

Study of Some Risk Factors in Acute Exacerbation of COPD at Tertiary Care Centre

Juhi R. Kadukar^{1*}, Ramesh Sundrani², Sushma Dugad³, Gauri Suhas Kulkarni⁴,
Jaspreet Singh Khandpur⁵ and Maya Mortale¹

¹Former PG Resident, Department of Respiratory Medicine, Dr. Vasant Rao Pawar Medical College, Nashik - 422203, Maharashtra, India; jui0309@gmail.com

²Professor and Head, Department of Respiratory Medicine, Dr. Vasant Rao Pawar Medical College, Nashik - 422203, Maharashtra, India

³Associate Professor, Department of Respiratory Medicine, Dr. Vasant Rao Pawar Medical College, Nashik - 422203, Maharashtra, India

⁴Professor, Department of Respiratory Medicine, Dr. Vasant Rao Pawar Medical College, Nashik - 422203, Maharashtra, India

⁵PG Resident, Department of Respiratory Medicine, Dr. Vasant Rao Pawar Medical College, Nashik - 422203, Maharashtra, India

Abstract

Background: Respiratory symptoms of patients usually worsen, which may be beyond normal day to day variation this is nothing but an acute event of a disease leading to further change in medication. Acute exacerbation of Chronic obstructive pulmonary disease is defined as sudden worsening of symptoms like in breathlessness, chest pain, change in quantity and colour of sputum, fever, these symptoms usually last for several days. These symptoms are aggravated by environmental pollutants, bacterial and viral infections wherein infections usually lead to 75% or more of the exacerbations but improper inhaler technique is also one of the most important factors for causing exacerbation of Chronic Obstructive Pulmonary disease. **Aims and Objectives:** To study the risk factors for exacerbation of COPDs. **Methods:** Present sample consists of 51 diagnosed COPD patients who fulfilled eligibility criteria. Study was conducted in the department of Respiratory medicine from August 2016 to December 2018. Detailed history along with general and respiratory system examination was done and findings were recorded. **Results:** Most of the study population was present between 51 to 60 years (41.2%) of age group and rest were in 41 to 50 years (29.4%) and more than 60 years (29.4%). There was male predominance (64.7%) amongst study population as compared to females (35.3%). 82.4% of study population were taking inhaler improperly. 64.7 % of study population were exposed to outdoor pollution. 43.1% of study population are exposed to indoor pollution. **Conclusion:** Environmental stress are also involved in acute exacerbation of chronic obstructive pulmonary disease apart from viral and bacterial infections. Improper technique of using inhaler was also the main risk. So patients are advised proper & regular use of inhaler technique. Indoor and outdoor pollution is also main risk factor for exacerbation so avoidance of exposure to biomass fuel and outdoor pollution should be considered.

Keywords: Biomass Fuel, COPD, Improper Inhaler Technique, Indoor and Outdoor Pollution

1. Introduction

Chronic Obstructive Pulmonary Disease (COPD) is a

progressive chronic pulmonary disease characterized by decrease in exercise capacity, respiratory function and

*Author for correspondence

health status^{1,10}. Tobacco usage is responsible for increase in the prevalence of COPD².

Increasing environmental pollution is also another factor. During the course of illness, intermittently there are exacerbations of COPD symptoms with variations in frequency and severity. Exacerbations in COPD leads to short-term and long term effects on an individual's quality of life, health status, morbidity and mortality. Health related quality of life is determined by the number of frequency of exacerbations³.

Increased in the admission and readmission in hospital with increase in the burden on health resources are caused due to COPD exacerbations⁴. In-hospital mortality of Acute Exacerbation of COPD (AECOPD) can vary from 6% to 42%⁵. Various factors such as baseline lung function, cause of acute exacerbation, severity of illness, nutritional status of the patient, and need for mechanical ventilation are responsible for such a wide range of mortality. Numerous causes of AECOPD have been identified, the most common being lower respiratory tract infection. Bacteria, atypical organisms, and respiratory viruses lead to various respiratory infections causing about 50-70% of exacerbations⁶. Depending on season and geographic placement about 10% of exacerbations are due to environmental pollution⁷ and up to 30% of exacerbations are of unknown etiology⁵.

