Original Research

# Evaluation of Respiratory Failure in Patients with Chronic Obstructive Pulmonary Disease

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**Objectives:** The present study focuses to evaluate the clinical profile, investigations, treatment protocol and the response to the therapy in patient of chronic obstructive pulmonary disease (COPD) presenting with Respiratory failure.

**Materials and Methods:** All patients diagnosed with COPD with respiratory failure admitted in IPD in the Department of Respiratory Medicine R. D. Gardi Medical College, Ujjain. Patient's detailed history includes clinical examination, chest radiograph, arterial blood gas analysis and relevant blood test were checked then analysed followed by treatment.

**Results:** 83.3% of patients were males with mean age of 65 years. From conducted study, it was found that 80% risk factor was smoking for COPD with respiratory failure. Nearly 70% cases were having type 2 respiratory failure. The main causes of exacerbations were bronchospasm (88.3%) and secondary infection (68.4%). 65% and 23.3% of the patients were discharged on room air with medical treatment and on home oxygen with medical treatment, respectively whereas 3.33% patients discharged with NIV along with medical treatment and during hospitalization 5 patients were died.

**Conclusion:** The holistic approach emphasizes toward COPD patient with respiratory failure. Early diagnosis, prompt treatment, pulmonary rehabilitation and vaccination are mainstay of management modalities and to prevent further exacerbation in patients.

**Access this article online**

**Website:** www.cijmr.com

**Keywords:** Cheast disoder, Chronic Obstructive Pulmonary Disease (COPD), Holistic therapy, Respiratory Failure.

10.58999/cijmr.2022.114

## Introduction

COPD is a long term and progressive disease which is common and curable that depicts airflow limitation and persistent respiratory symptoms. Respiratory symptoms which are most commonly present in patients of chronic obstructive pulmonary disease (COPD) are dyspnoea, cough and or sputum production.[1]

The main cause of morbidity and mortality in COPD patients is tobacco smoking[2,3] other causes are environmental exposure like outdoor air pollutants, indoor air pollutants, occupational dust, vapours and fumes biofuel mass etc.[4,5]

Pathogenesis of COPD is an abnormal inflammatory response to inhaled particles and gases in the lung resulted chronic airflow limitation. In susceptible smokers it seems to to be different airspace inflammation which involves a predominance of neutrophils, CD8 T lymphocytes, and macrophages.[6,7] Oxidative stress and an excess of proteinase in the lung are reason behind the modify lung inflammation.[8]

In acute exacerbations of COPD, increase ventilation–perfusion mismatch, hypoxemia muscle overload may occur that lead to hypercapnic respiratory failure. In case of acute disease like respiratory failure, the patient may be unable to maintain normal blood gases which may lead to type II respiratory failure or hypercapnic possibly causes death of patients with COPD.[9]

Chest ray and CT scan, ABG, 2D Echo were other investigation done to diagnose and assess the patient.[10]

Pharmacological therapy for COPD is useful in reducing frequency and severity of exacerbation. *e.g.* bronchodilators, steroids, antibiotics, antimuscarinics, diuretics and others drugs.[11] To counteract hypoxemia and breathing issue of patients dealing with acute COPD with acute respiratory failure, controlled oxygen delivery is a reasonable and effective approach. Non-invasive ventilation is highly recommended and useful in reducing the risk for invasive ventilation and the associated complications, so it is fair enough to use in patients with mild to moderate respiratory acidosis and

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Submitted: 04/05/2022 Revision: 01/06/2022
Accepted: 01/06/2022 Published: 30/06/2022



**How to cite this article:** Shrivastava HK, Shah BA, Julka A, Dubey M, Mishra S. Evaluation of Respiratory Failure in Patients with Chronic Obstructive Pulmonary Disease. Central India Journal of Medical Research. 2022;1(1):20-23.

long term oxygen therapy (LTOT) is strongly beneficial to improve hemodynamic parameters and long-term prognosis in patients suffering from COPD.[11,12]

### *Objectives*

The aim is to evaluate the clinical profile, investigations, treatment protocol and the response to the therapy in patient of COPD presenting with Respiratory failure.

## Material and Method

It is an observation study conducted between January 2019 to January 2020 in IPD, Department of Respiratory Medicine, R.D Gardi Medical College, Ujjain (MP). A total of 60 patients were included and admitted after they gave a signed consent form saying that patients were aware in detailed about the conducted study.

All the included patients underwent detailed history, examination, chest radiograph, HRCT thorax, arterial blood gas analysis, spirometry, all relevant blood investigation. Patient's relevant data was collected in a pre-approved proforma. The data collected was put in the SPSS and analysis was done.

