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Respiratory Medicine

FACTORS PREDICTING READMISSIONS FOR ACUTE EXACERBATION OF CHRONIC OBSTRUCTIVE PULMONARY DISEASE

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ABSTRACT **Introduction:** Chronic obstructive pulmonary disease (COPD) is the third leading cause of death worldwide, causing 3.23 million deaths in 2019. Nearly 90% of COPD deaths in those under 70 years of age occur in low- and middle-income countries (LMIC). Patients with COPD are often readmitted to hospital for treatment due to an acute exacerbation. The study is to provide relevant data that may contribute to the clinical prevention or improvement of AE of COPD. **Aims & Objectives:** 1.To assess the risk of readmission using pearl score (Previous admissions (p), dyspnea (e MRCD score), age (a), right heart failure(r), left heart failure (l)) in readmitted patients. 2. To assess the co- morbidities and the other risk factors associated with readmission. **Materials and Methods:** This study was conducted in the Department of Pulmonary Medicine, Dr. Pinnamaneni Siddhartha Institute of Medical Sciences and Research Foundation, Vijayawada, from October 2022 to November 2022. We collected data of 92 patients with previous hospital admissions for AE COPD. Demographic, clinical data was collected and were stratified into low, intermediate and high risk groups using PEARL score. Association of factors such as treatment adherence, co-morbidities and smoking with readmission were studied. Analysis was done in MS EXCEL. **Results:** Out of 92, majority of patients were males (83.69 %) with mean age of 62.28±11.38 Years. About 47.82 % were current smokers, 40.21 % were ex-smokers, 88.04 % had co-morbidities either diabetes or hypertension or both and heart failure, 52.17 % had treatment non-compliance and 92.39% had high pearl score (5-9). **Conclusion:** Patients with Co-morbidities, High pearl score, treatment non-compliance and current smoking are associated with re-admissions. Particular attention to such predictors may help to identify subgroup of COPD patients with a high risk of readmission in order to encourage rehabilitation programs.

KEYWORDS : PEARL Score, Smoking, Co- Morbidities, Heart failure.

INTRODUCTION

Chronic obstructive pulmonary disease is a heterogeneous lung condition characterized by chronic respiratory symptoms (Dyspnoea, cough, sputum production) due to abnormalities of airflows (bronchitis, bronchiolitis) and/or alveoli (emphysema) that cause persistent often progressive, airflow obstruction. [1] It is the third leading cause of death worldwide, causing 3.23 million deaths in 2019. Nearly 90% of COPD deaths in those under 70 years of age occur in low- and middle-income countries (LMIC).[2] Morbidity due to COPD increases with age and is influenced by chronic conditions. COPD exacerbations resulting in hospital admissions contribute to a significant clinical and economic burden worldwide. [3] COPD readmission may be defined as either re-hospitalization exclusively for acute exacerbation of COPD (AECOPD) or secondary to any cause.[3]

An exacerbation of COPD (ECOPD) is defined as an event characterized by increased dyspnoea and/or cough and sputum that worsens in < 14 days which may be accompanied by tachypnea and/or tachycardia and is often associated with increased local and systemic inflammation caused by infection, pollution, or other insult to the airways.[1] There is a lack of consensus when defining readmission time intervals, which may range from 30 days to 2 years.[5] Exacerbations of COPD are important events in the management of COPD because they negatively impact health status, rates of hospitalisation and readmission, and disease progression.[1] COPD exacerbations resulting in hospitalisation can be up to 60 times more expensive than mild or moderate exacerbations managed by primary care services.[3] Because readmissions in COPD are preventable, readmission rates are routinely used to assess the quality of care provided. Predictive readmission models help physicians develop treatment strategies that specifically target patients at high risk of hospitalization and readmission. Some of the previous COPD-specific predictive models, including ADO (age, dyspnoea, airflow obstruction), BODEX (BMI, airflow obstruction, dyspnoea, exacerbation), and DOSE (dyspnoea, obstruction, smoking, exacerbation), were only able to offer a small amount of value. All of these scores were originally developed to predict mortality.

