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Original Research Article

EVALUATION OF BLOOD UREA NITROGEN, URIC ACID AND URIC ACID /CREATININE RATIO IN PATIENTS OF CHRONIC OBSTRUCTIVE PULMONARY DISEASE (COPD)

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ABSTRACT

Background: Chronic obstructive pulmonary disease (COPD) is a group of lung diseases that block airflow and long term breathing problems. The very common symptoms cough with sputum production and shortness of breath. **Aim:** The present study was planned to assess the blood urea nitrogen, uric acid & uric acid/creatinine ratio in COPD patients and compare with healthy control. **Material & Method:** Total 100 diagnosed patients of chronic obstructive pulmonary disease were enrolled for the study age between 18 to 60 years. Patients were further sub-grouped Acute exacerbation 50 patients, Stable COPD 50 patients and 50 age & sex-matched healthy subjects constituted the control group. Patients with pneumonia, neoplastic pathologies, and hepatic or renal diseases, pregnant females were excluded from the study. **Results:** The mean level of blood urea nitrogen was significantly in both subgroups. Serum creatinine level was significantly higher in acute exacerbations COPD patients (1.48±0.82) as compared to healthy subjects (1.02±0.29) (p = <0.0001). Serum uric acid significantly higher in acute exacerbations COPD patients (5.90±3.29) as compared to healthy subjects (3.86±0.82) (p = <0.0001).Uric Acid /Creatinine ratio was non- significant in acute exacerbation and stable COPD patients. **Conclusion:** Findings of the present study suggest that renal function tests specially BUN is significantly altered in COPD patients and strong association with the occurrence of acute exacerbation.

Keywords: Chronic obstructive pulmonary disease, BUN, Uric acid, Renal function

INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is a group of lung diseases that block airflow and long term breathing problems. The very common symptoms cough with sputum production and shortness of breath. **(1,2)** COPD is a progressive disease, it typically aggravate over time. **(3)** Finally, daily routine life works become difficult. **(4)**

An exacerbation was defined as an acute increase in the severity of a problem of patient's respiratory symptoms that was beyond normal day-to-day variations and that led to a change in medication. **(5)** Alteration in medication involved increased doses and/or frequency of bronchodilators, and put on intravenous corticosteroids or oral and/or antibiotics without or with hospitalization. **(5,6)** Emphysema and chronic bronchitis are the two most common conditions that contribute to COPD. The term "chronic bronchitis" is defined as a productive cough that is present for at least three months each year for two years. **(5)** Chronic bronchitis is the inflammation of the bronchial tubes, which carry air to and from the lungs. Emphysema is a lung condition featuring

an abnormal accumulation of air due to enlargement and destruction of the lungs as a result of damaging exposure to smoke cigarette and particulate matter and other irritating gases.

Blood urea nitrogen (BUN) is a common marker of kidney function, and hence its blood concentrations vary according to change in glomerular filtration rate (GFR). **(7)** BUN levels are increased by the catabolism of lean body mass and lower levels of BUN may be a marker of the cessation of catabolism, which is certain for respiratory muscle recovery and a well-known predictor of weaning. **(8,9)**

Uric acid (UA), a final product of purine metabolism is higher in hypoxic states. Poor lung functions reduces oxygen uptake which causes tissue hypoxia such as in COPD.**(10)**

Serum uric acid/creatinine ratios and uric acid were higher in stable COPD patients compared to healthy subjects. Uric acid/creatinine ratios a more valuable compare to serum uric acid levels **(11)**

Therefore, the present study was planned to the evaluation of blood urea nitrogen, serum creatinine, uric acid, and uric acid /creatinine ratio in patients of COPD.

MATERIAL & METHOD:

Total 100 diagnosed patients of chronic obstructive pulmonary disease, Age between 18 to 60 years, who visited the outpatient and inpatient department of Respiratory Medicine in Mahatma Gandhi Medical College& Hospital.

Patients were further sub-grouped Acute exacerbation 50 patients, Stable COPD 50 patients and 50 age & sex-matched healthy subjects constituted the control group. Patients with pneumonia, neoplastic pathologies, and hepatic or renal diseases, pregnant females were excluded from the study. The study was conducted after approval from the Institutional Ethics Committee (IEC), written and informed consent obtained from all participants.

Blood samples were collected using standard aseptic technique for all subjects enrolled in the study and analysed blood urea nitrogen (BUN), serum creatinine, and uric acid on Vitros 5600.

The results obtained were presented as mean±SD.To find the significance between COPD acute exacerbations, stable COPD, and Healthy subjects applied the student's t-test.

RESULTS:

Table1: Distribution of variables between Stable COPD patients and Healthy subjects.

Parameters	Stable COPD patients	Healthy subjects	t-value	p-value
Blood Urea Nitrogen (mg/dL)	21.63±19.04	13.59±4.27	-2.914	0.004
Creatinine (mg/dL)	1.00±0.64	1.02±0.29	0.201	0.841
Uric Acid (mg/dL)	3.87±1.52	3.86±0.82	-0.041	0.967
Uric Acid /Creatinine (mg/dL)	4.72±2.60	4.08±1.40	-1.533	0.129

Table2: Distribution of variables between Acute ExacerbationsCOPD patients and Healthy subjects.

