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Clinical And Comorbidity Profile Of Patients With Congestive Heart Failure And Its Association With Serum Uric Acid Levels.

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Abstract

Background: CHF frequently occurs alongside cardiovascular and metabolic comorbidities that may contribute to clinical complexity. Serum uric acid (SUA) has emerged as a potential biochemical marker of altered metabolism and cardiac dysfunction. ***Objective:*** To describe the clinical and comorbidity profile of patients with CHF and assess the association of SUA with left ventricular systolic function. ***Methods:*** A prospective study was conducted among 130 patients with CHF. Demographic characteristics, symptoms, comorbidities, lifestyle factors, physical findings, SUA and left ventricular ejection fraction (LVEF) were evaluated. ***Results:*** Males constituted 66.92% of participants, and the 51–60-year age group was predominant. Dyspnea was the commonest symptom (58.47%), while ischemic heart disease was the leading comorbidity (32.31%). Mean SUA was 6.35 ± 1.78 mg/dL and mean LVEF was 39.78 ± 8.73%. SUA showed a significant inverse correlation with LVEF ($r = -0.725$, $p < 0.001$). ***Conclusion:*** CHF was associated with substantial comorbidity burden, while higher SUA was associated with poorer systolic function.

Keywords: Congestive heart failure; serum uric acid; comorbidity; ischemic heart disease; diabetes mellitus; left ventricular ejection fraction.

INTRODUCTION

Heart failure (HF) is a complex clinical syndrome resulting from structural or functional cardiac abnormalities and is characterized by symptoms and signs that may arise from pulmonary or systemic congestion. Its burden continues to increase with population ageing and the growing prevalence of cardiovascular risk factors [1,2].

Comorbid conditions are an important component of the HF phenotype. Ischemic heart disease, diabetes mellitus, hypertension and other chronic disorders frequently coexist with HF and may contribute to myocardial remodeling, impaired ventricular function and adverse clinical outcomes [3,4]. The presence of multiple comorbidities can further complicate clinical assessment and management.

Serum uric acid (SUA) has attracted increasing interest as a biochemical marker in cardiovascular disease. Elevated SUA may reflect altered purine metabolism, increased xanthine oxidase activity, oxidative stress and impaired renal handling. Evidence suggests an association between higher SUA levels and heart failure occurrence and prognosis, although its precise causal role remains uncertain [5].

Therefore, the present study was undertaken to describe the demographic, clinical, comorbidity and lifestyle profile of patients with congestive heart failure and to assess the association between SUA and left ventricular systolic function.

MATERIALS AND METHODS

A prospective correlational study was conducted among patients attending the Medicine outpatient department and admitted to the medical wards of ESIC Medical College and PGIMSR, Bengaluru. The study was carried out from January 2019 to June 2020 and included 130 patients fulfilling the predefined eligibility criteria. Patients were assessed through

detailed clinical history and examination along with relevant biochemical investigations, serum uric acid estimation, electrocardiography, renal function tests, electrolyte assessment and transthoracic two-dimensional echocardiography. Written informed consent was obtained from the participants.

Inclusion Criteria

- Male and female patients aged 18–65 years.
- Patients providing informed written consent.
- Patients admitted with clinical symptoms and signs of acute congestive heart failure.

Exclusion Criteria

- Acute coronary syndromes.
- Chronic obstructive pulmonary disease.
- Chronic renal failure with serum creatinine >2 mg/dL.
- Hematological malignancies.
- Previously diagnosed hypouricemia.
- Patients receiving uricosuric drugs.

Clinical and Laboratory Assessment

Demographic details, presenting symptoms, comorbidities, smoking and alcohol history, and physical examination findings were recorded. Serum uric acid was measured by an enzymatic uricase method using an automated analyzer. Transthoracic two-dimensional echocardiography was performed to assess LVEF.

Statistical Analysis

Data were analyzed using SPSS version 22. Categorical variables were summarized as frequencies and percentages, while continuous variables were expressed as mean ± standard deviation. Student's t-test was used for comparison of continuous variables and the chi-square test for categorical variables, wherever applicable. Pearson correlation analysis was performed to evaluate the relationship between SUA and LVEF. A p value <0.05 was considered statistically significant.

RESULTS

A total of 130 patients with congestive heart failure were included in the analysis. The demographic profile showed a predominance of males, with the largest proportion belonging to the 51–60-year age group.

Table 1: Demographic Profile of Patients with Congestive Heart Failure (n=130)

Variable	Category	Number (%)
Age	≤40 years	22 (16.92%)
	41–50 years	38 (29.23%)
	51–60 years	46 (35.38%)
	>60 years	24 (18.46%)
Sex	Male	87 (66.92%)
	Female	43 (33.08%)

The 51–60-year age group represented the largest proportion of participants (35.38%), followed by the 41–50-year group (29.23%). Males predominated, accounting for 66.92% of the study population, whereas females constituted 33.08%. The mean age of the participants was 51.46 ± 9.50 years.

Table 2: Clinical Presentation of Patients with Congestive Heart Failure (n=130)

Symptom	Number	Percentage
Dyspnea	76	58.47%
Bilateral lower-limb swelling	65	50%
Chest pain	36	27.69%
Palpitation	20	15.38%
Orthopnea	1	0.77%

Dyspnea was the most frequently reported symptom, occurring in 58.47% of patients. Bilateral lower-limb swelling was reported by half of the participants, while chest pain was present in 27.69%. Palpitation was less frequent, and orthopnea was reported in only one patient.

