

# AN AUDIT OF THE MANAGEMENT OF PATIENTS ADMITTED WITH ACUTE EXACERBATION OF COPD AT A TERTIARY CARE HOSPITAL.

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## Abstract

**Objective:** To audit the management of patients admitted with acute exacerbation of chronic obstructive pulmonary disease at Pulmonology Unit Khyber Teaching Hospital (KTH), Peshawar.

**Patients and Methods:** This was a retrospective clinical audit conducted at Pulmonology Unit KTH, Peshawar from 1<sup>st</sup> January 2015 till 30<sup>th</sup> April 2015. All patients' charts with the diagnosis of COPD exacerbation were retrieved. BTS guidelines (2010) for management of COPD were taken as standard for comparison. Risk factors for COPD, cardinal features of COPD exacerbation, management of respiratory failure and discharge outcome were the main variables recorded in a structured proforma and analyzed via SPSS 19. The results were presented as table or graphs.

**Results:** Of the total 119 patients with mean age of 62 ( $\pm 13$  SD) years, females constituted 63.5%. Smoking and occupational history was recorded in 37.5% and 24% respectively. The three cardinal features of COPD exacerbation i.e. Increase in dyspnea, increase in sputum volume and purulence were documented in 95.2%, 28.8% and 17.3% respectively. Oxygen saturation was recorded in all patients, showing Spo<sub>2</sub> <92% in two third (67.3%), in which Arterial blood gases were obtained in 90% cases. Controlled oxygen was prescribed to 90% of patients with type 2 respiratory failure. The exact diagnosis was documented in 29.3% only. Nebulized bronchodilators, intravenous steroids and intravenous antibiotics were prescribed to >90% of patients. Most of the patients (84.5%) were discharged on home treatment while in-hospital mortality was 13.68%.

**Conclusion:** Smoking status, occupational history and the three cardinal features of COPD exacerbation were not documented in more than half of the clinical notes. The management of COPD exacerbation and respiratory failure was parallel with BTS standards in majority; however the exact diagnosis was not documented in nearly two third of the cases.

**Key Words:** Acute Exacerbation; BiPAP; BTS Guidelines; Clinical Audit; COPD; Respiratory Failure.

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## INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is a slowly progressive, preventable and treatable respiratory disorder characterized by airflow limitation with systemic manifestations.<sup>1</sup> It is the 4<sup>th</sup> leading cause of death worldwide and is on the rise.<sup>2</sup> Tobacco smoke is the most important risk factor

for development of COPD. Other important risk factors include exposure to biomass fuel particularly in developing countries, occupational exposures and genetic predisposition.<sup>3</sup> The diagnosis of COPD is confirmed when a patient, who has symptoms that are compatible with COPD, is found to have airflow obstruction as suggested by spirometry (FEV<sub>1</sub>/FVC <

0.70 and an FEV1 < 80% of predicted) and there is no alternative explanation for the symptoms and airflow obstruction.<sup>4</sup> FEV1 (forced expiratory volume in 1<sup>st</sup> second), BMI (Body mass index), MRC (medical research council) dyspnea scale and co morbidities have a significant impact on health status, prognosis and exacerbations.<sup>5</sup>

Acute exacerbations of COPD and subsequent hospitalizations are responsible for most of the health care expenditure accounting for about 70% of the cost of medical care for patients with COPD.<sup>6</sup> An exacerbation is characterized by an increase in the patient's baseline dyspnea and/or amount and/or purulence of sputum that is beyond normal day-to-day variations, acute in onset, and may warrant a change in medications.<sup>7</sup> Many patients also develop respiratory failure which needs assessment and may require assisted ventilation in addition to pharmacologic therapy of antibiotics, bronchodilators and corticosteroids (ABC approach).<sup>8,9</sup>

Despite many guidelines published by various thoracic bodies (GOLD, BTS, ERS and Pakistan Chest Society), the diagnosis and management of COPD exacerbations has been suboptimal. A large multicentre UK audit of COPD exacerbation has reported that spirometry (FEV1) was documented in 53%, blood gases in 79% (inter hospital range 40-100%), oxygen was prescribed to 64 % (range 9-94%) and of 35% with hypercapnea only 13% received ventilator support. Only 30% of the current smokers had cessation advice documented.<sup>10</sup> Very little is known about the standard of care of COPD as practiced in our local setup.

