of working days of the patient.
Material and Methods: It was a prospective study (observational) which included all patients of depressive symptoms with acute exacerbation of COPD (e-COPD) admitted to the Department of Pulmonary Medicine, SGT Medical College, Gurgaon, over a period of 9 months.
Results: In this study we observed the mean length of stay (LOS) of patients with AECOPD was 9.08±4.76 days .There was no significant difference in the length of stay between patients of different age groups. The LOS varied significantly between different GOLD stages. The patient who had a history of admission for twice or more in the past 1 year or had a mortality have a greater mean LOS as compared to patient with just one or no hospitalization in the past.
Conclusion: The patient who had a history of admission for twice or more in the past 1year had a greater mean LOS as compared to patient with just one or no hospitalization in the past.

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INTRODUCTION

Chronic Obstructive Pulmonary Disease (COPD) is prone to acute exacerbations, leading to hospitalization which is a major event in the natural history of chronic obstructive pulmonary disease (COPD) due to its negative effect on lung function, survival, risk of readmission, and quality of life (Seemungal *et al*., 1998; Almagro *et al*., 2006; Donaldson *et al*., 2002; Garcia-Aymerich *et al*., 2003). Several measurements are employed to assess hospital performance of COPD patients of which one of them is the average length of hospital stay (LOS).It is the number of the days of a patient's stay in hospital to get treatment in a certain period (Griffith, 1978; Slee *et al*., 1996), calculated by dividing the total number of the days of the discharged patients' stay (including the ones who died) by the number of the patients discharged (Sümbüloğlu *et al*., 1982). LOS is an important indicator of effectiveness of the quality medical care provided by the hospital limited by the severity of disease. Various clinical and social factors have been implicated in increasing the LOS of hospital admissions (Agboado *et al*., 2012; Poole *et al*., 2001). The increasing fragility and severity of patients is reflected by prolonged length of stay (LOS), thus needing more attention from health personnel (Roche *et al*., 2010). The impact of anxiety and depression on COPD patients, their families, and society is significant. Depressed patients with a chronic medicalillness are usually sicker than their counterparts and have lower treatment adherence (Felker *et al*., 2001; Di Matteo *et al*., 2000). By compromising the health status, mood disorders may lead to an increased risk of hospitalization and re-hospitalization (Gudmundsson *et al*., 2005). Depression may

Corresponding author:* **Kapil Sharma,
Assistant Professor, Department of Pulmonary Medicine, SGT Medical College & Hospital, Gurgaon, Haryana, India.

also be a significant predictor of mortality following hospitalization for acute exacerbation. Assessment of hospital stay and gathering of information regarding time course and recovery from exacerbation is crucial in standardizing the length of treatment, in planning appropriate follow up and decreasing loss of working days of the patient. The aim of this study is to identify the factors affecting hospital LOS for patients in depression with exacerbation of COPD(e-COPD). Since the period after acute exacerbation is prolonged due to various factors and patients and their relatives are interested in knowing the length of hospital stay, this study was done to answer this and help the health staff to reduce the factors affecting the length of hospital stay for patients with COPD and if possible, in future to find out ways to reduce it.

MATERIALS AND METHODS

Study Population: All patients with depressive symptoms in acute exacerbation of COPD (e-COPD) admitted to the Department of Pulmonary Medicine, SGT Medical College, SGT University, Gurgaon over a period of 9 months (October 2016 to June2017) were recruited according to the study criteria. It was a prospective (observational) study with a sample size of 73.

Procedure for Sampling: A detailed clinical history and examination is performedin ward by the clinician at the onset of exacerbation confirmed by Pulmonologist with the aim of finding out the cause as well as to rule out the alternative diagnosis. GOLD Severity Staging was done during stable state of the patients during their initial visit to the pulmonary medicine OPD, 2 months before or after the exacerbation period (Global Initiative for Chronic Obstructive Lung Disease, 2016). Patients were treated according to a fixed protocol that included oxygen therapy, ventilator support (if needed), bronchodilators, oral/intravenous (i.v) corticosteroids, oral/i.v antibiotics, theophylline and adjunct therapies.

