International Journal of Life Sciences, Biotechnology and Pharma Research Vol. 13, No. 9, September 2024 Online ISSN: 2250-3137
Print ISSN: 2977-0122

DOI: 10.69605/ijlbpr_13.9.2024.78

Original Research

Comparison Of Hemodynamic And Laboratory Parameter Between Hospital Admission And Readmission Rates In Acute Exacerbation Of COPD Patients

[1]Dr. Sandeep Kumar Parihar, [2]Dr. Vandana Rawat, [3]Dr. Pankaj Kumar Jain, [4]Dr. Poorva Parihar

[1]Senior resident, Department of Respiratory Medicine, Nandkumar Singh Chouhan Government Medical College, Khandwa, Madhya Pradesh, India
[2]Senior Resident, Department of General Medicine, Nandkumar Singh Chouhan Government Medical College, Khandwa, Madhya Pradesh, India
[3]Associate Professor, Department of General Medicine, Nandkumar Singh Chouhan Government Medical College, Khandwa, Madhya Pradesh, India
[4]Assistant Professor, Department of General Medicine, Nandkumar Singh Chouhan Government Medical College, Khandwa, Madhya Pradesh, India

Corresponding Author
Dr. Pankaj Kumar Jain
Associate Professor, Department of General Medicine, Nandkumar Singh Chouhan Government Medical College, Khandwa, Madhya Pradesh, India
Email: drpankajjain07@gmail.com

Received: 25/08/2024 Accepted: 29/09/2024

ABSTRACT

Background: The readmission rate following hospitalization for chronic obstructive pulmonary disease (COPD) exacerbations is extremely high and has become a common and challenging clinical problem in developing countries.

Aim: To compare clinical, radiographic, and laboratory characteristics of acute exacerbation of COPD patients among admission and re-admission group.

Materials and methods:140 patients with AECOPD were recruited in admission group and 50 in re-admission group. Hemodynamic parameters (respiratory rate, SPo_2, Heart rate, blood pressure), radiological findings (2D ECHO and chest x-ray), blood investigation (total leucocyte count & hemoglobin concentration), and sputum gram staining findings were analysed and compared in both the groups

Results: Among re-admission group, suggestive of respiratory acidosis was 72% and tachycardia were 66% respectively. Dyspnea and Tachypnea were significantly higher in re-admission group as compared to admission group ($p<0.05$).Prevalence of left heart failure was 20% and suggestive of PAH was 26% in readmission group ($p>0.05$). Pneumonitis and neumothorax was more among re-admission group. Leukocytosis was 58%, polycythemia was 10% and anemia was 14% in readmission group, not significantly differ from admission group ($p>0.05$)

Conclusion: Addressing risk factors, supporting patient education and maximizing treatment compliance are the key elements for minimizing re-admission rates in AECOPD patients

Keywords: Acute exacerbation of chronic obstructive pulmonary disease, admission, Readmission, hemodynamic parameters Biomarkers

INTRODUCTION

Chronic Obstructive pulmonary disease is common, preventable and treatable disease that is characterized by persistent respiratory symptoms and airflow limitation and that is due to airway or alveolar abnormalities usually caused by significant exposure to noxious particles or gases or influenced by host factors including abnormal lung development. An exacerbation of COPD is defined as an acute worsening of respiratory symptoms that result in additional therapy [1].Chronic obstructive pulmonary disease (COPD) is a