Parameters	Acute patients	Healthy subjects	t-value	p-value
Blood Urea Nitrogen (mg/dL)	28.75±12.18	13.59±4.27	-8.306	<0.0001
Creatinine (mg/dL)	1.48±0.82	1.02±0.29	-3.74	<0.0001
Uric Acid (mg/dL)	5.90±3.29	3.86±0.82	-4.254	<0.0001
Uric Acid /Creatinine (mg/dL)	4.43±2.66	4.08±1.40	-0.823	0.412

Parameters evaluated in stable patients and healthy subjects are present in (Table 1). The mean level of blood urea nitrogen was significantly in stable COPD patients (21.63±19.04) as compared to healthy subjects 13.59±4.27 (p = 0.004). Other parameters serum creatinine, uric acid, and uric acid /creatinine ratio was non- significant.

The distribution of various Parameters between Acute exacerbations COPD patients and healthy subjects are presented in (Table 2). The mean level of blood urea nitrogen were significantly higher in acute exacerbations COPD patients (28.75±12.18) as compared to healthy subjects (13.59±4.27) (p = <0.0001). Serum creatinine level was significantly higher in acute exacerbations COPD patients (1.48±0.82) as compared to healthy subjects (1.02±0.29) (p = <0.0001). Serum uric acid significantly higher in acute exacerbations COPD patients (5.90±3.29) as compared to healthy subjects (3.86±0.82) (p = <0.0001). Uric Acid /Creatinine

ratio was non-significant compared to acute exacerbations COPD patients with healthy subjects.

DISCUSSION

The mean blood urea nitrogen level significantly higher in both group's stable COPD patients and acute exacerbations COPD patients compared with healthy subjects.

Blood urea nitrogen (BUN) is a well-known marker of renal function, and hence its serum concentrations vary according to change in glomerular filtration rate (GFR). Recent studies have also shown that BUN correlates with neurohormonal activator of parameters. Some recent studies have also reported the importance of venous congestion in pathophysiology of kidney dysfunction in heart failure. **(12)** On the other hand BUN levels are increased catabolism of lean body mass and lower levels of BUN a batter marker of the cessation of catabolism, which certain for respiratory muscle recover and a batter predictor of weaning.**(13,14)** Limsuwat C, Nantsupawat N et al., 2013 finding Patients with low mean blood pressures, high BUNs, and severe respiratory failure requiring intubation have higher mortality rates . **(15)**

Serum creatinine can provide indirect information on body muscle mass. Oterdoom et al [2013] Reported that low creatinine excretion in the urine is an indirect measure of low muscle mass (with normal renal function) and is associated with major adverse cardiovascular events. **(16)** An acute elevation in serum creatinine from muscle destruction due to drug-induced muscle atrophy. **(17)** Serum creatinine level is decrease in patients with whole-body muscle wasting or atrophies. **(18)** Ugur and Tanseli et al [2007], showed rise levels of BUN and serum creatinine suggest protein catabolism in patients with COPD. This catabolic process appeared to be active only in male patients. **(19)** Bratel. T et al 2003 reported hypoxaemic COPD patients have severe impaired renal function. **(20)**

Uric acid, a final product of purine metabolism is elevated in hypoxic states. Poor lung functions reduces oxygen uptake which causes tissue hypoxia such as in COPD. Uric acid elevates due to its release from lungs and peripheral tissue damage. Uric acid levels are associated with systemic inflammation and increased cardio vascular risk. **(11)**

Serum uric acid can be noted as a marker for impaired oxidative metabolism, and it is also believed to play a significant role, besides other factors, in the prognosis of respiratory diseases, particularly COPD **(21,22)**. Moreover, uric acid is detected in high concentrations in the epithelial fluid of both the upper and lower respiratory tract and is believed to be an important defence mechanism against oxidants **(23)**. Consequently, higher uric acid levels are expected in more severe hypoxia, which results from a more sever COPD state. High serum uric acid has been shown to reflect both worse situation and worse prognosis in conditions with hypoxia such as primary pulmonary hypertension and congestive heart failure. **(24,25)** Bartziokas et al. Bartziokas et al. findings that systemic uric acid levels are related with oxidative stress and inflammation. **(26)** Nicks et al reported that an increase level of serum uric acid was associated with better lung function. **(27)**

In similar study, These UA levels and sUA/creatinine ratios were higher in patients with co-morbidities; sUA level was significantly higher in COPD patients than in healthy controls. However, serum uric acid/creatinine ratio in acute cases as well as in stable and healthy controls did not exhibit any significant change. The results of the present study are not in agreement with the findings of previous similar studies, the normal serum creatinine concentration is 0.5-1.25 mg/dL. A serum creatinine value of <1.0mg/dL may falsely increase the uric acid/ creatinine ratio. That is why the present study does not recommend uric acid/creatinine ratio as a reliable indicator.

CONCLUSION

Findings of the present study suggest that renal function tests specially BUN is significantly altered in COPD patients and strong association with the occurrence of acute exacerbation. The study also attempted to assess the significance of uric acid/ creatinine ratio in the patient of COPD especially during the phase of acute exacerbation. It was observed that the uric acid/creatinine ratio exhibits no significant variation in COPD patients as compared to healthy controls. Regular screening of COPD patients for BUN and UA is recommended to diagnose at risk of developing acute exacerbation.

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