**Table 1:** Risk factor wise distribution of patients of COPD with Respiratory failure

| *Risk Factors* | *Frequency* | *Percent (%)* |
|---|---|---|
| Smoking | 50 | 83.3 |
| Indoor pollution | 13 | 21.7 |
| Outdoor pollution | 19 | 31.7 |
| Tobacco chewing | 34 | 56.7 |
| Chronic recurrent infections | 8 | 13.3 |

**Table 2:** Distribution of patients according to History of smoking Pack year in COPD patient with Respiratory Failure

| *Smoking pack years* | *Frequency* | *Percent (%)* |
|---|---|---|
| NIL | 10 | 16.7 |
| 10–19 | 6 | 10.0 |
| 20–29 | 21 | 35.0 |
| >=30 | 23 | 38.3 |
| Total | 60 | 100.0 |

**Table 3:** Distribution of patients according to Type I and II COPD patients with Respiratory Failure

| *Respiratory failure* | *Frequency* | *Percent (%)* |
|---|---|---|
| Type 1 respiratory failure | 19 | 31.66 |
| Type 2 respiratory failure | 41 | 68.33 |
| Total | 60 | 100 |

**Table 4:** Distribution of patients According to Finding of Auscultation in COPD patient with Respiratory Failure Auscultation

| | *Frequency* | *Percent (%)* |
|---|---|---|
| Rhonchi | 53 | 88.3 |
| Decreased Breath Sounds | 7 | 11.7 |
| Crepitations | 33 | 55.0 |
| Bronchial Breath Sounds | 12 | 20 |

## Results

In this study, 60 patients of COPD with respiratory failure were evaluated. Patients were in age range of 40 to 90 years of age with skewing towards the elderly age group, mean and median age were 64 and 65 years respectively. Majority of the patients 83.3% in this present study were belong to male sex. As risk factors for COPD are common in male likes smoking etc.

Major risk factor present in patients was exposure to tabacco as smoking (83.3%) and tobacco chewing (56.7 %) for COPD.

Most of the patient (50%) had normal echocardiography finding. PAH and cor-pulmonale were present in 11.67% patient, cor-pulmonale with TR was present in 15% patient and PAH with cor-pulmonale with TR and Biventricular dysfunction present in 5% patient. In 18.3% patient's echocardiography could not be done.

The main causes of exacerbations were due to bronchospasm (88.3%) and secondary infection (68.4%).

Most common treatment given to patients were bronchodilator and antibiotics which were given to all patients. Steroids (inhaled and parenteral) was the second most common drug prescribed to patients accounting for 85% of cases. As most of patients in our study were in type 2 respiratory failure, so BIPAP/NIV given to 65% patients and low flow oxygen given to 35% patients, 8.3% patient were intubated eventually. Chest physiotherapy given to 81.7% patients and diuretics for patients with cor-pulmonale and CCF. On discharge 23.3% patients required long term oxygen therapy.

In our study, we observed that requirement of NIV in type 1 and type 2 respiratory failure were significant, statistically (Table 6).

This shows that type 2 respiratory failure are better managed by NIV were as type one respiratory failure require low flow oxygen delivery devices.

In our study, most patients (65%) were discharged on room air with medical treatment, 23.3% patients were

**Table 5:** Distribution of patients according to Total Leukocyte count in COPD patient with Respiratory Failure TLC

| | *Frequency* | *Percent (%)* |
|---|---|---|
| <11000 | 19 | 31.7 |
| 11000–15000 | 34 | 56.7 |
| >15000 | 7 | 11.7 |
| Total | 60 | 100.0 |

**Table 6:** Cross tabulation between use of NIV and type of respiratory failure

| *NIV* | *Type I* | *Type II* | *Total* |
|---|---|---|---|
| Yes | 5 | 34 | 39 |
| | 12.8% | 87.2% | 100.0% |
| No | 14 | 7 | 21 |
| | 66.7% | 33.3% | 100.0% |
| Total | 19 | 41 | 60 |
| | 31.7% | 68.3% | 100.0% |

Chi-square = 18.290, p = 0.000

discharge on LTOT apart from medical treatment, 3.33% patients discharged on NIV along with medical treatment and 5 patients died during treatment (Table 7).

