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Original Research Paper

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PROGNOSTIC SIGNIFICANCE OF SERUM ALBUMIN AND SERUM TOTAL CHOLESTEROL IN ACUTE DECOMPENSATED HEART FAILURE

Dr. Ruchika Mathur Department of General Medicine, Jhalawar Medical College and SRG Hospital, Jhalawar, India

Dr Geetika Roat Department of General Medicine, Jhalawar Medical College and SRG Hospital, Jhalawar, India

Dr Megha Sanuja Department of General Medicine, Jhalawar Medical College and SRG Hospital, Jhalawar, India

ABSTRACT

Background: Serum albumin and total cholesterol are inexpensive markers of the malnutrition–inflammation syndrome. Their prognostic value in acute decompensated heart failure (ADHF) is of growing interest. This study assessed their role in predicting in-hospital mortality. **Materials and Methods:** This descriptive study was conducted in the Department of General Medicine, Jhalawar Medical College and SRG Hospital, from April 2022 to December 2022. Patients aged ≥18 years with ADHF, presenting with typical clinical features and responding to intravenous furosemide, were included (n=100). Data were analysed using SPSS v24. Independent t-test and Chi-square test were applied, with p <0.05 considered significant. **Results:** Eighty-one patients had definite HF and 19 possible HF by Boston score. Hypoalbuminemia was observed in 65 patients and hypocholesterolemia in 14. Sixteen patients died during hospitalization. Mortality was significantly higher in those with cor pulmonale, CCF, DCM, cardiomegaly, pulmonary oedema, hypoalbuminemia, and hypocholesterolemia. **Conclusion:** Hypoalbuminemia and hypocholesterolemia were strongly associated with mortality in ADHF and may serve as simple, cost-effective predictors of short-term outcomes. These markers could aid risk stratification, particularly in resource-limited settings. Larger trials are needed to assess whether albumin supplementation or lipid modulation improves survival.

KEYWORDS : Serum Albumin; Serum Cholesterol; Hypoalbuminemia; Hypocholesterolemia; Acute Decompensated Heart Failure

INTRODUCTION

Heart failure (HF) is a chronic, progressive syndrome caused by structural or functional cardiac abnormalities, leading to reduced (HFrEF) or preserved (HFpEF) ejection fraction. It results in elevated filling pressures at rest or during stress.[1] Common symptoms include dyspnoea and fatigue, often accompanied by pulmonary rales, oedema, or raised jugular venous pressure. [1]

HF prevalence is rising globally, driven by an aging population, and is associated with high healthcare costs.[2] Early detection, prevention, and optimized management are essential. Risk stratification in acute decompensated heart failure (ADHF) is particularly important to guide therapies such as drug titration, cardiac resynchronization, and ventricular assist devices. Prognostic biomarkers such as BNP and NT-proBNP are widely used,[3] while newer markers like galectin-3 and soluble ST2 have been proposed.[4] The 2017 ACC/AHA guideline update highlighted their potential roles, including admission troponin in ADHF and myocardial fibrosis markers for predicting hospitalization and mortality.[5] However, their high cost and limited availability restrict routine use.[6-9]

Serum albumin and total cholesterol are inexpensive, easily measured markers of the malnutrition–inflammation syndrome. Emerging evidence suggests they help identify ADHF patients at higher risk of adverse outcomes.[10] Hypercholesterolemia is a risk factor for coronary artery disease, yet very low cholesterol has paradoxically been linked to poor prognosis in congestive HF, making cholesterol a "double-edged sword."[11] Albumin maintains plasma oncotic pressure, and hypoalbuminemia—common in HF due to malnutrition, inflammation, cachexia, haemodilution, or hepatic dysfunction[12]—may also predict outcomes, though data remain limited.

This study aimed to evaluate the prognostic value of serum albumin and cholesterol in predicting in-hospital mortality and prolonged hospital stay among patients admitted with ADHF at SRG Hospital.

MATERIALS AND METHODS

This descriptive study was conducted on patients admitted with acute decompensated heart failure (ADHF) in the Department of General Medicine, Jhalawar Medical College and SRG Hospital, from April 2022 to December 2022.

Study Population

Patients aged ≥18 years with a primary diagnosis of ADHF were included. Diagnosis required HF symptoms, clinical signs consistent with HF, and a favourable response to intravenous furosemide. A total of 100 patients were enrolled.

Definitions

- Hypoalbuminemia: serum albumin <3.5 g/dL.
- Hypocholesterolemia: serum cholesterol <135 mg/dL.

Data Analysis

Data were analysed using SPSS v24. Independent t-test and Chi-square test were applied, with p <0.05 considered statistically significant.

RESULTS

Baseline Characteristics

The mean age was 55.7 ± 7.5 years; 76 patients (76%) were <60 years, with a male predominance (71%). Comorbidities included CAD in 91 patients, DCM in 51, CCF in 21, and cor pulmonale in 10. Hypertension (19) and diabetes mellitus (15) were the most frequent additional comorbidities. Chest X-ray showed cardiomegaly in 55 and pulmonary oedema in 43 (Table 1).