Sample selection and data collection: All together 118 patients were screened, of which 92 were eligible according to the inclusion and exclusion criteria. Of those 73 patients agreed to participate in the study after excluding drop outs (response rate 79 %). The medical records and discharge cards of all included patients are manually reviewed to extract demographic data including age, sex, marital status, highest form of education received (low level: illiterate and primary education; high level: secondary education and graduate) . Participants were asked about their smoking habits and exposure to biomass fuel. Severity of depression was estimated using Hamilton Depression Rating (HAM-D), and the quality of life was estimated using disease (COPD) specific St George's Respiratory Questionnaire (SGRQ) and Generic health related quality of life (HRQoL) Short Form-36(SF-36) Scale. Spirometry was performed using a computerized spirometer (Model Vitalograph 6800; SN.PN06011Vitalograph Ltd., Ireland) to assess lung function after inhalation of 400 micrograph salbutamol. Measurements followed American Thoracic Society criteria for Spiro-metric standardization and procedures (Miller *et al*., 2005). Data regarding the total length of stay (Total LOS), ICU LOS and the Ward LOS of study population were extracted, also previous COPD-related Hospitalization during one year before the current admission is noted. A COPD-related admission was defined by discharge diagnoses from previous admissions using the same criteria as for thecurrent admission.

End Points

The primary endpoint of the study is *length of stay* {LOS-(WARD LOS, ICU LOS, Total LOS)}. The secondary endpoints were effect of *age* on length of stay (LOS), *effect of severity of COPD* on Length of Stay (LOS) and *effect of mortality and previous hospitalization* on Length of Stay (LOS).

Inclusion and exclusion criteria

Inclusion criteria were (1) post bronchodilator(400 microgram Salbutamol) ratio of Forced Expiratory Volume in one second to Forced Vital Capacity less than 0.70 (FEV1/FVC<0.70) (Global Initiative for Chronic Obstructive Lung Disease, 2016), (2) Patients presenting and admitted with a diagnosis of acute exacerbation of COPD by admitting team, complaining of an acute change of symptoms (baseline dyspnea, cough and/or sputum production) that is beyond normal day to day variation 3) Male or Female aged more than 40years.

Exclusion criteria were (1) coexisting acute pulmonary tuberculosis, pulmonary fibrosis, bronchiectasis, pneumothorax, or lung cancer; (2) Death during hospital stay; (3) inability to perform spirometry or being to physically ill or mentally incapacitate to participate; (4) receiving corticosteroids or immune-suppressive medications; (5) unstable coronary artery disease; (6) significant neurological disease and (7) absence of informed consent.

Measurement of depression

A clinical diagnosis of major depression is defined by the Diagnostic and Statistical Manual of Mental Disorders, 4th edition (DSM-IV) criteria (American Psychiatric Association, 1994) and ICD-10 criteria (WHO, 1992), and symptoms are assessed through the use of a clinically structured interview i.e the Hamilton Depression Rating Scale (HAM-D). Although the HAM-D form lists 21 items, the scoring is based on the first 17. It generally takes 15-20 minutes to complete the interview and scoring the results. Eight items are scored on a 5-point scale, ranging from 0= not present to 4 = severe. Nine are scored from 0-2. The score has sensitivity:86.4% and specificity: 92.2%. According to Strik*et al* (Psychosomatics 2001), scores ranges from 0 to 27 and depending upon the total score, severity of depression was classified as follows: none (0-7), mild (8-13), moderate (14-18), severe (19-22) and very severe (23-27).

Assessments of COPD

Six-minute walk tests (6MWTs) is performed (American Thoracic Society, 2002) using a walk track of 25 meters in which 2 attempts is performed at least 30 minutes apart. Breathlessness is scored using modified Medical Research Council (mMRC) Dyspnea scaleconsisting of 5 stages: 1-shortness of breath with strenuous exercise; 2-shortness of breath when hurrying on level on level ground; 3-needing to stop after walking 100 meters ; 4 -too breathless to leave the house. Additionally, the calculation of BODE index for classification of COPD is as follows: for each threshold value of FEV1%predicted, distance walked in six minutes, and score on the MMRC dyspnea scale (Mahler and Wells, 1988), the patients received points ranging from 0 (lowest value) to3 (maximal value). For body mass index, the values were 0or 1.

The points for each variable is added, so that the BODE index of total 10 points is evaluated. The post bronchodilator FEV1%predicted is used and classified according to the three stages identified by the American Thoracic Society (Standards for the diagnosis and care of patients with chronic obstructive pulmonary disease, 1995). Finally, after obtaining the BODE index, quartiles of the BODE index is constructed for all patients into four severity stages (Celli *et al*., 2004):

BODE stage 1 = BODE index 0 – 2; BODE stage 2 = BODE index 3 – 4;
BODE stage 3 = BODE index 5 – 6; BODE stage 4 = BODE index 7 – 10.