Acute exacerbations of chronic bronchitis have sputum from which bacteria's are isolated in 40% to 60% of patients. *Streptococcus pneumoniae*, *Haemophilus influenzae* and *Moraxella catarrhalis* are the three predominant bacterial species which are isolated. Morbidity in COPD patients is commonly caused by viral infections of the respiratory tract and whether healthy individuals are less vulnerable to viral infections than COPD patients is still unclear. According to some studies in certain COPD patient's viruses have been isolated more frequently while some have not⁸⁻¹¹. Exacerbations are more perpetually seen in winter months and during this season viral infections are more common in the community which is associated with nasal discharge, nasal obstruction, sneezing, sore throat, general malaise and cough. These symptoms are called as 'Coryza symptoms'¹². Relying on the serological conversion which acts as a marker of infection many studies gave indirect evidence of viral etiology of acute exacerbation of chronic obstructive pulmonary disease^{8,13}.

Identification of Viral DNA or RNA sequence is usually done by other better techniques like viral culture and polymerase chain reaction to identify viral RNA or DNA sequence^{10,14}.

Therefore we conducted this study to identify and distinguish the risk factors like infections, allergens, toxins, air pollution improper technique of using inhaler in case of acute exacerbation of COPD.

2. Aims and Objectives

To study risk factors of acute exacerbation in COPD patients.

3. Material and Methods

This was an observational study in the department of Respiratory medicine of tertiary health care institute, Nashik, during the period of August 2016 to December 2018 with a study population of 51. The patients included in this study were diagnosed COPD patients who getting admitted and having acute exacerbation. Patients who are not giving written informed consent and Patients with HIV positive status and having other causes of acute breathlessness like Pulmonary thromboembolism, Pneumothorax, Pneumonia, Pleural effusion, cardiac failure, Patients having tuberculosis and those who were newly diagnosed as COPD were excluded.

Detailed history along with general and respiratory system examination was done and findings were recorded in a predesigned proforma. All investigations done by the patient in the past and present was noted. The data which was collected was entered in Microsoft Excel sheet. This data was then transferred to SPSS software ver. 17 for analysis. Frequency and percentages showed Qualitative data and this data was analysed using chi-square test, while Mean and SD shows Quantitative data and this data was compared by t-test. Level of significance was taken as P-value < 0.05.

4. Observation and Results

As seen in Table 1, most of the study population belonged to the age group of 51-60 years.

Table 1. Age group among study population

Age group	Number of patients	Percentage
41 to 50 years	15	29.4 %
51 to 60 years	21	41.2 %
more than 60 years	15	29.4 %
Total	51	100.0 %

Table 2. Sex distribution amongst study population

Sex	Number of patients	Percentage
Female	18	35.3 %
Male	33	64.7 %
Total	51	100.0 %

Table 3. Inhaler technique amongst study population

Inhaler technique	Number of patients	Percentage
Improper	42	82.4 %
Proper	9	17.6 %
Total	51	100.0 %

Table 4. Outdoor pollution amongst study population

Outdoor pollution	Number of patients	Percentage
No	18	35.3 %
Yes	33	64.7 %
Total	51	100.0 %

64.7 % of study population, were exposed to outdoor pollution (table 4).

Table 5. Indoor pollution amongst study population

Indoor pollution	Number of patients	Percentage
No	29	56.9 %
Yes	22	43.1 %
Total	51	100.0 %

As seen in the table 2, there was male predominance (64.7%) amongst study population as compared to females (35.3%)

As seen in the Table 3, 82.4% of study population were taking inhaler improperly.

As seen in table 4, 64.7% of the patients were exposed to outdoor pollution. As seen in the table 5, 43.1% of study population were exposed to indoor pollution.

5. Discussion

Due to chronic exposure to toxic gases, smoke dust and air pollutants there is an abnormal inflammatory response of the lungs which causes permanent small airway obstruction and progressive breathlessness called as chronic obstructive pulmonary disease. According to GOLD guidelines COPD is defined as preventable and treatable disease which is characterized by persistent of respiratory symptoms and airflow limitation leading to airway and alveolar abnormalities usually caused by significant exposure to noxious particles or gases. The best method for treatment is prevention of exposure to air pollutants and smoke dust as obstruction caused by these irritants is untreatable.

5.1 Age Group

The study population in the this study belonged in the age group of 51 to 60 years (41.2%) and 41 to 50 years (29.4%) and more than 60 years (29.4%) with the mean age of 56.35 ± 8.48 years (table 1). Most Patients who have COPD were in the age group of 41 to 50 years as described by Asif Hasan *et al.*, in his study¹⁵. Guleria *et al.*, also found that most patients who have COPD were in range of age between 40 to 70 years¹⁶.