The aim of this audit was to establish data on the management of acute exacerbation of COPD judged against BTS guidelines and to identify the gaps in management to improve our standard of care.

## OBJECTIVE

To audit the management of patients admitted with acute exacerbation of COPD.

## METHODS

This was a retrospective clinical audit conducted at Pulmonology Unit Khyber Teaching Hospital Peshawar from 1<sup>st</sup> Jan 2015 till 30<sup>th</sup> April 2015. All patient charts with the diagnosis of COPD exacerbation were retrieved. We focused on the documentation of risk factors for COPD (Smoking, occupation), confirmation of diagnosis via spirometry, prognostic parameters (FEV1, BMI, MRC dyspnoea Scale and comorbidities), three cardinal features of COPD exacerbation, assessment and treatment of respiratory failure and pharmacological treatment prescribed

in patients charts. BTS guidelines (2010) for management of COPD were taken as standard for comparison.

Background information: BTS guidelines recommend risk factors assessment and spirometry for all patients with COPD. Definition of exacerbation is based on the three clinical parameters i.e. Increase in dyspnea, amount and purulence of sputum. Oxygen saturation via pulse oximeter should be checked for all patients with exacerbation and ABGs should be obtained for those having SPO2 below 92%. All patients with type 2 respiratory failure should be given controlled oxygen. Pharmacological therapy for exacerbation includes nebulized/inhaled bronchodilators and systemic steroids if there is no contraindication. Antibiotics are recommended if there is evidence of infection Aminophylline may be considered if the response to bronchodilators is poor.

Information related to bio-data, date of admission/discharge, diagnosis, length of stay at hospital, medications prescribed and discharge outcome were recorded in a structured proforma. Any comment on smoking or occupation was accepted as history taken. Three cardinal features of COPD exacerbation assessed were (any comment on) increase in dyspnea, increase in sputum volume or purulence. BMI was calculated if height and weight were available. Spirometry report written anywhere in chart was noted. Management of respiratory failure was assessed by: (i) recording Oxygen saturation via finger pulse oximeter at presentation ( as noted in arrival reports), (ii) arterial blood gas analysis in those patients who had SpO2 <92%, (iii) type of the respiratory failure (mentioned anywhere in charts or interpreted from ABGs results if available), (iv) treatment of type 2 respiratory failure with controlled oxygen (via venturi mask) and (v) application of BiPAP to a subset of patients with type 2 respiratory failure . Lastly, the outcome of discharge was recorded in terms of discharge with or without long term oxygen therapy, death or transfer to other unit as documented.

The data was analyzed via SPSS 19. Frequencies/Percentages were calculated for qualitative variables like sex, recording of MRC scale, co-morbidities, smoking status, Spo2, type of respiratory failure, treatment prescribed, antibiotics used and outcome of discharge. Mean and std. deviation were calculated for age, BMI, duration of antibiotics use and length of hospital stay. The results were presented as table or graphs.

## RESULTS

Of the total 119 patients with mean age of 62 (±13 SD) years, females constituted 63.5% and males

36.5%. Smoking and occupational history was recorded in 37.5% and 24% of the charts respectively. Spirometry report for confirmation of COPD and staging of the disease was documented in none of the cases. Besides FEV1, prognostic parameters like Body mass index (BMI), and MRC dyspnea scale were recorded in 48% and 50% respectively (table 01) however, patient's weight was available in 72% of cases. Common co-morbidities included Hypertension, Diabetes, post TB status, and cardiac failure as shown in figure 01. Many patients (6.7%) had more than one co morbidities. Pulmonary arterial hypertension (a complication of COPD) was found in 19.23% cases. History of the three cardinal features of COPD exacerbation i.e. Increase in shortness of breath, increase in sputum volume and purulence was documented in 95.2%, 28.8% and 17.3% respectively (table 01). Oxygen saturation was recorded in all patients, showing respiratory failure (Spo2 <92%) in two third (67.3%), in which Arterial blood gases were obtained in 90% cases (table 01). Type 2 respiratory failure was found in 35% of total cases and was the predominant (53%) subtype (figure 02). Controlled oxygen was prescribed to 90% of patients with type 2

