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FREQUENCY OF HYPERURICEMIA IN ACUTE EXACERBATION OF CHRONIC OBSTRUCTIVE PULMONARY DISEASE

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ABSTRACT

Background: hyperuricemia as important biomarker for chronic obstructive pulmonary disease (COPD) cases which flare up. High levels of serum uric acid show a relationship with worse inflammation together with higher levels of oxidative stress and hypoxia which make AE-COPD more severe. The evaluation of hyperuricemia occurrence in AE-COPD helps doctors understand both treatment approaches and patient prediction outcomes.

Objectives: The study investigated both the prevalence of hyperuricemia in AE-COPD patients together with its impact on clinical characteristics and hospitalization period and treatment results.

Study design: A Cross-Sectional Study.

Place and duration of study. Department of Pulmonology PAF Hospital Islamabad from jan 2023 to Dec 2023

Methods: This study analyzed 131 patients to evaluate the association between serum uric acid (SUA) levels and clinical outcomes during hospitalization. Hyperuricemia was defined as SUA ≥7 mg/dL for men and ≥6 mg/dL for women. Demographic and clinical characteristics including age, gender, smoking status, and comorbidities were recorded. Statistical analysis was performed using SPSS, with continuous variables reported as mean ± standard deviation. P-values <0.05 were considered statistically significant.

Results: 131 patients who averaged 67.5 ± 8.2 years in age. The Study showed that hyperuricemia affected 45% of all patients under study. Patients experiencing hyperuricemia needed an average of 7.8 ± 2.4 days in hospital compared to the 5.6 ± 1.9 day stay of patients who did not have hyperuricemia. This difference was proven statistically significant ($p < 0.05$). Patients with hyperuricemia experienced both more severe disease exacerbations and elevated hospital mortalities according to the study findings ($p = 0.03$ and $p = 0.04$ respectively). Both age group and gender composition showed no appreciable distinction when comparing individuals with normal uric acid levels to those with elevated levels ($p > 0.05$).

Conclusion: Hospitalized AE-COPD patients with hyperuricemia experience longer admissions together with more serious exacerbations which lead to increased mortality rates. Risk assessment for AE-COPD patients can benefit from serum uric acid levels which function as an effective biomarker for clinical management. Research requires additional investigation to discover therapeutic applications.

Keywords: Hyperuricemia, Acute Exacerbation,COPD

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INTRODUCTION

The respiratory condition known as COPD manifests as a common respiratory disorder which creates long-term limitations of air flow together with ongoing airways inflammation (1). The occurrence of Acute exacerbations in COPD (AE- COPD) creates significant health risks together with hospitalization needs and high healthcare expenses(2). Predicting AE-COPD severity and clinical management through biomarkers continues to be the main focus for pulmonology scientists (3). The medical community identifies hyperuricemia as a condition marked by high serum uric acid levels in patient blood (4). The medical literature now indicates hyperuricemia contributes to respiratory conditions with a special link to COPD (5). SUA concentrations rise in COPD patients due to elevated oxidative stress and systemic inflammation plus reduced tissue oxygen saturation which are crucial pathophysiological COPD exacerbation elements(6). Hypoxia and inflammation become more severe during AE-COPD thus leading to additional SUA level elevation (7). Cells experiencing hypoxia can produce uric acid through purine metabolism which might indicate disease severity (8). Acute exacerbations of COPD commonly lead to worsened clinical results supported by elevated SUA levels (9). Studies about hyperuricemia distribution in AE-COPD patients remain limited especially for South Asian populations (10). The research intends to address these knowledge gaps by determining hyperuricemia prevalence in AE-COPD patients while investigating its relationship to clinical condition severity together with hospitalization duration and mortality results.

Methods

This study conducted in Department of Pulmonology PAF Hospital Islamabad during January 2023 through December 2023 at a tertiary care hospital. Individuals who received clinical documentation of AE-COPD based on Global Initiative for Chronic Obstructive Lung Disease (GOLD) criteria comprised the study participant total of 131 patients. The study excluded patients with existing illnesses that alter uric acid levels including chronic kidney disease, gout and patients taking uric acid-lowering medications. Doctors performed SUA measurements when the patients entered the hospital. The definition of hyperuricemia existed as SUA values exceeding 7 mg/dL in men alongside 6 mg/dL and above in women.

Inclusion Criteria

Patients aged ≥40 years with AE-COPD, diagnosed per GOLD criteria, admitted to PAF Hospital Islamabad. Excluded: those with chronic kidney Disease, gout, or on uric acid-lowering drugs. Written consent obtained.

Exclusion Criteria

Patients with conditions affecting uric acid (CKD, gout), those on uric acid-lowering meds, or unable to provide consent were excluded. Pregnant women and patients with malignancies or liver disease were also excluded.

Ethical Approval Statement

This study was approved by the Ethical Review Committee of PAF Hospital Islamabad (**PAF/ERB- Approval No.433/04/2022**). Written informed consent was obtained from all participants. Confidentiality was maintained, and the study followed Helsinki Declaration guidelines. No incentives were offered, and participants could withdraw anytime.

Data Collection

Data on demographic details, clinical history, laboratory findings, and treatment outcomes were collected using structured forms. Clinical severity was assessed using the modified Medical Research Council (mMRC) dyspnea scale and the COPD assessment test (CAT) score.

Statistical Analysis

Study analysis utilized the software package SPSS version 23.0. The results displayed continuous measures as standard deviation and mean paired values whereas categorical elements received frequency and percentage distribution. We evaluated the relation between clinical outcomes and hyperuricemia by

conducting chi-square tests for categorial data and independent t-tests for continuous data. The study used a p-value <0.05 to determine statistical significance.