The PEARL Score (Previous Hospitalization, Extended Medical Research Council Dyspnea Score, Age, Right-sided Heart Failure, Left-sided Heart Failure) was first developed in the UK to accurately assess the risk of patient readmission and stratification for death. The PEARL Prognostic Score consists of 5 indices. Patients are classified as low risk (0-1), intermediate risk (2-4), and high risk (5-9) for readmission or death within 90 days. PEARL was shown to be easy to use at the bedside, with a c-statistic of only around 0.7, which outperforms other existing predictive models.[4]

The aim of our study is, to assess the factors associated with readmission in acute exacerbation of COPD and to assess the risk of readmission using the PEARL score.

MATERIALS & METHODS

1. An observational study collected data from 92 patients who were admitted to the DEPARTMENT OF PULMONARY MEDICINE in DR.PSIMS& RF during the period of 1 year October 2022 To November 2022.
2. Data regarding symptomatology, Co-morbidities, regular usage of inhalers, smoking habits, other risk factors of COPD and previous hospitalizations history was collected. Analysis was done in MS EXCEL.

Inclusion Criteria:

1. Patients who were more than 18 years of age
2. Patient who were known cases of COPD.
3. Patient who had more than 1 readmission.

Exclusion Criteria:

- Recently diagnosed COPD.
- Hospitalizations for reasons other than AECOPD like community-acquired pneumonia, heart failure, pneumothorax, pulmonary embolism
- Co- existing pulmonary disease which may lead to multiple admissions like active pulmonary tuberculosis or underlying malignancy

STATISTICALANALYSIS

The data was entered into MS excel spreadsheet and analyzed

RESULTS

The present study included 92 patients. The characteristics of patients

are listed in [Table/Fig-1]. The mean age of patients was 62.28±11.38 with 77 (83.69%) males and 15 (16.30%) females. Most of the patients were under normal BMI (41%) followed by underweight (35%). Among the study subjects majority are associated with Co-Morbidities i.e., 59.7 % had heart failure and 44.56% are both diabetic and hypertensive.

The majority of patients were current smokers 44 (47.82%) and about 48 (52.17%) had poor adherence to the treatment Variables Frequency (n=92)Percentages (%)AGE (years)<3011.0831-503841.351-704852.17>7055.43GENDER Males7783.69%Females1516.30%BMIUnderweight3234.78Normal3841.3Overweight1819.5Obesity44.34Co-morbiditiesDiabetes Mellitus (DM)77.608%Hypertension (HTN)2426.08%Both DM& HTN4144.56%Heart failure5559.7% H/o Smoking Current smokers4447.82%Ex-Smokers 3740.21%Non-Smokers 1111.95%TREATMENTCompliance4447.82%Non-compliance4852.17%[Table/Fig-1]: Demographics and baseline clinical characteristics of the study population.[Table/Fig-2] In our study, 62 (67.3%) had more than 2 previous admissions in the past year, 4 (4.34%) had age more than 80 years, right-heart failure occurred in 30 (32.6%) and Left heart failure was present in 25 (27.1%). Low-risk (0–1) PEARL scores were not seen, intermediate-risk (2–4) were present in 7 (7.60%) patients and high-risk in 85 (92.39%). [Table/Fig-3]

PEARL Score	Frequency	Percentage	Weighting
Previous admissions (≥2)	62	67.3 %	3
eMRCD score 4	12	13.04%	1
eMRCD score 5a	32	34.78%	2
eMRCD score 5b	48	52.1%	3
Age 80 or more	4	4.34	1
Right ventricular failure	30	32.6%	1
Left ventricular failure	25	27.1%	1
Maximum pearl score			9
[Table/Fig-2] : Predictors of readmission, the PEARL score			