5.2 Sex

In the present study, there was male predominance (64.7%) amongst study population as compared to females (35.3%) (Table 2). Higher prevalence of COPD is seen in males due to a higher prevalence of smoking and males are more liable to develop COPD as they are more susceptible to smoking than females, hence COPD is usually a male dominant disease. Niranjana Mambally Rachaiah *et al.*, conducted a study and concluded that males were more prone to develop COPD than females wherein 88% of males were susceptible with a ratio between male and female was 6.33:1. This study showed

that all male were smokers and non smoker females were only 6, also most of them were exposed to smoke from burnt biomass fuels as cooking in Indian rural population is done using wood and cow dung which when burnt produces smoke and is an important risk factor for development of COPD usually in females¹⁹. In a study by Narayanagowda *et al.*,^{18,19} in which out of one hundred and seven (107) patients, seventy two (72) were male patients. In this present study, most of the study population had BMI (Body Mass Index) less than 20 (68.6%) followed by BMI 21 to 25 (27.5%), and BMI more than 25 (3.9%). It showed that less nutrition is also one of co- morbidity of COPD patients.

5.3 Smoking History

In the present study, 47.1% of study population were current smoker. Similarly the study by Narayanagowda *et al.*,¹⁹ in which out of 72, 45 (62.5%) were smokers and 27 (37.5%) were non-smokers¹⁹. Inhaler technique: In the present study, 82.4% of study population were taking inhaler improperly (Table 3). Ganguly *et al.*,²⁰ showed that 6% of MDI (Metered Dose Inhaler) and 16.12% DPI (Dry powder inhaler) were using inhaler improperly. Similarly, Molimard *et al.*,²¹ showed 62% patients using improper inhaler technique prone for increased risk of exacerbations.

5.4 Exposure to Pollution

In the present study, 64.7 % and 43.1% of patients were exposed to outdoor pollution and indoor pollution respectively. The study conducted by Niranjana Mambally Rachaiah *et al.*, has showed same findings which co-relates with this study¹⁷.

6. Conclusion

Though various factors are responsible for acute exacerbation of COPD like bacterial infections , viral infections, smoking, inadequate nutrition and indoor pollution but in our study out of 51 patients most of them were farmers from rural areas who belongs to low socio-economic status out of which 33 patients were exposed to outdoor pollution and 22 patients were exposed indoor pollution especially due to burning of biomass fuel while 47.1 % were smokers with 68.6% of Patients had low BMI with inadequate nutrition and 42 Patients had improper inhaler technique. 47.1% of the current smokers were

educated to stop smoking. The most important risk factors from our point of view which lead to acute exacerbations of COPD are exposure to indoor pollution which is biomass fuel exposure and outdoor pollution, improper inhaler technique and smoking.

To conclude, contributors to morbidity due to AECOPD are smoking behaviour, accessibility to health care, presence of co-morbidities like poor nutrition and improper inhaler technique. So proper education regarding correct use of inhaler, maintenance of adequate nutrition, avoidance of indoor air pollution in the form of biomass fuel, passive smoke should be advised.