Health related quality of life (HRQoL)

HRQoL is measured using the disease (COPD) specific St George's Respiratory Questionnaire (SGRQ) and Short Form-36(SF-36) Scale Generic health related quality of life (HRQoL) Scale. Symptoms burden, functional, physical, social status and impairment of quality of life were measured using the validated Hindi version of "Saint George Respiratory Questionnaire" (SGRQ) which is a self-administered disease-specific health-related quality-of-life (HRQoL) measure, ranging from zero (indicating no impairment) to 100 (Jones *et al*., 1992). The questionnaire assesses the symptoms of patient, impairment of daily activity and the amount of distress caused by it. Worsening of health status is indicated by increased SGRQ scores. It has been validated for hospital use. The Short Form-36(SF-36) Scale is a generic quality-of-life instrument that has two summary measures: The Physical Component Summary (PCS) and the Mental Component Summary (MCS) (Ware *et al*., 1995). Scores range from zero (worst possible impairment) to 100 (good quality of health).Studies reveal the reliability of the SF-36 as 0.80 and well validated for hospital use (McHorney *et al*., 1994). The SF-36 has eight scaled scores which are weighted sums of the questions in each section including vitality, physical functioning, bodily pain, general health perceptions, physical role functioning, emotional role functioning, social role functioning and mental health.

Statistical Analysis

Statistical analysis was done using Statistical Package of Social Science (SPSS Version 20; Chicago Inc., USA). Data comparison was done by applying specific statistical tests to find out the statistical significance of the comparisons. In statistical analysis: correlation, the importance control of the difference between two averages (t test) and one sided variance analysis were used. Quantitative variables were compared using mean values and qualitative variables using proportions. Significance level was fixed at $P < 0.05$.

RESULTS

The study included all patients with a discharge diagnosis of COPD from October 2016 to June 2017. Based on the International Statistical Classification of Disease and Related Health Problems, 10th Revision (ICD-10), we included both patients with COPD (J43 or J44) as the main diagnosis, and patients with respiratory failure (J96) or pneumonia (J12–J18) as the main diagnosis and COPD (J43 or J44) as a secondary diagnosis. Patients were then screened for the presence of depressive symptoms (HAM – D Score > 8 points), as described above. Final analysis was done on 73 patients.

General characteristics (Table 1, 2 and 3)

Results were expressed using means ± standard deviations. The mean length of stay (LOS) is 8.16±3.94 days (in ward), 0.92±1.06 days (in ICU) and 9.08±4.76 days (in total). Mean age at admission was 54.68±10.86 years. Severity of COPD was assessed by CAT Score (17.04±5.73), BODE Index (2.70±1.85), SGRQ Impact Score (44.42±16.55), SGRQ Symptom Score (58.63±21.58) and SGRQ Activity Score (38.36±21.9). Depression was assessed by HAM D Score (15.33±6.68) ranging from minimum 8 to maximum 27.Generic Health Related Quality of Life was assessed by SF-36 Mental Component Scale(41.78±21.43) and SF-36 Physical Component Scale (53.78±24.28). Comorbidities are assessed by Deyo"s adapted Charlson"s Index (1.26±0.78) ranging from minimum 0 to maximum 3. The population is majorly males (52.05%), than females (47.95%). 43.8% of patients demonstrated GOLD stage I, 41.1% - Gold stage II, 8.2% - GOLD Stage III and 6.8% of sample has GOLD Stage IV disease. 35.6% of patients are current smokers, while 64.4% were ex-smokers or non-smokers. Overall 21 (28.76%) men are current smokers and 5 (6.84%) females are current smokers. Non-smokers or Ex-smokers comprised of 23.28 % males and 41.09 % females).

Severity of COPD (Table 4)

The Total length of Stay (in days) varied significantly between different GOLD stages. Stage I had a mean LOS of 7.28 ±4.44 days, Stage II had a mean LOS of 9.63 ± 4.49 days, Stage III had a mean LOS of 11.0 ± 4.77 days and Stage IV had a mean LOS of 15.0 ± 2.0 days, with a p value of 0.002 which was highly significant.