Variables	Frequency (n=92)	Percentages (%)
AGE (years)		
<30	1	1.08
31-50	38	41.3
51-70	48	52.17
>70	5	5.43
GENDER		
Males	77	83.69%
Females	15	16.30%
BMI		
Underweight	32	34.78
Normal	38	41.3
Overweight	18	19.5
Obesity	4	4.34
Co-morbidities		
Diabetes Mellitus (DM)	7	7.608%
Hypertension (HTN)	24	26.08%
Both DM& HTN	41	44.56%
Heart failure	55	59.7%
H/o Smoking		
Current smokers	44	47.82%
Ex-Smokers	37	40.21%
Non-Smokers	11	11.95%
TREATMENT		
Compliance	44	47.82%
Non-compliance	48	52.17%
[Table/Fig-1]: Demographics and baseline clinical characteristics of the study population.		

Risk	PEARL score	Frequency	Percentage
Low	0 1	0 0	0 0
Intermediate	2 3 4	1 2 4	1.08 % 2% 4.34%
High	5 6 7 8 9	35 27 17 6 0	38.04% 29.3% 18.47% 6.52%
Total		92	
[Table/Fig-3] : PEARL score in readmission			

DISCUSSION

The present study identified male sex, previous hospitalizations, current smoking habit, treatment non-compliance and comorbidities such as heart failure, diabetes, hypertension as the potential risk factors for re-admission.

Rehospitalization for acute exacerbations of COPD has resulted in significant epidemiological and economic burdens that significantly impact health systems worldwide. COPD exacerbations are associated with increased morbidity and mortality. Individuals who have experienced one moderate exacerbation of COPD have an increased risk of respiratory and all-cause mortality compared to those without an exacerbation.

Respiratory infections, most commonly viruses (eg; rhinoviruses) or bacteria, are estimated to cause about 70% of COPD exacerbations.1
In our study re-admission rates are more among patients age group 51-70 Years (48%), the mean age was 62.28±11.38 with male predominance about 83.69%. Higher re-admission rates in males were due to higher rates of smokers and lower adherence to medical advice. Similar studies were done by Chittaluru et al 6 and Huanrong Ruan et.al 5 found that older age, male sex, and heart failure were potential risk factors for re-admission. The older age group was more prone to infections due to diminished immune response. Complicating comorbid illnesses in this age group in turn increases the risk of COPD exacerbations and readmissions.

As with exacerbations prior, the strength of the relationship increased with the number of comorbidities. Some of the comorbidities found to be associated with exacerbations of COPD share common biological mechanisms for systemic inflammation, such as cardiovascular disease, diabetes, and depression. [7]

Cardiovascular comorbidities are common in patients with COPD, particularly in those patients with more severe airflow limitation. 8-10
In our study comorbidities such as diabetes, hypertension, and heart failure are associated with higher readmission rates which are similar to the study done by Huanrong Ruan et.al in which length of stay and comorbidities such as cancer, diabetes, and malnutrition are closely related to re-admissions.5 In addition, other respiratory complications were also associated with exacerbations, including asthma and bronchiectasis, in which pathogenesis was airway inflammation.11
Exacerbations of COPD have a profound effect on the cardiovascular status of the patient. Reducing cardiovascular risk may be a key goal in reducing the occurrence of exacerbations.8-10 Since a substantial proportion of readmissions are not due to COPD itself but related to comorbidities, optimal management of these conditions and COPD may reduce the risk of future COPD exacerbations and improve quality of life. [12,13]

In our study majority of the patients have more than 1 previous exacerbation requiring hospitalization. Exacerbation is known to result in the hospitalization of COPD patients with damaging effects on the health and mortality of COPD.7 The results of our review support the concept of a ' frequent exacerbation phenotype' that is prone to readmission regardless of disease severity.