respiratory failure and BiPAP was applied to 17% as shown in table 01. Despite treatment of respiratory failure, the exact diagnosis was mentioned on the front page in 29.3% only.

Nebulized bronchodilators, intravenous steroids and intravenous antibiotics were prescribed to majority of patients (>90%) as shown in table 01. Levofloxacin was the most commonly prescribed intravenous antibiotic, followed by ceftriaxone, cefipime, sulbactam-cefoperazone and moxifloxacin as shown in figure 03. The mean duration of antibiotic use was 4.8 (±2.74 SD) days and the length of stay at hospital was 4.91(±3.1 SD) days. Majority of the patients (79.49%) were discharged on treatment, an additional 5.1% (06) were discharged home with oxygen, two were transferred to other unit while 13.68% (16) died in hospital as shown in figure 04.

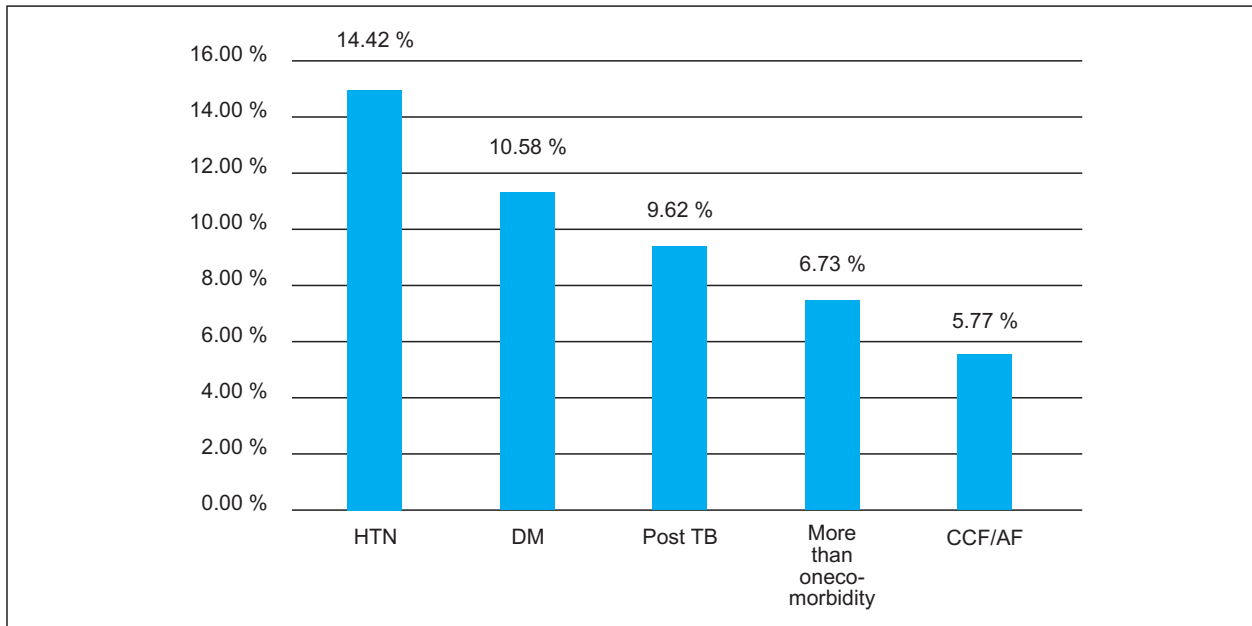
### DISCUSSION

This audit has enabled to document the baseline and demonstrated gaps in management of acute exacerbation of COPD judged against BTS standards. Tobacco smoke being the most important risk factor