Table 1. Descriptive characteristics of various COPD related variables, Health Related Quality of life, Depression Score, length of stay and Previous Hospitalization in Depressed COPD patients in acute exacerbations (e-COPD) subjects

	Minimum	Maximum	Mean	Std. Deviation
Age	40	85	54.68	10.860
Previous hospitalization	0	2	.59	.684
Total LOS(length of stay)	1	18	9.08	4.769
LOS ICU	0	3	.92	1.064
LOS WARD	1	15	8.16	3.948
CAT Score	6	28	17.04	5.736
BODE Index	0	7	2.70	1.854
SGRQ Impact Score	12	73	44.42	16.551
SGRQ Symptom Score	13	99	58.63	21.587
SGRQ Activity Score	10	98	38.36	21.903
HAM D Score	8	27	15.33	6.688
SF36 Mental Component Scale	10	100	41.78	21.431
SF36 Physical Component Scale	0	84	53.78	24.284
Deyo"s adapted Charlson"s Index	0	3	1.26	.782

Abbreviations:- LOS WARD- Length of stay in ward, LOS ICU- Length of stay in ICU, HOSP- Hospitalization in previous year, SD- Standard Deviation, N- Number of Cases.

Table 2. Characteristics of Depressed COPD patients in acute exacerbations (e-COPD) according to GOLD Scale

Score	Gold Staging	Number of cases	Percentage
1	mild	32	43.8
2	moderate	30	41.1
3	severe	6	8.2
4	very severe	5	6.8
	Total	73	100.0

Table 3. Characteristics of Smoking according to Gender in Depressed e-COPD patients

%- percentage of total sample population.

		MALE	FEMALE	Total
Smoker	Non-smoker,	17	30	47
	Ex-smoker	(23.28 %)	(41.09 %)	(64.4 %)
	Current Smoker	21	5	26
		(28.76 %)	(6.84%)	(35.6 %)

Stratified age group (Table 5)

The minimum age of the study population is 40 years and the maximum age is 85 years. The highest proportion of the admissions (34.24%) was for patients aged between 40 and 49 years while the lowest (2.73%) was for patients aged 80 years & above. There was no significant difference in length of stay between patients in different age groups. The Mean Length of Stay for age group 40-49 years, 50-59 years, 60-69 years, 70-79 years and 80 years and above are 9.52±4.79 days, 8.13±5.43 days, 9.36±4.79 days, 9.67±3.5 days and 10.0±2.82 days respectively ;with a p value of 0.855. Henceforth, variation of length of stay with the age group is statistically not significant.

Table 4. Analysis of Total length of Stay (in days) in Depressed COPD patients with acute exacerbations according to GOLD Scale

	Number of cases	Mean	Std. Deviation	*Anova f value*	Significance
Mild (Stage I)	32	7.28	4.445		
Moderate (Stage II)	30	9.63	4.491	*5.372*	.002
Severe (Stage III)	6	11.00	4.775		
very severe (Stage IV)	5	15.00	2.000		
Total	73	9.08	4.769		

Table 5. Analysis of Total length of Stay (in days) in Depressed e-COPD according to Age Group

Stratified age group (in years)	Number of cases	Mean length of stay (in days)	Std. Deviation	*ANOVA f value*	Significance
40-49	25	9.52	4.797		
50-59	23	8.13	5.430		
60-69	14	9.36	4.798	0.333	0.855
70-79	9	9.67	3.500		
More than 80	2	10.00	2.828		
Total	73	9.08	4.769		

LOS according to previous Hospitalization (Table 6)

There were 73 admissions (mean age of 54.68±10.86 years) included in the present study. 8(10.95 %) patients had a history of two or more hospitalization in past 1 year, 65(89.04%) patients were admitted once in past 1 year due to exacerbation of COPD or had no history of admission due to COPD. The study group which have a history of admissions for twice or more in the past 1 year had a greater (Statistically significant) mean Total LOS, LOS WARD and LOS ICU as compared to patient with just one or no hospitalization in the past. (Mean LOS= 14.13 days vs 8.46 days, 12.13 days vs 7.68 days, 2.0 days vs 0.78 days: p value= 0.01, p=.02 and p=.02 respectively).

