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Assessment of Renal Diseases among COPD Patients: A Hospital Based Study

Anil Kumar Gupta
MD (General Medicine), Senior Consulted Physician,
MMG District Hospital, Ghaziabad, Uttar Pradesh, India.

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***Correspondence to:**
Dr. Anil K Gupta
Senior Consulted Physician,
MMG District Hospital,
Ghaziabad, UP, India.
anil.gupta.dr@gmail.com

ABSTRACT

Background: The prevalence of both CKD and COPD increases with age and both these diseases are associated with atherosclerotic disease. While the mechanisms linking CKD and COPD have been completed elucidated, systemic inflammation and hypoxia associated with COPD could contribute to adverse outcomes in those with CKD. Present study was conducted to assess renal diseases among COPD patients.

Materials and Methods: The study was conducted in the department of general medicine MMG District Hospital, Ghaziabad, Uttar Pradesh, India. For the study group, patients with stable COPD visiting the department OPD were selected. The control group, non-COPD patients with no history of COPD and kidney disease was selected. Levels of hemoglobin, blood urea nitrogen, Cr, Cys, and brain natriuretic peptide were evaluated. CKD was defined as an eGFR of less than 60 mL/min/1.73 m^2. The data was tabulated and subject to statistical analysis.

Results: A total of 70 patients, 35 in Study group and 35 in control group were included in the study. The mean age of patietns in study group was 72.33 years and 69.83 years in control group. The number of male pateitns in study group was 21 and 19 in control group. The mean BMI of patients in study group was 22.98 kg/m^2 and in control group was 23.18 kg/m^2. In the study group, the number of patients with $eGFR_{Cr}$<60 was 11 and with $eGFR_{Cys}$<60 was 19. In the control group, the number of patients with $eGFR_{Cr}$<60 was 3 and with $eGFR_{Cys}$<60 was 6.

Conclusion: The renal disease occurs at a high rate in COPD patients. Hence, it is utmost important to not miss the presence of renal disease in COPD patients because renal disease can influence the treatment and prognosis of patients.

KEYWORDS: COPD, Renal Disease, GFR.

INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is a systemic disease with various comorbidities and is associated with underlying systemic inflammation. Because the comorbidities of COPD affect disease severity and prognosis, the screening and treatment of comorbidities are keys to the control of COPD.[1,2] Cardiovascular diseases (CVD), osteoporosis, and depression are considered to be representative comorbidities of COPD, but chronic kidney disease (CKD) has been minimally investigated in this context. Advanced age and smoking as well as COPD are risk factors for CKD, which is also known to be an important risk factor for CVD. The prevalence of both CKD and COPD increases with age and both these diseases are associated with atherosclerotic disease.[3]

While the mechanisms linking CKD and COPD have been completed elucidated, systemic inflammation and hypoxia associated with COPD could contribute to adverse outcomes in those with CKD.

Given that CKD is more prevalent in people with COPD than without and given that CKD is a risk factor for acute kidney injury (AKI), it is possible that the rate of AKI is higher among COPD patients than in people without COPD. [4,5]

Additionally, at the time of a COPD exacerbation, when gaseous exchange within the lungs may become less effective and carbon dioxide retention can occur, reduced renal blood flow and hence GFR can result.[6] Hence, the present study was planned to assess renal diseases among COPD patients.

MATERIALS AND METHODS

The study was conducted in the department of general medicine, MMG District Hospital, Ghaziabad, Uttar Pradesh, India. For the study group, patients with stable COPD visiting the department OPD were selected. The control group, non-COPD patients with no history of COPD and kidney disease was selected. An informed written consent was obtained from the patients after explaining then the procedure of the study verbally. Levels of hemoglobin, blood urea nitrogen, Cr, Cys, and brain natriuretic peptide were evaluated. CKD was defined as an eGFR of less than 60 mL/min/1.73 m^2.

COPD was diagnosed based on spirometry when the FEV_1/FVC was less than 70% after inhalation of a bronchodilator, and the severity of airflow obstruction was judged according to the Global Initiative for Chronic Obstructive Lung Disease (GOLD) criteria. The data was tabulated and subject to statistical analysis.

The statistical analysis of the data was done using SPSS version 20.0 for windows. The Student's t-test and Chi-square test were used to check the significance of the data. The p-value less than 0.05 was predetermined as statistically significant.