DOI: 10.69605/ijlbpr_13.9.2024.78

leading cause of morbidity and mortality globally, imposing a massive socioeconomic burden on the global healthcare system [2, 3]. Moderate or severe COPD affects more than 65 million people worldwide and causes more than three million deaths annually [4]. It is estimated that by 2030, more than 4.5 million people will die from COPD and related comorbidities every year [5], accounting for approximately 8.6% of global deaths [6].COPD is the fourth major cause of death and may rise to the third leading cause of death by 2030 according to the prediction of the World Health Organization [7]. For COPD patients surviving hospitalization due to COPD exacerbations, readmission is a major clinical problem. COPD hospital readmissions contribute to a clinical and economic burden on patients and society [8]. Identifying and mitigating risk factors for readmission is, therefore, essential [9, 10]. A recent systematic review and meta-analysis of nearly four million COPD patients found that the all-cause readmission rate at 30 days ranged from 9% to26%, and from 18% to 39% at 90 days [11]. The commonest risk factors for all-cause readmissions within 30 and 90 days were comorbidities, previous exacerbations and hospitalizations, and increased length of stay during the initial admission [11]. Despite global policy makers' initiatives to apply financial penalties to hospitals with higher readmission rates, limited impact on changing readmission has been observed [12].
Globally, the prevention and reduction of readmission have been recognized as high-priority management strategies. Early identification of patients at higher risk of readmission and providing timely treatment could minimize this risk.

Aims & objectives: We aimed to identify hemodynamic and laboratory characteristics that might help distinguish acute exacerbation of COPD in terms of hospital admission and readmission rates.

MATERIAL AND METHODS

This was a comparative observational hospital based study conducted in the department of respiratory medicine, at school of excellence in pulmonary medicine in Netaji Subhash Chandra Bose Medical College & Hospital Jabalpur (M.P) from March 2021 to August 2022 (18 months duration).

Inclusion criteria

- Patients ≥ 18 years of age with both gender
- Patients those were readmitted within 90 days after admission in hospital due to acute exacerbation of COPD
- Patients who are willing to give consent for the study

Exclusion criteria

- Follow up cases of COPD without exacerbation
- Patients readmitted after 90 days of acute exacerbation of COPD
- Respiratory disease cases other than COPD
- Patient who are not willing to give consent for my study

Admission group: enrolled140 patients admitted in our hospital during study period

Re-admission group: enrolled 50 patients re-admitted within ninety days of admissionin our hospital.
Information of both the groups were collected in the form of patient demographics, clinical characteristics(pneumonitis, neumothorax or no lesion), history (previous exacerbation, comorbidities, previous hospitalization), hemodynamic parameters (respiratory rate, SPo_2, Heart rate, blood pressure), radiological findings (ABG,2D ECHO and chest x ray)blood investigation (total leucocyte count & hemoglobin concentration), and sputum gram staining were done for all the study patients.
All clinical and laboratory investigation were analysed and compared among both the groups.

Statistical analysis: Data was analysed using SPSS 25.0 software. The quantitative variables were summarized as mean and quality variables as proportion (%). Comparison was done using t test and qualitative variables was compared using chi – squared test or fisher exact test. p value of <0.05 was taken as significant.

RESULT

Hemodynamic parameters of 140 patients of admission group and 50 patients of re-admission group were analysed.
Among re-admission group, respiratory acidosis was 72%, suggestive of dyspnea was 100%, suggestive of Tachypneawas 94% and suggestive of tachycardia were 66% respectively. Dyspnea and Tachypnea were significantly higher in re-admission group as compared to admission group ($p<0.05$)

DOI: 10.69605/ijlbpr_13.9.2024.78

Table 1: Patient distribution as per vital parameters

Hemodynamic parameters		Admission group	Readmission group	P value
Respiratory acidosis (ABG)	Yes	79 (56.4%)	36 (72%)	0.066
	No	61 (43.5%)	14 (28%)	
SPO_2	<88	56 (40%)	50 (100%)	**0.001**
	>88	84 (60%)	0 (0%)	
Respiratory rate	>22	138 (98.5%)	47 (94%)	**0.044**
	<22	2 (1.42%)	3 (6%)	
Heart rate	>100	80 (57.1%)	33 (66%)	0.182
	<100	60 (42.8%)	17 (34%)	

On blood investigation findings suggestive of leukocytosis was 58%, suggestive of polycythemia was 10% and anemia was 14% in readmission group, not significantly differ from admission group (p>0.05)

