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Renal dysfunction in COPD patients - an Observational Study

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INTRODUCTION

COPD is the third leading cause of death worldwide killing more than 10 million persons in the United States. It is estimated that COPD will rise from the sixth to the third most common cause of death worldwide by 2020.COPD is estimated to cause half a million deaths annually in India. The prevalence of COPD in India is estimated to be 3.49% based on nationwide prevalence study conducted by ICMR.

COPD is commonly associated with other chronic diseases because of the common risk factors involved. These associated conditions may contribute significantly to the symptoms and severity in the affected patients. The diseases associated with COPD include congestive heart failure, arrhythmias, peripheral artery disease, coronary artery disease, diabetes, hypertension, osteoporosis, cachexia, chronic renal failure, infections and lung cancer. It is important to screen COPD patients for the associated comorbid illnesses since addressing these associated illnesses by early identification and prompt management can lead to better patient management& hence better quality of life.

The prevalence of chronic kidney disease increases with age. Chronic kidney disease is associated with many chronic diseases such as diabetes, hypertension and congestive heart failure. The association of chronic kidney disease with COPD has been recognized only recently. This may have therapeutic implications including modification of the dose of drugs that are excreted by kidneys. Understanding the pathogenesis of renal failure in COPD can lead to novel treatment strategies in the management of COPD in future.

The association of chronic kidney disease with COPD has been demonstrated in western population. This association has not been studied in our patients. Hence we took up this study to find the association of renal failure in COPD patients and its significance.

AIMS AND OBJECTIVES

To determine the incidence of renal dysfunction (renal failure, as defined in terms of GFR) among patients with Chronic Obstructive Pulmonary Disease (COPD).

MATERIALS AND METHODS

The study was conducted in Department of General Medicine, Vijayanagara Institute of Medical Sciences, Ballari, Karnataka during November 2014 to April 2016.It is an observational study of 100 cases.

Inclusion Criteria: Patients who are diagnosed to have COPD based on clinical features and spirometry will be included in the study.

Exclusion Criteria: Patients with COPD who have other comorbid illnesses including diabetes mellitus, hypertension, and known renal disease such as renal stones, polycystic kidney disease etc, coronary artery disease & cardiac failure, ingestion of nephrotoxic drugs which are likely to cause renal failure are excluded and patients who were not willing to participate in the study.

Methodology: COPD patients who fulfill the study criteria were included. A total of hundred patients were included. They were subjected to detailed history taking including smoking and current treatment history, clinical examination and investigations which include

- Spirometry using a spirometer, in all stable patients, in accordance with the guidelines of the American Thoracic society. Regular treatment was not changed prior to spirometric testing.
- Chest X-ray P A view.
- Blood urea.
- Serum creatinine.
- Serum electrolytes.
- Complete blood count.
- Liver function tests.
- Urine analysis.
- USG Abdomen
- ECG
- Echocardiography

The creatinine clearance is estimated using the four variable MDRD formula here.For creatinine in mg/dl :

eGFR = 186 * Serum Creatinine$^{-1.154}$ * Age$^{-0.203}$ * [0.742 if female] * [1.210 if Black].

A creatinine clearance <60ml/min is defined as renal failure. This cut-off is based on the National Kidney Foundation's Kidney Diseases Outcome Quality Initiative Guidelines[43] which marks the threshold for moderate renal dysfunction.

- Serum sodium< 135 mEq/L is defined as hyponatremia.
- Serum albumin< 3.5 g/dL is defined as hypoalbuminemia.
- Hemoglobin< 13 g/ dL is defined as anemia in males.
- Hemoglobin <12 g/dL is defined as anemia in females.

The results were tabulated and analysed. The incidence of renal failure, hyponatremia, anemia and hypoalbuminemia was recorded among COPD patients and analysed using SPSS2 software for statistical significance to determine whether these abnormalities are more prevalent among COPD patients.

RESULTS

The majority of the patients were in the 60 - 69 years age group contributing to 41% of the study population with mean age of 60 years & 9 were females and rest males.

All the patients presented with breathlessness and cough with expectoration and the most common associated symptom was leg swelling (34%).

Among our patients, 9 were females who were non-smokers and had exposure to household smoke while cooking and also passive smoking in 3 females and maximum number of patients had smoking index between 400 to 600. Among males, 87 had smoking index above 200 which increases risk of COPD52% of our patients had anemia according to WHO cut off for anemia and mean Hemoglobin value was 12.6 g/dl.