LOS of mortality group (Table 7)

13 patients (17.80 %) out of total 73 admissions died during the 6 months follow up period and these were labelled as mortality group. The mortality group have mean Total LOS 13.46±4.33 days compared to 8.13±4.33 days of other group which was statistically significant(p=.000). The mortality group had a greater (statistically significant) mean LOS WARD and LOS ICU as compared to others. (Mean LOS= 11.69 days vs 7.40 days, 1.77 days vs 0.73 days; p value= 0.00, and p=.00 respectively).The mortality group have greater (statistically significant) mean number of hospitalization in previous year compared to others (1.38±0.65 vs 0.42±0.56; p=0.00). Henceforth, the average number of hospitalizations in previous year and the length of stay in ward, ICU or in total was statistically greater in the mortality group.

DISCUSSION

The purpose of this study is to describe the outcomes of depressed COPD patients with exacerbation (e-COPD) in terms of hospital length of stay. Currently there are no established standards for LOS in depressed COPD patients with exacerbation on the basis of disease severity, previous hospitalization or mortality status probably due to the heterogeneity of the e-COPD patients and complexity of the disease. Various Secondary outcome end points are discussed in details with the LOS:-

Length of Stay (LOS)

In our observational study, the mean LOS of patients admitted with AECOPD was 9.08 ± 4.76 days. This goes in accordance with the wide range of LOS (3-16 days) noted in previous studies (Chang *et al*., 2007; Díaz-Peromingo *et al*., 2004). Also, the first conducted study by Mushlin to determine the necessary length of stay for patients admitted to the hospital with an exacerbation of chronic pulmonary disease found out LOS to be between 6 and 7 days, on average (Mushlin *et al*., 1991. Recently, Yin Wang (2013) in his study found Mean length of stay (LOS) to be 8.9±9.7 days, with a median of 6.0 days (Wang *et al*., 2013). Previously, a similar study was done by Gary k Kong. in which he found the mean LOS in COPD patient with exacerbation was 6.5 days (Gary Kong *et al*., 1997). Anxiety and depression symptoms were also associated with increased length of stay in hospital for COPD exacerbations (Xu *et al*., 2008; Koenig *et al*., 1998). Certainly, an association between LOS, depression and early readmission has been reported (Sharif *et al*., 2014). Over the past two decades, the increased healthcare facilities has decreased internationally the trend of LOS (Sullivan *et al*., 2000; Baker *et al*., 2004). Despite this reduction, the most commonly reported mean or median LOS is still 6-10 days (Agboado *et al*., 2012; Barba *et al*., 2012). However one must also keep in text noted the 'revolving door' phenomenon', i.e.

patients discharged too early are readmitted sooner (Capewell 1996).

Table 6. Analysis of total length of stay (in days) in depressed COPD patients with acute exacerbations according to previous hospitalization (more than ONE / ONE or no hospitalization)

	Previous hospitalization	Number of cases	Mean length of stay	Std. Deviation	Sig (2-tailed)
Total	>=2	8	14.13	3.523	.01
LOS	0-1	65	8.46	4.545	
LOS	>= 2	8	12.13	3.227	.02
WARD	0-1	65	7.68	3.767	
LOS	>= 2	8	2.00	.756	.02
ICU	0-1	65	.78	1.023	

Table 7. Analysis of Different (Ward/ICU) Length of Stay (in days) of mortality group with the other live depressed COPD patients in acute exacerbations (e-COPD)

	Mortality	N	Mean	Std. Deviation	Sig (2 – tailed)
Total LOS.	YES	13	13.46	4.332	.000
	NO	60	8.13	4.335	
LOS	YES	13	11.69	3.614	.000
WARD.	NO	60	7.40	3.609	
LOS ICU.	YES	13	1.77	1.013	.000
	NO	60	.73	.989	
HOSP.	YES	13	1.38	.650	.000
	NO	60	.42	.561	

Quality of life

According to the results, life quality in our patients was moderate to low, SGRQ Impact Score (44.42±16.55), SGRQ Symptom Score (58.63±21.58), SGRQ Activity Score (38.36±21.9), SF-36 Mental Component Scale(41.78±21.43) and SF-36 Physical Component Scale(53.78±24.28). This seems to be in consistent with similar previous studies. Okubadejo evaluated the life quality of COPD patients through SGRQ questionnaire and reported a score of 55.3±18.2 which was not satisfactory (Okubadejo *et al*., 1996). Also, Miravitllesfound a score of 47.9 which indicates the low quality of life in COPD patients (Miravitlles *et al*., 2006). Alvarez-Mon *et al*. reported the score of 37.5±17.5 revealing an unpleasant life quality in COPD patients (Alvarez-Mon *et al*., 2005). On the other hand, Ferrer and colleagues stated that COPD was one of the factors responsible for decreasing the quality of life in their study patients (Ferrer *et al*., 2002).