**Table 1: Percent record of different variables related to clinical assessment and management of COPD exacerbation and respiratory failure.**

S. No	Categories of Variables	Individual Variables	Percent Recorded (%)
01	History	1.Smoking history	37.5
		2. Occupational history	24
		3. Documentation of the three cardinal features of COPD exacerbation	
		a. Shortness of breath/MRC scale	95.2/50
		b. Sputum volume	28.8
		c. Sputum colour	17.3
02	Respiratory Failure and Management	i. SPO2 at presentation	100
		ii. Respiratory failure (SPO2 <92%)	67.3
		iii. Diagnosis of respiratory failure made in those with	29.3
		iv. SPO2 <92% or PO2 <60mm of Hg.	90.1
		v. ABGs done when spo2 was < 92%	
		vi. Oxygen prescribed in treatment sheet to patients with spo2 <92%	79.2
		vii. Controlled oxygen prescribed (for type 2 respiratory failure)	97.1
		viii. BiPAP applied (type 2 RF patients)	17
03	Drugs prescribed for management of COPD exacerbation	1. Nebulized Salbutamol	90.4
		2. Nebulized ipratropium	98.1
		3. Intravenous steroid	92.5
		4. Intravenous antibiotic	98.1
		5. Aminophylline i.v	61.5

**Figure 1: Co-morbidities in patients admitted with COPD exacerbation.**

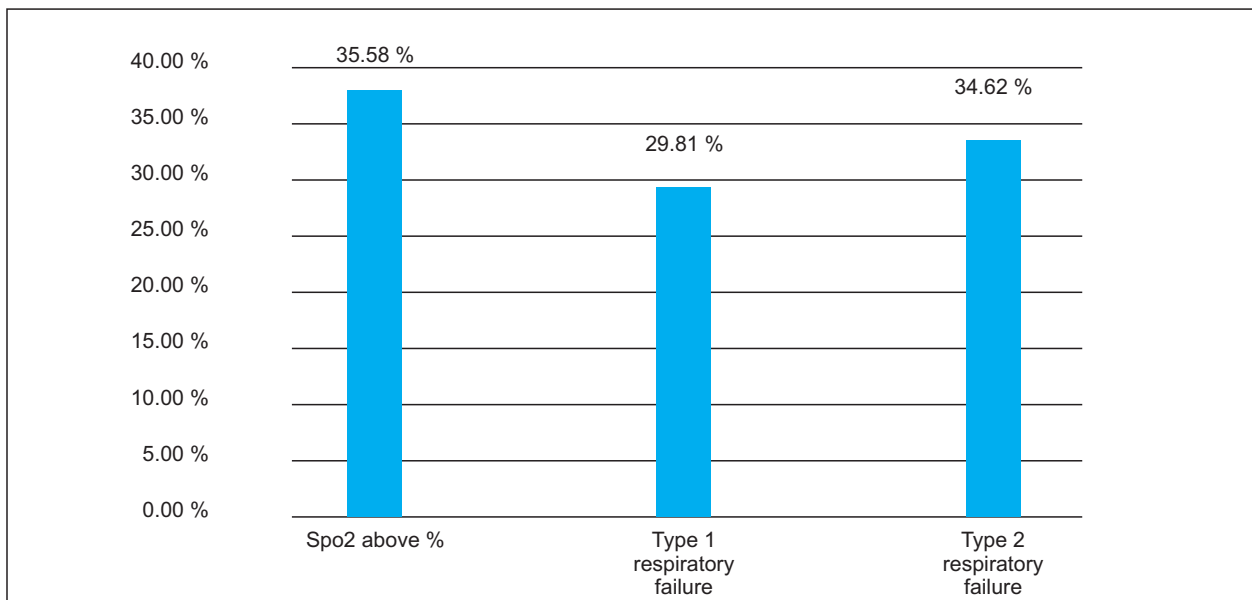


for COPD and the chance of disease development is directly related to the number of pack years of smoking. Proper smoking history was recorded in only 37.5% of our patients. This could be due to females' predominance in our study group. MAG-1 study<sup>11</sup> has reported this figure as 45%, suggesting universal problem with smoking status assessment. A meta-analysis of 47 studies has confirmed that current smokers are at a greater risk of disease progression and decline in lung function (measured via FEV1) as compared to non smokers.<sup>12</sup> An up-to-date smoking