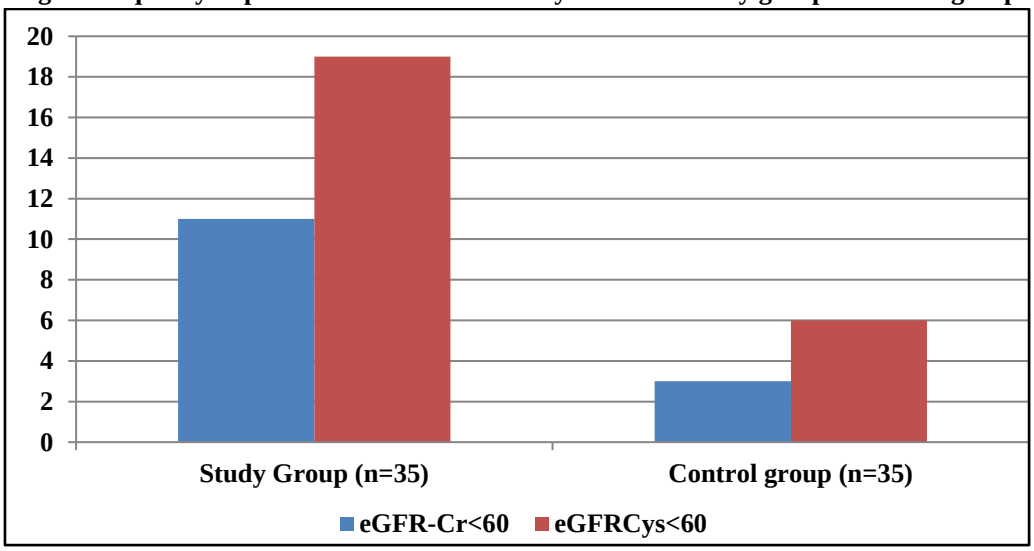
Table 1: Charactristic parametrs of study group and control group

Characteristic Parameters	Study group (n=35)	Control group (n=35)	p-value
Mean age (years)	72.33	69.83	0.31
No. of male patients (n)	21	19	0.12
Mean BMI (kg/m^2)	22.98	23.18	0.38
Smoking history			0.001
• Non smoker	2	29	
• Past smoker	26	4	
• Current smoker	7	2	

Table 2: No. of patients with chronic kidney disease in study group and control group

	Study Group (n=35)	Control group (n=35)	p-value
$eGFR_{Cr}$<60	11	3	0.03
$eGFR_{Cys}$<60	19	6	

Fig 1: Frequency of patients with chronic kidney disease in study group & control group



RESULTS

A total of 70 patients, 35 in Study group and 35 in control group were included in the study. Table 1 shows characteristic parameters of study group and control group. The mean age of patients in study group was 72.33 years and 69.83 years in control group. The number of male patients in study group was 21 and 19 in control group. The mean BMI of patients in study group was 22.98 kg/m^2 and in control group was 23.18 kg/m^2. In the study group, 7 patients were currently smoker and 26 were past smoker.

In control group, 2 patients were currently smoker, 4 patients were past smoker and 29 patients were non-smoker. Table 2 shows number of patients with chronic kidney disease in study group and control group. In the study group, the number of patients with $eGFR_{Cr}$<60 was 11 and with $eGFR_{Cys}$<60 was 19. In the control group, the number of patients with $eGFR_{Cr}$<60 was 3 and with $eGFR_{Cys}$<60 was 6. On comparing the results, we observed that the results are statistically significant ($p<0.05$). [Fig 1]