Table 2: Patient distribution as perTLC Count and Hemoglobin

Laboratory Parameters		Admission group	Readmission group	P value
WBC Count	>11000	61 (43.5%)	29 (58%)	0.174
	4000 - 11000	79 (56.4%)	21 (42%)	
	<4000	0 (0%)	0 (0%)	
Hemoglobin Concentration	>17	5 (3.5%)	5 (10%)	0.993
	12-16	127 (90.7%)	38 (76%)	
	<12	8 (5.7%)	7 (14%)	

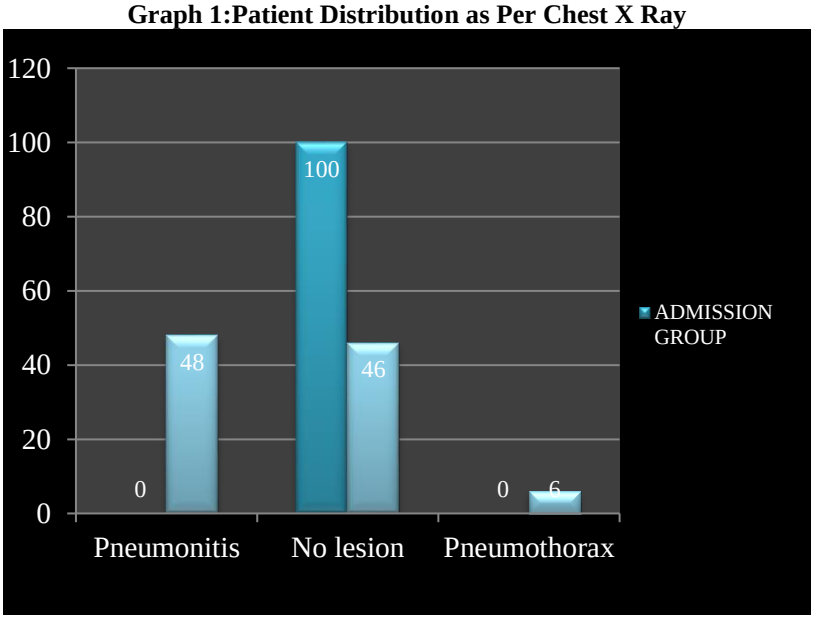
Prevalence of left heart failure was 20% and suggestive of PAH was 26% in readmission group, not significantly differ from admission group (p>0.05)

Table 3: Patient distribution as per heart failure and PASP

Hemodynamic status		Admission group	Readmission group	P value
LVEF	<50	13 (9.1%)	10 (20%)	0.263
	>50	127 (90.7%)	40 (80%)	
PASP	<25	117 (83.5%)	37 (74%)	0.347
	>25	23 (16.4%)	13 (26%)	

Pulmonary lesions (pneumonitis and neumothorax were significantly more among re-admission group (p<0.05)

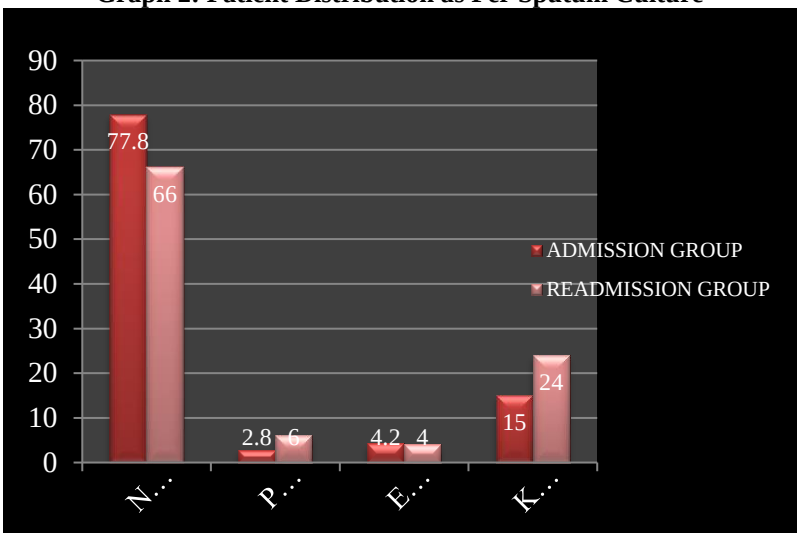
Graph 1:Patient Distribution as Per Chest X Ray



On sputum culture, finding suggestive of prevalence of pyogenic growth was higher (34%) in readmission group as compared to admission group (22%).