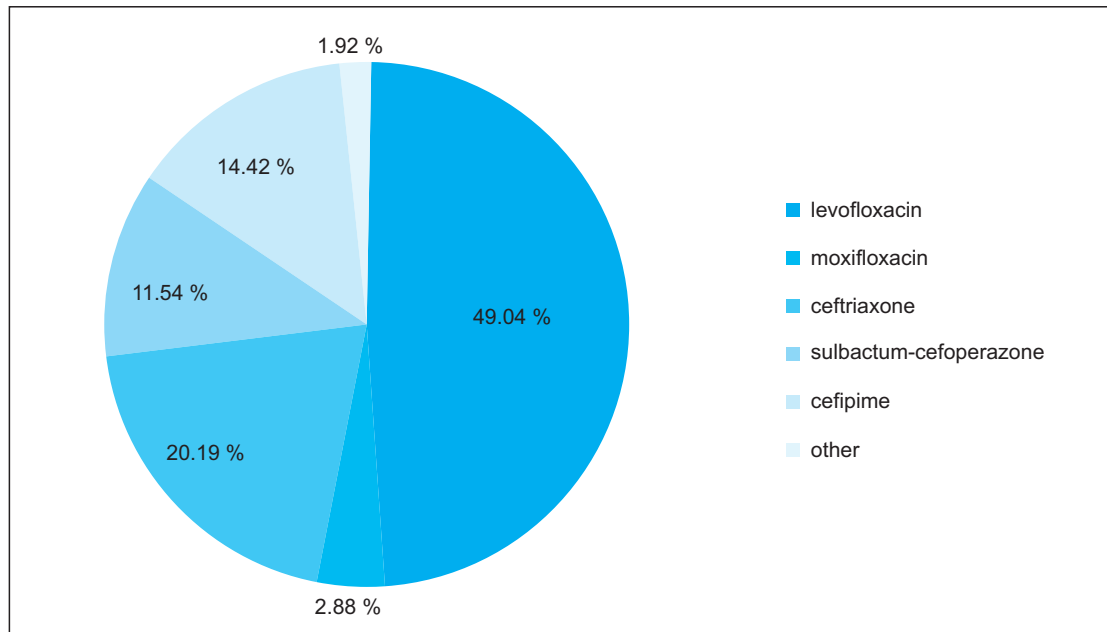
history, including pack years smoked should be documented for everyone with COPD.<sup>13</sup> Similarly occupational history was recorded only in only 24% of patients suggesting inadequate clinical history of COPD risk assessment. Evidence from literature suggests that 15% of all cases of COPD are work related.<sup>14</sup> On a population level, prevention of occupational exposures and smoking together are important measures to reduce the global burden of disease.

Spirometry is the gold standard test to diagnose COPD and FEV1 is the most powerful predictor of

**Figure 2: Percentage of respiratory failure in patients admitted with COPD exacerbation.**



**Figure 3: Intravenous Antibiotics used in patients with COPD exacerbation**



mortality (prognostic marker) in these patients. None of the case records showed the results of this important investigation, suggesting either poor record keeping or poor attention to confirmation and staging of the disease. Objective confirmation of the disease via spirometry has been suboptimal universally, however. In the audit by Roberts et al<sup>15</sup> a definitive diagnosis of COPD (by measurement of FEV1 in the period 5 years before or 3 months after the exacerbation) was made in only half of the 1400 cases. BMI and MRC dyspnea scale are other important prognostic parameters for COPD which were recorded in almost half of the patients.