A similar study by N. Bhatta et al. in which major and minor criteria were identified predicting AE of COPD readmissions. This includes >2 exacerbations per year, diabetes, active smoking, hypercapnic respiratory failure, any comorbidities, male sex, poor adherence to inhalers, GOLD stage D, elevated CRP, and shorter stay of hospitalisation.14 Previous reviews indicated that the history of hospitalization in the year prior to admission was a key interpreter of

COPD re-admissions .[15,16,17] Most of the patients in our study had treatment non-compliance. Adherence to treatment is a key factor in the successful prevention of exacerbations Poor medication adherence in COPD adversely affects long-term disease outcome.18

In our study, majority were active smokers, 55 (59.78%), which is similar to that reported by Elena Badaran et al. [19]

Smoking cessation has had a significant impact on COPD natural history and is associated with symptom relief and improved health status. Increasing participation in smoking cessation programs may reduce the risk of exacerbations by targeting modifiable risk factors, especially at discharge, when patients are specifically motivated to quit smoking to avoid severe exacerbations.

COPD is a chronic, consuming disease that not only affects the lungs but also has a variety of extra pulmonary effects, including Poor nutritional status or malnutrition.[20]

Malnutrition was an important factor influencing prognosis and was associated with a significantly increased risk of readmission within 30 days of hospital discharge.21 However, this was not the case in our study. To slow the progression of COPD, supplementation and gaining weight appropriately is recommended. Because of this high readmission rate and many risk factors for COPD readmission, it is important to strengthen follow-up management after hospital discharge.

In our study, readmission was significantly higher in high risk (n=85, 92.39%) and intermediate risk (n=7, 7.06%) similar to study done by Meena N. Kishor et al in which High-risk PEARL groups had higher readmission rates. 7 The readmission rates are similar to study done by Echevaria C et al 4 done to predict 90 day readmission or death after hospitalization following acute exacerbation of COPD using the PEARL score which found considerably higher risk of readmission or death within the high risk (66.4%) and intermediate (42.1%) PEARL groups.

The PEARL Score is a novel scoring system that represents an important conceptual step towards a multidimensional approach to COPD patients beyond the traditional spirometry evidence-based assessment of airway obstruction. 4The readmissions from our study indicate that patients with higher PEARL scores are more severely ill and more likely to be readmitted. This may have particular implications for clinicians to identify high-risk patients in post-discharge planning.

For patients hospitalized with COPD exacerbations, formal discharge criteria and a comprehensive discharge plan can help reduce readmissions and recurrent exacerbations. After severe exacerbation, pulmonary rehabilitation may be offered to restore pre-exacerbation functional status, resume normal physical activity, improve quality of life, and reduce risk of further exacerbation. Self-administered intervention programs improve outcomes. A disease management plan for COPD should include an exacerbation prevention action plan designed jointly with the physician and the patient.

CONCLUSION

- High PEARL score, treatment non-compliance and current smoking are some of the factors which may predict the re-admissions.
- Particular attention to such predictors may help to identify subgroup of COPD patients with a high risk of re-admission in order to encourage rehabilitation programs so that the health costs can be reduced.