Age Groups

In this study there is no significant difference in the length of stay of patients between different age groups. The LOS for age group 40-49 years, 50-59 years, 60-69years, 70-79 years and 80 years & above were 9.52±4.79 days,8.13±5.43 days, 9.36±4.79days, 9.67±3.5 days and 10.0±2.82 days respectively, with a p value of 0.85. Closely noting LOS suggests the it is progressively increasing with age from 50 years onwards except age group 40-49 years which was probably because of false belief of overcorrection of symptoms by prolonging the duration of hospitalization during initial phase of COPD (40-49 years). From the 50 years age onwards, most of the COPD people have more than 5 years of duration of symptoms and they become habitual to the subjective perception of breathlessness. Also with the chronicity of COPD, there are always early discharges due to lack of financial and social support of relatives, limiting the duration of LOS proportionately equal in all age groups above 50 years (Çelik *et al*., 2001; Farren *et al*., 1991). The literature also indicates that LOS tends to increase with age (Connolly *et al*., 2006, Munoz *et al*., 1989) This may be because of poor functional states, increased exacerbations frequency, comorbidities and fragility with age (George *et al*., 2003 and 2008).

Severity of COPD

The Total length of Stay (in days) varied significantly between different GOLD stages. Stage I had a mean LOS of 7.28 ±4.44 days, Stage II had a mean LOS of 9.63 ± 4.49 days, Stage III had a mean LOS of 11.0 ± 4.77 days and Stage IV had a mean LOS of 15.0 ± 2.0 days, with a p value of 0.002 which was highly significant. This observation is consistent with the GOLD recommendations as well as the guidelines of the Polish Society of Lung Diseases according to which, major co-morbidities were one of the reasons of necessary hospital treatment in case of COPD exacerbation (Pierzchała *et al*., 2010). Also mentioned in previous studies that the mainfactors associated with LOS being longer than the median were related to disease or exacerbation severity (Mamta Ruparel1 *et al*., 2016; Zampieri *et al*., 2014; Incalzi *et al*., 2001)

Previous Hospitalization and mortality

In our study group patient who had a history of admission for twice or more in the past 1 year had a prolonged mean LOS as compared to patient with just one or no hospitalization in the past. Suissa *et al*, stated in his study that previous admissions were considered to be a significant factor in worsening disease and possibly in prolonging the LOS of subsequent admissions (Suissa *et al*., 2012). Also other studies report that the risk of admission due to exacerbation of COPD was greatest among the patients who had had more than three inpatient episodes (Garcia-Aymerich *et al*., 2001) or hospitalized 4 times and above (Afsun Ezel Esatoğlu *et al*., 2002) within the past year. Contradicting to above studies, Harries *et al* did a similar study stating that the time to recovery within hospital from a COPD exacerbation was not related to the number of previous ad missions of apatient (Harries *et al*., 2015).

Conclusion

The study included 73 patients of acute exacerbation of COPD. The mean length of stay (LOS)is 8.16±3.94 days (in ward), 0.92±1.06 days (in ICU) and 9.08±4.76 days (in total). More severe stage of the disease and history of previous hospitalization, is associated with prolonged hospital stay. The reasons for prolong LOS are probably multidimensional, and further require studies to evaluate patient and non-patient related factors. There is a need to understand the relationship of the comorbid conditions of anxiety and depression and the acute exacerbation of COPD that results in hospital admissions, and a need to determine if there are any other factors involved. Both age and LOS in this population are comparable to previous studies supporting the external validity of our sample.

Limitations

The study population was recruited from a single university hospital in Gurgaon serving a particular geographical unit.

Also, the included population was relatively small limiting the external validity of our results. Local practice guidelines, hospital resources, and the organization of care may influence LOS. The number of variables in the analyses was limited; hence, potentially important predictors might have been missed.

Abbreviations

LOS WARD- *Length of stay in ward*, LOS ICU- *Length of stay in ICU*, HOSP- *Hospitalization in previous year*, SD- *Standard Deviation*, N- *Number of Cases*.

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