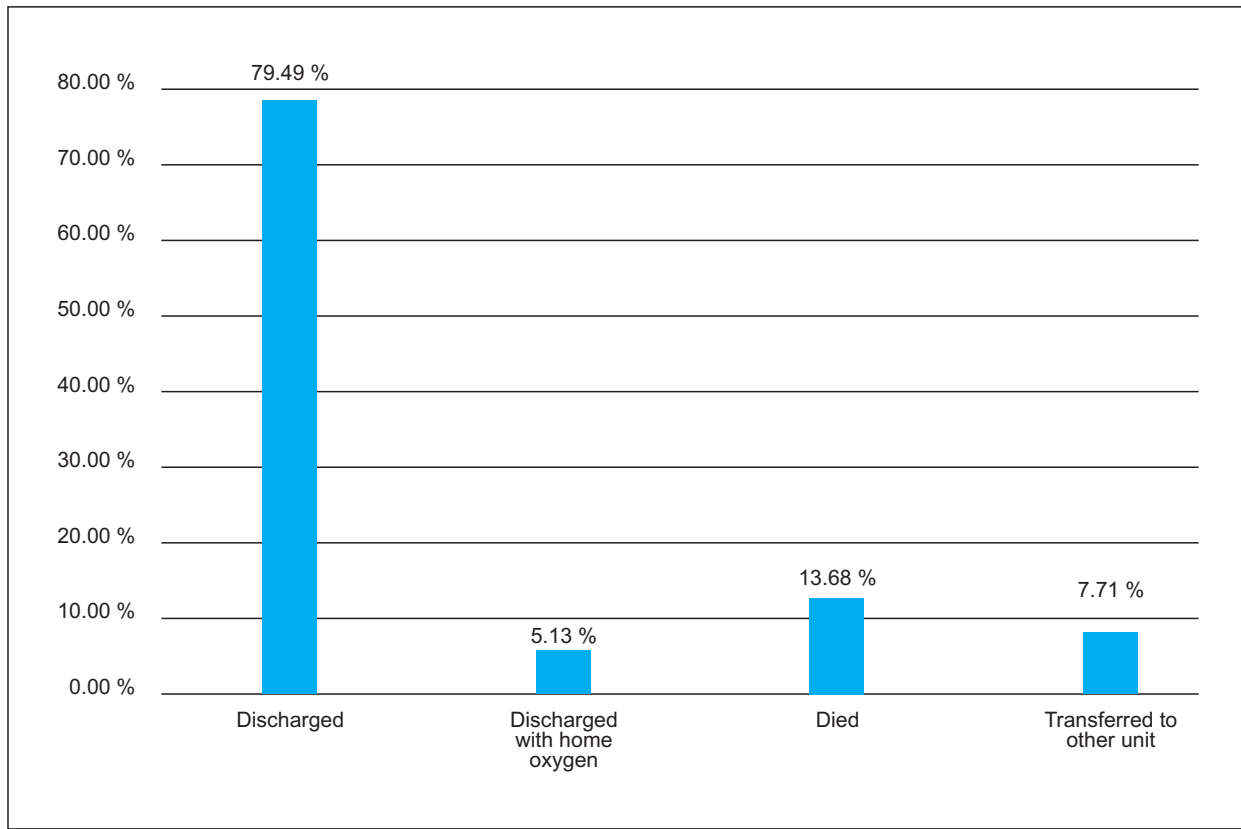
Common co morbidities in our patients were Hypertension (14.42%), Diabetes (10.58%), post TB status 9.6%), ischemic heart disease (5.7%) and cardiac disease including secondary pulmonary hypertension in 25% cases. The prevalence of secondary diagnoses has been variable among studies. In the review by Holguin and colleagues, comorbidities in hospitalized COPD patients were hypertension in 17%, cardiac disease in 25%, diabetes in 11% and pneumonia in 12%; all higher than in the control group.<sup>16</sup> In another study of 270 hospitalized patients with COPD, Antonelli and coworkers noted hypertension in 28%, diabetes in 14%, and ischemic heart disease in 10%.<sup>17</sup> Kinnunen and colleagues found that comorbidities had an impact on the duration of COPD hospitalizations, and reported a mean length of stay of 7.7 days without any comorbidity compared with 10.5 days if a concurrent disease was present.<sup>18</sup>