7. References

1. Stockley RA. Neutrophils and the pathogenesis of COPD. *Chest*. 2002 May 1;121(5):151S-5S. https://doi.org/10.1378/chest.121.5_suppl.151S. PMID:12010844.
2. Lopez AD, Murray CC. The global burden of disease, 1990-2020. *Nat Med*. 1998; 4:1241-3. <https://doi.org/10.1038/3218>. PMID:9809543.
3. Seemungal TA, Donaldson GC, Paul EA, Bestall JC, Jeffries DJ, Wedzicha JA. Effect of exacerbation on quality of life in patients with chronic obstructive pulmonary disease. *American journal of respiratory and critical care medicine*. 1998 May 1;157(5):1418-22. <https://doi.org/10.1164/ajrccm.157.5.9709032>. PMID:9603117.
4. Pauwels R, Calverley P, Buist AS, Rennard S, Fukuchi Y, Stahl E, Löfdahl CG. COPD exacerbations: the importance of a standard definition. *Respiratory medicine*. 2004 Feb 1;98(2):99-107. <https://doi.org/10.1016/j.rmed.2003.09.001>. PMID:14971871.
5. Connors Jr AF, Dawson NV, Thomas C, Harrell Jr FE, Desbiens N, Fulkerson WJ, Kussin P, Bellamy P, Goldman L, Knaus WA. Outcomes following acute exacerbation of severe chronic obstructive lung disease. The SUPPORT investigators (Study to Understand Prognoses and Preferences for Outcomes and Risks of Treatments). *American journal of respiratory and critical care medicine*. 1996 Oct;154(4):959-67. <https://doi.org/10.1164/ajrccm.154.4.8887592>. PMID:8887592.
6. Ball P. Epidemiology and treatment of chronic bronchitis and its exacerbations. *Chest*. 1995 Aug 1;108(2):43S-52S.
7. Sunyer J, Saez M, Murillo C, Castellsague J, Martinez F, Antó JM. Air pollution and emergency room admissions for chronic obstructive pulmonary disease: a 5-year study. *American journal of epidemiology*. 1993 Apr 1;137(7):701-5.
8. Carilli AD, Gohd RS, Gordon W. A virologic study of chronic bronchitis. *N Engl J Med*. 1964; 270:123-7. <https://doi.org/10.1056/NEJM196401162700303>. PMID:14067009.
9. Monto AS, Bryan ER. Susceptibility to rhinovirus infection in chronic bronchitis. *Am Rev Respir Dis*. 1978; 118:1101-3.
10. Smith CB, Golden CA, Kanner RE, Renzetti AD Jr. Association of viral and Mycoplasma pneumoniae infections with acute respiratory illness in patients with chronic obstructive pulmonary diseases. *Am Rev Respir Dis*. 1980; 121:225-32.
11. Greenberg SB, Allen M, Wilson J, Atmar RL. Respiratory viral infections in adults with and without chronic obstructive pulmonary disease. *American journal of respiratory and critical care medicine*. 2000 Jul 1;162(1):167-73. <https://doi.org/10.1164/ajrccm.162.1.9911019>. PMID:10903237.
12. Wedzicha JA, Donaldson GC. Exacerbations of chronic obstructive pulmonary disease. *Respiratory care*. 2003 Dec 1;48(12):1204-15. <https://doi.org/10.1201/9780203913406.ch9>.
13. Stenhouse AC. Viral antibody levels and clinical status in acute exacerbations of chronic bronchitis: a controlled prospective study. *Br Med J*. 1968 Aug 3;3(5613):287-90. <https://doi.org/10.1136/bmj.3.5613.287>. PMID:4299087 PMID:PMCID:PMCID1986246.
14. Seemungal TA, Harper-Owen R, Bhowmik A, Jeffries DJ, Wedzicha JA. Detection of rhinovirus in induced sputum at exacerbation of chronic obstructive pulmonary disease. *European Respiratory Journal*. 2000 Oct;16(4):677-83. <https://doi.org/10.1034/j.1399-3003.2000.16d19.x>. PMID:11106212 PMID:PMCID:PMCID7163563.
15. Hasan A, Ashraf MU, Naaz S, Bhargava R, Ashraf J. A study of clinical and echocardiographic profile of patients of chronic obstructive pulmonary disease helping in early diagnosis of Cor pulmonale. *International Journal of Enhanced Research in Medicines and Dental care*, ISSN. 2014:2349-1590.
16. Guleria JS, Pande JN, Gupta RG. Chronic obstructive lung disease in Northern India. *American Review of Respiratory Disease*. 1969 Oct;100(4):490-8.
17. Dirkje PS, Huib KAM. Epidemiology and natural history of chronic obstructive pulmonary disease. John GG, Duncan GM, Ulrich C, Peter SJ, Bryan C, editors. *Respiratory Medicine*. 3rd ed. Saunders; 2003. p. 1109-1120.
18. Rachaiah NM, Rachaiah JM, Bhadravathi RK. A correlative study of spirometric parameters and ECG changes in patients with chronic obstructive pulmonary disease. *Int J Biol Med Res*. 2012; 3(1):1322-6.

19. Narayanagowda DS, Golia S, Jaiswal J, Manasa SS. A bacteriological study of acute exacerbation of chronic obstructive pulmonary disease over a period of one year. *Int J Res Med Sci* 2015; 3:3141-6. <https://doi.org/10.18203/2320-6012.ijrms20151152>.
20. Ganguly A, Das AK, Roy A. Study of proper use of inhalation devices by bronchial asthma or COPD patients attending a tertiary care hospital. *J Clin Diagn Res.* 2014; 8(10):HC04-7. <https://doi.org/10.7860/JCDR/2014/9457.4976>. PMID:25478367 PMCID:PMC4253185.
21. Molimard M, Rahersion C, Lignot S. Chronic obstructive pulmonary disease exacerbation and inhaler device handling: Real-life assessment of 2935 patients. *Eur Respir J.* 2017; 49(2). <https://doi.org/10.1183/13993003.01794-2016>. PMID:28182569.

How to cite this article: Kadukar JR, Sundrani R, Dugad S, Kulkarni GS, Khandpur JS and Mortale M. Study of Some Risk Factors in Acute Exacerbation of COPD at Tertiary Care Centre. *MVP J. Med. Sci.* 2020; 7(1):98-103.