## Discussion

In our study, we observe that respiratory failure in COPD patients was more common in male sex, as they were more exposed to risk factors. In our study 83.3% patient of COPD with respiratory failure were male. It was observed that smoking is common risk factor for patients of COPD with respiratory failure. It was present in 80% of our patients. Smoking is more prevalent in males in India, thus we have male predominance study group. Intensity of smoking expressed in pack-years, as the smoking intensity increased above 20 pack year, lead to an increased predisposition to COPD. It is well proven fact that significant smoking for COPD is atleast 20 pack year. Cigarette smoking, and smoking cessation was the major and vigorous risk factor for COPD and decline adult lung function studied by Anthonisen *et al*.[13]

It was noted that most common co-morbidity present in our cases was hypertension, present in 26.7% of patients and coronary artery disease in 13.3%. This can be easily related to the smoking habits, as we know that smoking causes hypertension and coronary artery diseases. Barnes *et al*.[14] observed that COPD and CAD are coexisted and shares similar risk factors, such as age factor and smoke frequently and lifestyle pattern whether healthy and unhealthy.

Majority of patient 66.7% have type 2 respiratory failure and only 33.33% patients have type 1 respiratory failure. Out of 40 patients of type 2 respiratory failure, majority of patients have chronic respiratory failure in 55% cases, 37.5% patients have acute on chronic respiratory failure and only 7.5% patients have acute respiratory failure. Most respiratory failure in COPD occur due to the acute exacerbation, which may lead to acute on chronic failure.

In our study, most common treatment given to patients were bronchodilator and antibiotics, which were given

**Table 7:** Distribution of patients according to outcomes

| *Outcome* | *Frequency* | *Percent (%)* |
|---|---|---|
| Improved on treatment (stable on room air) | 39 | 65 |
| Discharged on LTOT | 14 | 23.3 |
| Discharged on NIV | 2 | 3.33 |
| Died | 5 | 8.33 |
| Total | 60 | 100.0 |

to 100% patients. According to recent GOLD guidelines also, LABA and LAMA or LABA and ICS combination is given to patients of COPD exacerbation. In our study, many patients presented with secondary infection or developed secondary infection during hospital stay. Treatment with antibiotics is necessary in these patients. Steroids was second most common drug prescribed to patients in our study accounted for 85%. As most of patients in our study of COPD were in type 2 respiratory failure, so BIPAP/NIV was given to 65% patients and low flow oxygen given to 35% patients, 8.3% patient were intubated eventually. In our study we observed that requirement of NIV in type 1 and type 2 respiratory failure were statistically significant (Chi-square=18.290, p=0.001). On discharge, 23.3 % patients required long term oxygen therapy. Pulmonary Rehabilitation was included in treatment for patient of COPD with respiratory failure with prior goal to achieve optimum respiratory functions of patients which will improve their quality of life (QOL) and participation in their everyday lives. In our study we observed that duration of hospitalization for most of patients is >10 days for 75% cases. Less than 10 days duration of hospitalization found in 25% patients. In this study, increased duration of hospitalized patients with cor-pulmonale (Chi-square=10.098, p=0.006) was observed. Kinnunen and colleagues[15] found that various comorbidites had repercussions due to time length of COPD hospitalizations, with 7.7 days mean length of stay without any comorbidity but if compared with 10.5 days, the synchronously infection was present in patient.

In our study, most patients (65%) were discharged on room air with medical treatment, 23.3% patients were discharge on LTOT apart from medical treatment, 3.33% patients discharged on NIV along with medical treatment and 5 patients died during treatment.

The early diagnosis and timely intervention of acute exacerbation COPD can be very helpful for the management of the patient. In a poor country like ours, we need to focus on the prevention of COPD and first of all cessation of tobacco smoking. More than 25% patient of COPD end up requiring long term oxygen therapy

which is detrimental for the mobility of the patient and economical burden for the family. We require proper program for the rehabilitation of such patients. Some of the limitations of the study were that it was a small sample size and no follow-up was done. But still this study puts a light on the seriousness of the COPD patients and respiratory failure requiring hospitalization and ICU care.

## Conclusion

COPD is one of the most frequently occurring diseases present in urban and rural area and is due to poor quality of life, morbidity and mortality in old patients. However as rampant bidi smoking and failure to take regular treatment even after diagnosis caused more COPD exacerbation in the rural areas. Acute exacerbation of COPD affects millions of patients annually which accounts for substantial medical care cost. Bacterial infections, viral infections and environmental stresses concur commonly to cause AECOPD that frequently lead to respiratory failure. So we carried out study for respiratory failure in COPD patient. As every exacerbation leads to the decline in the lung functions all attempts should be made to avoid it. Thus it is very important to take holistic approach toward COPD patient with respiratory failure. Pulmonary rehabilitation. Early diagnosis, prompt treatment, and vaccination are mainstay of management modalities and to prevent further exacerbation in patients.

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