DOI: 10.69605/ijlbpr_13.9.2024.78

Graph 2: Patient Distribution as Per Sputum Culture



DISCUSSION

Readmissions for acute exacerbations of COPD have brought about a significant epidemiological and economic burden, which has had a great impact on global public health healthcare systems. Exacerbation is known to result in frequent hospitalization of COPD patients with damaging effects on health and mortality of COPD. These findings support the concept of 'frequent exacerbation phenotypes' that are susceptible to readmission, irrespective of the severity of their disease [13-14].

In our study the prevalence of type 2 respiratory failure and corpulmonale was higher among readmission group as compared to admission group, but difference was not significant statistically ($p>0.05$), in agreement with the Ruan H, et al [15] and Echevarria C, et al [16].

Present study found dyspnea and Tachypnea were significantly higher among re-admission group as compared to admission group patients, similar results also reported by Chidiamara M.et al [17] and Pratt et al [18].

The prevalence of left ventricular failure was lower among admission group as compared to readmission group of acute exacerbation of COPD patients, concordance with the Chu CM, et al [19].

We have observed that pneumonitis and neumothorax were significantly more among re-admission group as compared to admission group of AECOPD patients, these findings correlates with the Chen and Chen, et al [20].

In this study raised WBC count was higher in re-admission patients as compared to admission group, but no statistical significant difference was found ($p>0.05$), our results were comparable to Kong CW, et al [21].

Higher rates of readmissions were related to lower patient experience measures in all domains including communication and discharge information [91], indicating that information provision has a positive impact [22].

Readmission occurs due to both a heightened risk of re-exacerbation and a loss of function and resilience driven by an index event. Future strategies to prevent readmission will need to focus on addressing risk factors including comorbidities and frailty, supporting patient education and maximizing treatment compliance.

CONCLUSION

We have concluded that various clinical and hemodynamic parameters were responsible for worsening of respiratory symptoms which leads to frequent exacerbation and readmission.By Controlled this various factor it could be possible to prevent disease progression and frequent exacerbation and readmission

Source of funding: none

Conflicts of interest: none

REFERENCES

1. Wedzicha JA, Wilkinson T. Impact of chronic obstructive pulmonary disease exacerbations on patients and payers. Proc Am Thorac Soc 2006; 3: 218–221.
2. GBD Chronic Respiratory Disease Collaborators, Prevalence and attributable health burden of chronic respiratory diseases, 1990-2017: a systematic analysis for the Global Burden of Disease Study 2017, Lancet Respir. Med. 8 (6) (2020) 585–596.
3. A.U. Rehman, M.A. Ahmad Hassali, S.A. Muhammad, S. Shah, S. Abbas, I.A. B. Hyder Ali, et al., The economic burden of chronic obstructive pulmonary disease (COPD) in the USA, Europe, and Asia: results from a systematic review of the literature, Expert Rev. Pharmacoecon. Outcomes Res. 20 (6) (2020) 661–672.