Table 3: Comorbidity Profile of Patients with Congestive Heart Failure (n=130)

Comorbidity	Present, n (%)	Absent, n (%)
Ischemic heart disease	42 (32.31%)	88 (67.69%)
Diabetes mellitus	36 (27.69%)	94 (72.31%)
Rheumatic heart disease	26 (20%)	104 (80%)
Hypertension	22 (16.92%)	108 (83.08%)
Cardiomyopathy	19 (14.62%)	111 (85.38%)

Ischemic heart disease was the most frequently documented comorbidity, present in 32.31% of patients. Diabetes mellitus was identified in 27.69%, while rheumatic heart disease was present in 20.00%. Hypertension and cardiomyopathy were reported in 16.92% and 14.62% of participants, respectively.

Table 4: Lifestyle Risk-Factor Profile of CHF Patients (n=130)

Risk factor	Present, n (%)	Absent, n (%)
Smoking	59 (45.38%)	71 (54.62%)
Alcohol consumption	52 (40%)	78 (60%)

Smoking was reported by 45.38% of participants, indicating a substantial prevalence of tobacco exposure in this cohort. Alcohol consumption was documented in 40.00% of patients.

Table 5: Major Physical Examination Findings in Patients with Congestive Heart Failure (n=130)

Finding	Number	Percentage
Pedal edema	124	95.38%
Raised JVP	77	59.23%
Pallor	14	10.77%
Clubbing	1	0.77%
Cyanosis	1	0.77%

Pedal edema was the most prominent examination finding, observed in 95.38% of patients. Raised jugular venous pressure was noted in 59.23%, whereas pallor was present in 10.77%. Clubbing and cyanosis were uncommon, each being documented in only 0.77% of patients.

Table 6: Serum Uric Acid and Cardiac Functional Profile of CHF Patients (n=130)

Parameter	Number	Mean ± SD
Serum uric acid (mg/dL)	130	6.35 ± 1.78
LVEF (%)	130	39.78 ± 8.73

The mean SUA concentration was 6.35 ± 1.78 mg/dL, while the mean LVEF was 39.78 ± 8.73%. The overall cardiac functional profile therefore showed a relatively reduced mean systolic function in the study population.

Table 7: Relationship of Serum Uric Acid with Left Ventricular Systolic Function

Variables	Pearson r	P value	Statistical significance
SUA vs LVEF	−0.725	<0.001	Significant

A strong and statistically significant inverse correlation was observed between SUA and LVEF (Pearson r = −0.725, p <0.001). This indicates that higher SUA concentrations were associated with lower LVEF in patients with CHF.

DISCUSSION

The present study describes the clinical and comorbidity profile of patients with congestive heart failure, with particular emphasis on SUA and left ventricular systolic function. The largest proportion of patients belonged to the 51–60-year age group, and males constituted 66.92% of the cohort. The predominance of middle-aged and older patients is consistent with the increasing burden of HF observed with advancing age [6]. Ischemic heart disease was the most frequent comorbidity, followed by diabetes mellitus, rheumatic heart disease, hypertension and cardiomyopathy. The coexistence of these conditions emphasizes the multifactorial nature of HF, in which ischemic, metabolic and hemodynamic abnormalities may contribute to progressive cardiac dysfunction. Comorbidities are common in HF and are associated with greater disease complexity and adverse outcomes [7].

Dyspnea was the commonest presenting symptom, whereas pedal edema and raised JVP were the predominant physical findings. These findings are compatible with the congestive manifestations of HF. Smoking and alcohol consumption were

also relatively common, indicating the presence of potentially modifiable cardiovascular risk factors in this population. The mean SUA concentration was 6.35 ± 1.78 mg/dL. A strong inverse correlation was observed between SUA and LVEF ($r = -0.725$, $p < 0.001$), indicating that higher SUA levels were associated with poorer left ventricular systolic function. This finding is supported by Oki et al., who reported a strong association between elevated SUA and reduced LVEF among patients with cardiovascular disease [8].

The prognostic relevance of SUA has also been demonstrated in chronic HF. The CHART-2 study showed a U-shaped relationship between SUA levels and long-term outcomes, with both abnormally high and low SUA levels associated with increased mortality and HF hospitalization [9]. Romuk et al. similarly reported that higher SUA concentrations were independently associated with adverse outcomes in patients with chronic HFrEF [10]. More recent evidence further supports SUA as a prognostic biomarker rather than an established therapeutic target. A comprehensive meta-analysis found higher SUA to be associated with HF occurrence, mortality and rehospitalization, while uric-acid-lowering treatment did not demonstrate improvement in HF prognosis [11]. The study was limited by its relatively small, single-center sample. In addition, separate SUA comparisons according to individual comorbidities were not available in the thesis data. Therefore, the observed SUA-LVEF relationship should be interpreted as an association rather than evidence of causality.

CONCLUSION

Patients with congestive heart failure showed a substantial burden of cardiovascular comorbidities and modifiable lifestyle risk factors. Ischemic heart disease was the most frequent comorbidity, while dyspnea, pedal edema and raised JVP were the predominant clinical findings. The mean serum uric acid level was 6.35 ± 1.78 mg/dL and showed a strong, statistically significant inverse correlation with LVEF ($r = -0.725$, $p < 0.001$). These findings suggest that higher serum uric acid levels are associated with poorer left ventricular systolic function in patients with CHF and may serve as a simple biochemical marker of cardiac dysfunction.

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