Boston Score and Biochemical Markers

The mean Boston score was 8.9 ± 1.9; 81 patients had definite HF and 19 possible HF. Hypoalbuminemia was present in 65 patients, hypocholesterolemia in 14. Mean ejection fraction (EF) was 37.9 ± 5.6%; systolic dysfunction was mild in 32%, moderate in 38%, and severe in 28% (Table 2).

Outcomes

In-hospital mortality occurred in 16 patients. Mortality was significantly higher in those with cor pulmonale, CCF, and

DCM. Radiological findings (cardiomegaly, pulmonary oedema) and biochemical abnormalities (hypoalbuminemia, hypocholesterolemia) were also significantly associated with mortality (Table 3).

DISCUSSION

Acute heart failure (HF) is a leading cause of hospitalization in the elderly and carries high in-hospital mortality, especially when patients lack specialized cardiology care. Severe symptoms and elevated BNP levels at admission remain established indicators of poor prognosis.

In the present study, 14 patients had hypocholesterolemia, and mortality was significantly higher in those with cor pulmonale, CCF, DCM, cardiomegaly, and pulmonary oedema. Similar trends have been reported by Polat et al.[11], who also described frequent comorbidities such as CAD, hypertension, diabetes, hyperlipidemia, atrial fibrillation, and valvular disease.

Hypoalbuminemia was observed in 65 patients and was strongly associated with mortality. Our results align with Polat et al.[11] (mean albumin 3.18 g/dL; 69.6% hypoalbuminemic) and Arques et al.[13] (mean 3.05 g/dL; 47% with hypoalbuminemia). Several studies have confirmed its prognostic value: Chao et al.[14] identified it as an independent predictor of short-term mortality; El Iskandarani et al.[15] found hypoalbuminemia in one-third of HF patients across 48 trials; Kinugasa et al.[16] showed it predicted in-hospital death independently of natriuretic peptides; Yanagisawa et al.[17] noted it as the sole predictor of mid-term outcomes in nonagenarians; and Uthamalingam et al.[18] linked it with severe symptoms, edema, renal dysfunction, and elevated BNP. Peterson et al.[19] further highlighted the role of hypoalbuminemia in aggravating myocardial oedema, oxidative stress, diuretic resistance, and fluid overload.

Similarly, hypocholesterolemia in 14 patients was significantly associated with mortality, in agreement with Arques et al.[13] (22% prevalence) and Yoon et al.[20], who reported that low cholesterol independently predicted higher mortality in the Korean Heart Failure Registry.

Overall, our findings reinforce the prognostic importance of serum albumin and total cholesterol in ADHF. These simple, inexpensive markers may be especially valuable in resource-limited settings where advanced biomarker assays are unavailable.

CONCLUSION

This study found hypoalbuminemia and hypocholesterolemia to be significantly more prevalent among ADHF patients who died during hospitalization, underscoring their value as simple, cost-effective predictors of short-term mortality. These readily available markers reflect nutritional and inflammatory status and may aid clinical risk stratification. Future randomized trials are needed to determine whether interventions such as albumin supplementation can improve survival in heart failure.

Table 1: Characteristics of Study Participants (N=100)

Variable		Percentage (%)
Age (Mean ± SD)	55.7 ± 7.5 yrs	
Age group	≤60 years	76
	>60 years	24
Gender	Female	29
	Male	71
Underlying disease	CAD	91
	COPD/Cor pulmonale	10
	CHF	21
	DCM	51
	Anaemia	1
Comorbidities	Diabetes	15
	Hypertension	19
	CKD	4
	CVA	3
Other history	Fluid overload	84
	Chronic medication use	96
X-ray findings	Cardiomegaly	55
	Pulmonary oedema	43
	Pulmonary oedema + Cardiomegaly	6
	Normal	8

Table 2: Distribution of Participants According to Heart Failure Based on Boston Score and Laboratory Investigations

Features	Percentage (%)
Heart failure	
Definite (8-12)	81
Possibly (5-7)	19
Hypoalbuminemia	65
Hypocholesterolemia (<135)	14
Ejection fraction (%)	
Normal (55)	2
Mild systolic dysfunction (40-54)	32
Moderate systolic dysfunction (35-39)	38
Severe systolic dysfunction (<35)	28

Table 3: Association of Age with Mortality

Variable	Alive (n=84) n (%)	Death (n=16) n (%)	p value
Age group			
<60	65 (77.4)	11 (68.8)	0.459
≥60	19 (22.6)	5 (31.3)	
Gender			
Female	22 (26.2)	7 (43.8)	0.156
Male	62 (73.8)	9 (56.3)	
Underlying disease			
CAD	78 (92.9)	13 (81.3)	0.137
COPD/Cor pulmonale	4 (4.8)	6 (37.5)	0.001
CCF	15 (17.9)	6 (37.5)	0.010
DCM	37 (44.0)	14 (87.5)	0.001
Fluid overload	69 (82.1)	15 (93.8)	0.246
X-ray findings			
Cardiomegaly	40 (47.6)	15 (93.8)	0.001
Pulmonary oedema	38 (45.2)	11 (68.8)	0.023
Heart failure status			
Definite (8–12)	65 (77.4)	16 (100.0)	0.035
Possible (5–7)	19 (22.6)	0 (0.0)	
Biochemical markers			
Hypoalbuminemia	49 (58.3)	16 (100.0)	0.001
Hypocholesterolemia	8 (9.5)	6 (37.5)	0.001

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