DISCUSSION

In the present study we assess renal diseases among COPD patients. We observed that patients with chronic kidney disease are more prevalent in COPD patients. In the study group, the number of patients with $eGFR_{Cr}$<60 was 11 and with $eGFR_{Cys}$<60 was 19. In the control group, the number of patients with $eGFR_{Cr}$<60 was 3 and with $eGFR_{Cys}$<60 was 6. The results were found to be statistically significant. The results were compared with previous studies and results were consistent with previous studies. Van Gestel YR et al investigated the relationship between COPD and CKD and the association between COPD and mortality in patients with CKD. They conducted a cohort study of 3358 vascular surgery patients between 1990 and 2006. CKD was defined according to the Modification of Diet in Renal Disease equation as an estimated glomerular filtration rate (GFR) <60 mL/min/1.73 m^2. In addition, the patients were divided into three categories based on the baseline estimated GFR: > or =90 mL/min/1.73 m^2; 60-89 mL/min/1.73 m^2 and <60 mL/min/1.73 m^2. Multivariable logistic regression analysis was used to evaluate the independent association between prevalent COPD and CKD. The prevalence of COPD was inversely related to kidney function. COPD was present in 47, 38 and 32% of patients with an estimated GFR <60, 60-89 and > or =90 mL/min/1.73 m^2, respectively. COPD was independently associated with CKD. This association was strongest in patients with moderate COPD. Both moderate and severe COPD were associated with increased long-term mortality in patients with CKD, compared to patients without COPD. Their findings indicate that COPD is moderately associated with CKD in a large cohort of vascular surgery patients. In addition, moderate and severe COPD are related to increased long-term mortality in patients with CKD. Musso G et al conducted a meta-analysis to determine whether the presence and severity of NAFLD are associated with the presence and severity of CKD. English and non-English articles from international online databases from 1980 through January 31, 2014 were searched. Observational studies assessing NAFLD by histology, imaging, or biochemistry and defining CKD as either estimated glomerular filtration rate (eGFR) <60 ml/min/1.73 m2 or proteinuria were included. The influences of age, whole-body/abdominal obesity, homeostasis model of insulin resistance (HOMA-IR), and duration of follow-up on effect estimates were assessed by meta-regression. Thirty-three studies (63,902 participants, 16 population-based and 17 hospital-based, 20 cross-sectional, and 13 longitudinal) were included. For 20 studies (61% of included studies, 11 cross-sectional and nine longitudinal, 29,282 participants), they obtained IPD. NAFLD was associated with an increased risk of prevalent and incident hazard ratio [HR] CKD. Non-alcoholic steatohepatitis (NASH) was associated with a higher prevalence and incidence of CKD than simple steatosis. Advanced fibrosis was associated with a higher prevalence and incidence of CKD than non-advanced fibrosis. In all analyses, the magnitude and direction of effects remained unaffected by diabetes status, after adjustment for other risk factors, and in other subgroup and meta-regression analyses. In cross-sectional and longitudinal studies, the severity of NAFLD was positively associated with CKD stages. It was concluded that the presence and severity of NAFLD are associated with an increased risk and severity of CKD.[7,8]

Wang H et al investigated the intrinsic linkage of COPD (or emphysema, chronic bronchitis and asthma) and lung cancer. The present hospital-based case-control study included 1,069 patients with newly diagnosed lung cancer and 1,132 age frequency matched cancer-free controls. The odds ratios (ORs) for the associations between each previous pulmonary disease and lung cancer were estimated with logistic regression models, adjusting for age, sex, family history of cancer, BMI and pack year smoking. In meta-analysis, the pooled effects of previous pulmonary diseases were analyzed with random effects models; and stratification analyses were conducted on smoking status and ethnicity. In the case-control study, previous COPD was associated with the odds for increased risk of lung cancer; so were emphysema and chronic bronchitis; while asthma was associated with odds for decreased risk of lung cancer. These associations were more pronounced in smokers, but not in non-smokers. In meta-analysis, 35 studies were identified. COPD was significantly associated with the odds for increased risk of lung cancer, so were emphysema and chronic bronchitis; and these associations were more pronounced in smokers than in non-smokers. No significant association was observed for asthma. It was concluded that previous COPD could increase the risk of lung cancer, especially in smokers. Sharkey RA et al evaluated renal functional reserve in patients with severe chronic obstructive pulmonary disease. Sixteen stable patients with severe COPD and five normal controls were studied. The mean (SD) arterial oxygen and carbon dioxide tensions (PaO2, PaCO2) and forced expiratory volume in one second (FEV1) of patients with COPD were 8.1 (1.04) kPa, 6.3 (0.69) kPa, and 0.74 (0.27) 1, respectively. The pulsatility index (PI), an index of renovascular resistance, was measured non-invasively by Doppler ultrasonography at baseline and at intervals after a protein load of 250 g steak. The PI fell after the protein load in the normal subjects from 1.04 (0.19) to 0.84 (0.17), mean difference 0.20. In the COPD group there was no change; baseline PI = 1.04 (0.16), PI after protein load = 1.08 (0.19), mean difference = -0.04. Six of the patients with COPD were normocapnic and 10 were hypercapnic. The normocapnic patients had no

significant change in PI, PI after protein load = 1.01 (0.16), mean difference = 0.06 while in the hypercapnic patients the PI tended to rise, PI after protein load = 1.12 (0.21), mean difference = -0.09. The authors concluded that renal haemodynamics were unchanged after a protein load in patients with severe COPD, suggesting that they had no renal functional reserve.[9, 10]

CONCLUSION

Within the limitations of the study we conclude that the renal diseases occur at a high rate in COPD patients. Hence, it is utmost important to not miss the presence of renal diseases in COPD patients because renal disease can influence the treatment and prognosis of patients.

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