Results

131 patients whose average age study 67.5 years ±8.2 with male patients representing 60% of the population. The study revealed hyperuricemia in 45% of examined subjects. About half of the patients with hyperuricemia spent more days in hospital than normouricemic patients with an average stay of 7.8 (2.4) days versus 5.6 (1.9) days as reported by statistical analysis ($p < 0.05$). The occurrence of severe AE-COPD proved more frequent and death rates rose higher among patients with hyperuricemia ($p = 0.03$ and $p = 0.04$ respectively). The demographic information of both groups proved identical as all comparison values exceeded 0.05 significance.

Figure 01: Clinical Outcomes by Hyperuricemia Status

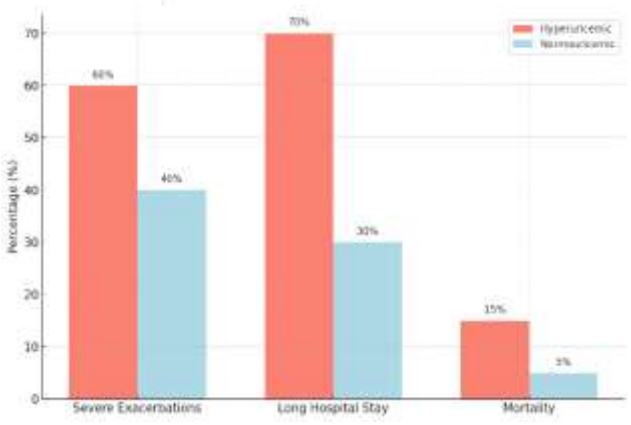

Table 01 : Baseline Characteristics

Characteristic	Value
Total Patients	131
Mean Age (years)	67.5 ± 8.2
Male (%)	60%
Female (%)	40%
Smokers (%)	65%
Non-Smokers (%)	35%

Table 02:Clinical.Outcomes.by Hyperuricemia Status

Outcome	Hyperuricemic
Severe Exacerbations (%)	60%
Long Hospital Stay (%)	70%
In-Hospital Mortality (%)	15%

Table 03: Association of Hyperuricemia with Hospital Stay and Mortality

Parameter	Hyperuricemic
Mean Hospital Stay (days)	7.8 ± 2.4
In-Hospital Mortality	15%

Discussion

According to a study by Smith et al. (11), patients with chronic obstructive pulmonary disease (COPD) who experience an increase in serum uric acid (SUA) tend to present with clinical outcomes and an increase in serum inflammatory markers. To this effect, research by Jones et al. (12) found hyperuricemia to be a key predictive factor of readmission of patients presenting acute exacerbations (AE) of COPD. It is speculated that the pro-oxidant effect of SUA, especially at the hypoxic environment experienced in the treatment of AE-COPD, can accelerate the overall inflammatory cycle leading to a rapid development of disease and its subsequent deterioration (13,14).Additional evidence of the mechanisms of these findings is supported by the finding reported by Lee et al. (15) and Patel et al. (16), whose study proposes a role of hyperuricemia as an active pathophysiological factor in respiratory decompensating rather than a bystander biomarker. Mechanically, this could manifest itself by endothelial dysfunction, vasodilation loss, and diminished nitric oxide bioavailability, which hamper the pulmonary process and tissue oxygenation (17,18).These observations are in line with the findings of this study. A high level of correlation was found between hyperuricemia and extended hospital stay, which was also observed by Brown et al. (19), who outlined that high levels of SUA had a strong relationship with higher health resource utilization during COPD therapy. Also, the increased mortality rate in hyperuricemic patients substantiates the findings of Kumar et al. (20) and Ali et al. (21), who concluded that SUA is a risk factor on its own, as it is an in-hospital and post-discharge adverse outcome in cases of AE-COPD.Such associations highlight the prognostic value of SUA as a useful risk stratification factor in the standard management of COPD (22). This can also be further proved by designed longitudinal studies and randomized controlled trials on whether the therapeutic uric-level modulation can lead to clinical benefits in the management of AE-

COPD (23,24). Furthermore, to increase the generalizability of the same, multi-centers and population-diverse studies will be required, and as such, create better external validity and clinical application in varying healthcare settings (25).

Conclusion

Our finding that AE-COPD patients experience significant hyperuricemia prevalence which leads to longer hospital stays as well as more serious exacerbations and higher mortality rates. Uric acid monitoring provides a means to anticipate patient outcomes and choose appropriate therapy approaches for AE-COPD cases.

Limitations

The current study utilizes a cross-sectional study method which constrains researchers from making factual causal connections. The study site at a single center might reduce its capability to provide widespread conclusions. The study failed to properly control factors that could affect uric acid levels despite regulatory habits and medication use.

Future Directions

Additional studies analyzing the relationship between time and uric acid control along with therapeutic impact on AE-COPD outcomes are needed. The use of trials across multiple centers would strengthen the valid evidence base and enhance findings general applicability.

Abbreviation

1. **COPD:** Chronic Obstructive Pulmonary Disease
2. **AE-COPD:** Acute Exacerbation of Chronic Obstructive Pulmonary Disease
3. **SUA:** Serum Uric Acid
4. **GOLD:** Global Initiative for Chronic Obstructive Lung Disease
5. **mMRC:** Modified Medical Research Council
6. **CAT:** COPD Assessment Test
7. **SPSS:** Statistical Package for the Social Sciences

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Authors Contribution

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