Mean albumin level was 3.6mg among our patients and 38% of them had hypoalbuminemia.

62% had renal dysfunction according to our study, of which 37% were in stage 3 CKD defined as renal failure i.e GFR < 60ml/min/1.73m^2.

DISCUSSION

Present study was undertaken between November 2014 & April 2016to study the prevalance of renal dysfunction in COPD patients in a study population of 100 patients. Below is a comparison of our study with reference studies done by R AIncalzi et al, I. Elmahallawy et alwith respect to different variables taken in the study.

The mean age in our study is in close correlation to that of Elmahhalaway et al which had a sample

size of 300 patients and lesser than that published by Incalzi et al which had 356 patients included in their study which may have been due to the difference in sample size as our study had only 100 patients.

Our study had only 9 % female patients which is lesser than both the other studies which may have been due to the inadequate sample size of our study.

Our study had slightly lower hemoglobin values compared to other two studies probably reflecting increased prevalance of anemia in our population in general and poorer nutritional status of patients.

Our study value with respect to serum creatinine correlates closely with the other two studies & mean GFR according to our study is slightly higher than other two studies possibly due to inadequate sample size.

Our study had 37% prevalance of renal failure among patients which is much lesser than other studies in comparison due to possibly inadequate sample size and less number of patients getting admitted for COPD as many of them are treated on OPD basis and only those who were admitted in hospital were included in this study.

SUMMARY

- Out of 100 patients who had been included in this study, most of the patients were in the age group of 60-69 years with mean age of 60 years.
- Most of the patient included in our study were male patients (91%).
- Clinical variables indicated that all patients had cough with expectoration & breathlessness and among associated symptoms, 38% of patients were detected to have leg swelling which may have been due to multiple reasons including hypoalbuminemia, renal failure, cor pulmonale etc and of the eleven patients who complaint of decreased urine output, 10 were detected to have renal dysfunction. Fever was one of the presenting complaint in 9% of patients which may have been the reason for the exacerbation of underlying COPD and admission.
- Maximum number of patients who had COPD in our study had a smoking index between 400 to 600(38%) and 29% had an index of more than 600.
- 52% had anemia according to our study and mean Hb was 12.6g% while 38% had hypoalbuminemia with a mean value of 3.6mg reflecting the poor nutritional status of our patients and also contributed by the underlying renal dysfunction.
- Of the 100 patients, 37% patients had underlying renal failure with ultrasound abdomen showing no evidence of contracted kidneys and 25% were in stage 2 CKD which may progress eventually to stage 3 and thus require serial monitoring and avoiding of precipitating factors like nephrotoxic medications, dehydrtion etc.
- 50 patients had hyponatremia in total, of which 24 had underlying renal failure.

CONCLUSION

COPD is the seventh most common chronic disease and is expected to rank fourth by the year 2020.It is the fourth most common cause of death in the world. It is estimated that every year half a million people die due to COPD in our country. The mortality due to COPD is expected to increase in the future.

COPD is associated with several other comorbid illnesses like coronary artery disease, musculos-keletal diseases, malignancy because of the common risk factors involved. The association of COPD with renal failure was only recently recognized. The extent of association of COPD with renal failure has been analysed in a few studies in the western population.

The reason for not recognizing the association of renal failure with COPD could be due to the reduced muscle mass in COPD patients leading to a normal serum creatinine despite significant decline in renal function. This is termed as

concealed renal failure. This implies that whenever possible in COPD patients the GFR should be estimated by calculating the estimated creatinine clearance using standard formulas like the MDRD formula which have been validated in large scale studies. Serum creatinine alone would not be an ideal marker of renal function in these patients.

We excluded COPD patients with other comorbid illness which might affect renal function. In our study we found that a significant proportion of patients with COPD had renal failure(37%). This has therapeutic implications such as modifying the drug dosage to prevent drug toxicity. It is proposed that COPD induces systemic inflammation and endothelial dysfunction which could be the cause for increased cardiovascular mortality and underlying renal disease. Thus renal failure and its magnitude can be an important prognostic tool in patients with COPD as well. This hypothesis has to be tested in future studies with further investigations to analyse the exact cause of the renal dysfunction and its value in predicting prognosis.

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