REFERENCES

1. Global Initiative For Chronic Obstructive Lung Disease (GOLD) Global strategy for the diagnosis ,management and prevention of COPD ;2023
2. World health organization (WHO).Burden of copd.geneva:WHO;2020
3. Chia Wei Kong and Tom M.A. Wilkinson. Predicting and preventing hospital readmission for exacerbations of COPD. ERJ Open Res 2020; 6: 00325-2019
4. Echevarria C, Steer J, Heslop-Marshall K, et al. The PEARL score predicts 90-day readmission or death after hospitalisation for acute exacerbation of COPD. Thorax 2017; 72: 686–693.
5. Huanrong Ruan, Hailong Zhang, Jiajia Wang, Hulei Zhao , Weihong Han , Jiansheng Li. Readmission rate for acute exacerbation of chronic obstructive pulmonary disease: A systematic review and meta-analysis. Respiratory Medicine 2022; 206 :107090
6. Chittaluru KP, Mohan KM, Aswini KM, Kalyana CP. Power of BODE index in predicting future exacerbations of COPD: a prospective observational study in Indian population. J Assoc Phys India 2019; 67:14–16
7. Meena N. Kishor, Narendra Khippal, Yogendra S. Rathore, Shubhra Jain, Vinod Joshi. Evaluation of PEARL score in assessingprognosis among patients with acute exacerbation of chronic obstructive pulmonary disease. The Egyptian Journal of Chest Diseases and Tuberculosis, 2020 ; 69:627–630
8. MacDonald MI, Shafuddin E, King PT, Chang CL, Bardin PG, Hancox RJ. Cardiac dysfunction during exacerbations of chronic obstructive pulmonary disease. Lancet Respir Med. 2016;4 (2):138–148.
9. McAllister DA, Maclay JD, Mills NL, et al. Diagnosis of myocardial infarction following hospitalisation for exacerbation of COPD. Eur Respir J. 2012;39 (5):1097–1103.
10. Patel AR, Kowlessar BS, Donaldson GC, et al. Cardiovascular risk, myocardial injury, and exacerbations of chronic obstructive pulmonary disease. Am J Respir Crit Care Med. 2013;188 (9):1091–1099.
11. Polverino E, Dimakou K, Hurst J, Martinez-Garcia MA, Miravitlles M, Paggiaro P, Shteinberg M, Aliberti S, Chalmers JD. The overlap between bronchiectasis and chronic airway diseases: state of the art and future directions. Eur Respir J. 2018;52:1800328
12. Bahadori K, FitzGerald JM. Risk factors of hospitalization and readmission of patients with COPD exacerbation: systematic review. Int J Chron Obstruct Pulmon Dis. 2007;2(3):241–251.
13. Shah T, Churpek MM, Coca PM, Konetzka RT. Understanding why patients with COPD get readmitted: a large national study to delineate the Medicare population for the readmissions penalty expansion. Chest. 2015;147(5):1219–1226.
14. N. Bhatta, K. Bhandari, N. Bhatta, D. R. Mishra, D. Bhattarai, A. B. Acharya, A. Verma, R. Sahi , S. H. Limbu 1, S. Katwal; Predicting Hospital Readmission Due to Acute Exacerbation of Chronic Obstructive Pulmonary Disease (AECOPD); Audit of Pulmonary Discharge Summary from Developing Country. AMJ Respir Crit Care Med 2022; 205: A1462.
15. E. Crisafulli, A. Torres, A. Huerta, R. M´endez, M. Guerrero, R. Martinez, et al., C reactive protein at discharge, diabetes mellitus and ≥ 1 hospitalization during previous year predict early readmission in patients with acute exacerbation of chronic obstructive pulmonary disease. COPD 2015; 12 (3): 306–314.
16. R. Gavish, A. Levy, O.K. Dekel, E. Karp, N. Maimon, The association between hospital readmission and pulmonologist follow-up visits in patients with COPD, 2015; Chest 148 (2): 375–381.
17. S. Hartl, J.L. Lopez-Campos, F. Pozo-Rodriguez, A. Castro-Acosta, M. Studnicka, B. Kaiser, et al., Risk of death and readmission of hospital-admitted COPD exacerbations. European COPD Audit, Eur. Respir. J. 2016: 47 (1):113–121.
18. Mäkelä MJ, Backer V, Hedegaard M, Larsson K. Adherence to inhaled therapies, health outcomes and costs in patients with asthma and COPD. Respir Med.2013;107(10):1481-90.
19. Elena Badaran, Ezequiel Ortega, Carlos Bujalance, Lola Del Puerto, Mirian Torres, Juan Antonio Riesco. Smoking and COPD exacerbations. Euroepan Respiratory Journal 2012 40 : P1055
20. Kalu´zniak-Szymanowska A, Krzyminska-Siemaszko R, Deskur-Smielecka E, ´ Lewandowicz M, Kaczmarek B, Wieczorowska-Tobis K, Malnutrition, sarcopenia, and malnutrition-sarcopenia syndrome in older adults with COPD.Nutrients 2021; 14 (1): 44.
21. Zapatero A, Barba R, Ruiz J, Losa J.E, Plaza S, Canora J. et al., Malnutrition and obesity: influence in mortality and readmissions in chronic obstructive pulmonary disease patients. J. Hum. Nutr. Diet. 2013; (26):16-22.