Exacerbations of COPD are the largest single cause of emergency respiratory admissions and defined by increase in any one or more of the following parameters i.e. dyspnea, sputum volume and/ or sputum purulence. These cardinal features of AECOPD particularly the later two were not documented in majority of our records. A large COPD clinical audit has reported that relevant entries were missing in two third of such cases.<sup>15</sup>

Majority of exacerbations were treated with Antibiotics, nebulized bronchodilators and corticosteroids as per guidelines. Methylxanthine was added to 61% of patients. It is recommended as second line therapy by BTS guidelines if nebulized bronchodilators fail to work. Compared with placebo, most studies with intravenous theophylline have shown marginal effects on symptoms, hospital admission rate, acid-base balance, and lung function (FEV<sub>1</sub> and arterial blood gases) in non-acidotic patients,<sup>19</sup> although a Cochrane systematic review<sup>20</sup> does not support this practice.

Management of respiratory failure was rather encouraging. Pulse oximetry was done in all cases and ABGs were done in 90 % of patients with Spo<sub>2</sub> < 92% and subsequently 34.6% were found to have type 2 respiratory failure. Controlled oxygen was prescribed to majority of the patients with type 2 respiratory failure and NIV applied to 17.8% which is in line with BTS recommendations. UK COPD audit has shown that ABGs were done in 79% and NIV applied to 13%.<sup>15</sup> Arterial blood gas analysis should be carried out in these patients as 20–47% will have carbon

**Figure 4: Outcome of patients admitted with COPD exacerbation**



dioxide (CO<sub>2</sub>) retention at presentation and one in five will be acidotic both of which affect oxygen prescription.<sup>21</sup> In contrast, the proper diagnosis of respiratory failure was not mentioned in 71% of cases suggesting inadequate documentation. Clinical audit at Italy, on the diagnostic accuracy and management of respiratory failure in COPD has shown that agreement between diagnosis of RF and ABG values was found to be insufficient in about half the cases i.e 54.5% of patients had no diagnosis of RF despite a PaO<sub>2</sub> < 60 mmHg.<sup>21</sup>

The mean length of stay at hospital was 4.91 days. It has been reported as 4-10 days in different studies.<sup>14,17,21</sup> Age, socioeconomic status and cause of exacerbations are among the factors independently associated with length of stay.<sup>22</sup> Heart failure, diabetes, stroke, high arterial PCO<sub>2</sub>, and low serum albumin level have also been reported in one study to be associated with a prolonged stay in hospital.<sup>23</sup>

In-hospital mortality in our patients was 13.68%. There is substantial variability among and even within countries in COPD mortality.<sup>24</sup> BTS audit has reported mortality of 14% at 3 months. Hoogendoorn et al. (2011) performed a meta-analysis of six cohort studies (57,144 patients) and found that a severe exacerbation needing hospitalization resulted in a weighted mean

case-fatality rate of 15.6% (95% CI 10.9 to 20.3%).<sup>25</sup> A prospective cohort study of patients from 16 different hospitals with COPD exacerbation attending the emergency departments (ED) has suggested five clinical parameters predictive of mortality may help guide clinicians regarding management of these patients. These include patient age, baseline dyspnea (MRC scale), use of accessory muscles of respiration or paradoxical breathing, previous need for assisted ventilation or long-term home oxygen therapy and altered mental state upon ED arrival.<sup>26</sup>

## CONCLUSION

Smoking status, occupational history and the three cardinal features of COPD exacerbation were not recorded in more than half of the clinical notes. The management of COPD exacerbation and respiratory failure was parallel with BTS standards in majority; however the exact diagnosis was not documented in nearly two third of the cases.

## LIMITATIONS

There are limitations to this study as the sample size was small, data was collected from a single unit and it depended upon case notes documentation and available information.

Future implications: Results from this study may be helpful in designing future COPD audit tool for routine prospective use. The areas of poor performance may be addressed by proper documentation, staffing, management protocols and clinical competence.

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