DOI: 10.69605/ijlbpr_13.9.2024.78

4. World Health Organization, Burden of chronic obstructive pulmonary disease. htt p://www.who.int/respiratory/copd/burden/en/. (Accessed 2 June 2022).
5. World Health Organization, Projections of mortality and causes of death, 2015 and 2030.http://www.who.int/healthinfo/global_burden_disease/projections/en/. (Accessed 3 June 2022).
6. C.D. Mathers, D. Loncar, Projections of global mortality and burden of disease from 2002 to 2030, PLoS Med. 3 (11) (2006) e442.
7. Decramer M, Janssens W, Miravitlles M. Chronic obstructive pulmonary disease. The Lancet. 2012; 379(9823):1341–51.
8. Jencks SF, Williams MV, Coleman EA. Re-hospitalizations among patients in the Medicare fee-for-service program. N Engl J Med. 2009; 360(14):1418–1428. Doi: 10.1056/NEJMsa0803563.
9. Iacobucci G. Hospital readmissions for COPD in England are rising, audit shows. BMJ. 2017; 356:j557. doi:10.1136/bmj.j557.
10. Stone RAH-BJ, Lowe D, McMillan V, et al. COPD: Who Cares When It Matters Most? National Chronic Obstructive Pulmonary Disease (COPD) Audit Programme: Outcomes from the Clinical Audit of COPD Exacerbations Admitted to Acute Units in England 2014. National Supplementary Report. London: RCP; 2017. Available from: www.rcplondon.ac.uk/copd-outcomesreport2014. Accessed September 30, 2021.
11. Alqahtani JS, Njoku CM, Bereznicki B, et al. Risk factors for all-cause hospital readmission following exacerbation of COPD: a systematic review and meta-analysis. Eur Respir Rev. 2020; 29(156):190166. doi:10.1183/16000617.0166-2019.
12. Myers LC, Faridi MK, Hasegawa K, Hanania NA, Camargo CA. The hospital readmissions reduction program and readmissions for chronic obstructive pulmonary disease, 2006–2015. Ann Am Thorac Soc. 2019; 17(4):450–456. doi:10.1513/AnnalsATS.201909-672OC.
13. T. Shah, V.G. Press, M. Huisingh-Scheetz, S.R. White, COPD readmissions: addressing COPD in the era of value-based health care, Chest 150 (4) (2016) 916–926, https://doi.org/10.1016/j.chest.2016.05.002. Epub 2016/05/12, PubMed PMID: 27167208; PubMed Central PMCID: PMCPMC5812767
14. J.R. Hurst, J. Vestbo, A. Anzueto, N. Locantore, H. Müllerova, R. Tal-Singer, et al., Susceptibility to exacerbation in chronic obstructive pulmonary disease, N. Engl. J. Med. 363 (12) (2010) 1128–1138, https://doi.org/10.1056/NEJMoa0909883. PubMed PMID: 20843247.
15. Huanrong Ruana, Hailong Zhanga,* Jiajia Wanga, Hulei Zhaoa, Weihong Hana, Jiansheng Lia, Readmission rate for acute exacerbation of chronic obstructive pulmonary disease: A systematic review and meta-analysis, Respiratory Medicine 206 (2023) 107090
16. Echevarria C, Steer J, Heslop-Marshall K, et al. Thorax 2017;72:686–693
17. Chidiamara M. Njokua, Jaber S. Alqahtanib, Barbara C. Wimmera, Gregory M. Petersona, Leigh Kinsmand, John R. Hurstb, Bonnie J. Bereznickie, Risk factors and associated outcomes of hospital readmission in COPD: A systematic review, RespiratoryMedicine173(2020)105988
18. Alexandre J. Pratt, Andrew Purssell, Tinghua Zhang, Vanessa P. J. Luks, Xavier Bauza, Sunita Mulpuru, Miranda Kirby, Shawn D. Aaron and Juthaporn Cowan, Complexity in clinical diagnoses of acute exacerbation of chronic obstructive pulmonary disease, BMC Pulmonary Medicine (2023) 23:298
19. Chu CM, Chan VL, Lin AWN, et al. Readmission rates and life threatening events in COPD survivors treated with non-invasive ventilation for acute hypercapnic respiratory failure. Thorax 2004; 59: 1020–1025.
20. Lili Chen and Shiping Chen, Prediction of readmission in patients with acute exacerbation of chronic obstructive pulmonary disease within one year after treatment and discharge, BMC Pulm Med (2021) 21:320
21. Kong CW, Wilkinson TMA. Predicting and preventing hospital readmission for exacerbations of COPD. ERJ Open Res 2020; 6: 00325-2019 [https://doi.org/10.1183/23120541.00325-2019].
22. Rinne ST, Castaneda J, Lindenauer PK, et al. Chronic obstructive pulmonary disease readmissions and other measures of hospital quality. Am J Respir Crit Care Med 2017; 196: 47–55