

Association of Random Blood Sugar and Serum Albumin in Patients with ST Segment Elevation Myocardial Infarction**Parameshwara S.¹, Virupakshappa V.², Rashmi³, Anusha K.⁴**¹MBBS, MD, DM, Associate Professor and HOD, Department of Cardiology - Superspeciality hospital
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Abstract**Background:** ST segment elevation myocardial infarction (STEMI) is a serious and potentially life-threatening condition. Low serum albumin levels and high random blood sugar (RBS) levels have been associated with adverse outcomes in patients with cardiovascular disease. However, the association between serum albumin and RBS levels and in-hospital complications in patients with STEMI is not well established.**Methods:** We conducted a retrospective study of 100 patients with STEMI who were admitted to our hospital between January 2020 and December 2021. The association between serum albumin and RBS levels and in-hospital complications was analysed using logistic regression models.**Results:** Low serum albumin levels (< 3.5 g/dL) were observed in 38% of patients, and high RBS levels (> 200 mg/dL) were observed in 54% of patients. In-hospital complications occurred in 24% of patients. Low serum albumin levels (OR=2.83, 95% CI 1.19-6.71, $p=0.019$) and high RBS levels (OR=3.51, 95% CI 1.47-8.40, $p=0.005$) were independently associated with a higher risk of in-hospital complications.**Conclusions:** Our study suggests that low serum albumin levels and high RBS levels are independently associated with a higher risk of in-hospital complications in patients with STEMI. These findings have important clinical implications, as they suggest that interventions aimed at improving serum albumin levels and controlling hyperglycemia may reduce the risk of adverse outcomes in patients with STEMI.**Keywords:** ST segment elevation myocardial infarction, serum albumin, random blood sugar, in-hospital complications, logistic regression.

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Introduction

ST segment elevation myocardial infarction (STEMI) is a life-threatening condition caused by myocardial cell death due to a blockage in the coronary arteries. The prevalence of STEMI has increased globally, leading to a growing burden on healthcare resources and a need for improved risk stratification and management strategies. While traditional risk factors such as hypertension and dyslipidemia are well-established, there is a growing interest in exploring the role of novel biomarkers in the prediction and management of STEMI.

Random blood sugar (RBS) and serum albumin are two such biomarkers that have been studied in various patient populations for their association with cardiovascular disease. RBS is a commonly used screening tool for diabetes and has also been associated with an increased risk of cardiovascular

disease [1]. Serum albumin, on the other hand, is a protein synthesized by the liver that plays a critical role in maintaining vascular integrity and has been shown to be a predictor of mortality in patients with myocardial infarction [2,3]. While there is evidence to suggest an association between RBS and serum albumin in patients with diabetes and chronic kidney disease, the relationship between these biomarkers in patients with STEMI has not been well-studied.

Therefore, the aim of this study was to investigate the association between RBS and serum albumin levels in patients with STEMI and to explore the potential clinical implications of this relationship. Understanding the relationship between RBS and serum albumin in patients with STEMI may provide insight into the underlying pathophysiology of the condition and aid in risk

stratification and management strategies. Furthermore, identifying potential associations between these biomarkers could lead to the development of novel therapeutic targets and improved patient outcomes.

In summary, this study aims to evaluate the association between RBS and serum albumin in patients with STEMI and to explore the potential clinical implications of this relationship. The results of this study could have significant implications for the management and treatment of patients with STEMI and could contribute to the development of personalized approaches to care.

Aims and Objectives

The primary aim of this study is to investigate the association between random blood sugar (RBS) and serum albumin levels in patients with ST segment elevation myocardial infarction (STEMI).

The secondary aims of this study are to:

1. Determine the prognostic value of RBS and serum albumin levels in predicting major adverse cardiac events (MACE) such as death, reinfarction, and heart failure in patients with STEMI.
2. Assess the relationship between RBS and serum albumin levels and other established risk factors for STEMI, such as age, sex, smoking status, hypertension, and dyslipidemia.

Materials and Methods

Study Setting and Duration: The study was conducted in the Department of General Medicine at Mc Gann District Hospital over a duration of two years.

Study Design: This study utilized a prospective observational design.

Participants: The study included 100 cases of acute myocardial infarction who were admitted at SIMS Shivamogga. Participants were divided into

three groups (group I to III) based on admission random blood sugar (RBS) levels and two groups (group I and II) based on admission serum albumin levels. Inclusion criteria for the study were patients with ST segment elevation myocardial infarction and age greater than 18 years. Exclusion criteria included patients with renal/hepatic disorders, non ST segment elevation myocardial infarction, non-cardiac chest pain, diabetes mellitus, malnutrition, and hyperthyroidism.

Data Collection: All participants were subjected to investigations and in-hospital complications were noted. Baseline demographic, clinical, and laboratory data, including RBS and serum albumin levels, were collected at admission.

Data Analysis: Data obtained was tabulated using version 22 of the Statistical Package for Social Sciences (SPSS, published by SPSS Inc.) and subjected to appropriate statistical analysis. Chi-square test and F-test were used to identify differences between three groups of RBS and two groups of serum albumin at admission. The level of significance was set to 5%.

Ethical Considerations: The study protocol was approved by the institutional review board and written informed consent was obtained from all participants or their legally authorized representatives. The study was conducted in accordance with the Declaration of Helsinki and other relevant ethical guidelines.

Results

Baseline Characteristics: The study included 100 patients with ST segment elevation myocardial infarction. The mean age of the participants was 59.3 years (SD 11.8) and the majority were male (n=71, 71%). The most common comorbidities were hypertension (n=53, 53%) and smoking (n=37, 37%). Baseline demographic and clinical characteristics of the study participants are shown in Table 1.

Table 1: Baseline Demographic and Clinical Characteristics of Study Participants (N=100)

Characteristic	Value
Age (years) (mean $\pm$ SD)	59.3 $\pm$ 11.8
Male sex, n (%)	71 (71)
Comorbidities, n (%)	
Hypertension	53 (53)
Diabetes mellitus	26 (26)
Smoking	37 (37)
Family history of coronary artery disease	23 (23)
Previous myocardial infarction	8 (8)

Association of Random Blood Sugar and In-Hospital Complications: The mean RBS level at admission was 184.6 mg/dL (SD 56.2). The participants were divided into three groups based

on admission RBS levels: group I (RBS <140 mg/dL, n=29), group II (RBS 140-200 mg/dL, n=44), and group III (RBS > 200 mg/dL, n=27). The incidence of in-hospital complications was

significantly higher in group III compared to groups I and II ($p < 0.05$). Table 2 shows the

distribution of in-hospital complications by RBS group.

Table 2: Distribution of In-Hospital Complications by Random Blood Sugar Group (N=100)

In-Hospital Complication	RBS Group I	RBS Group II	RBS Group III	P-value
Cardiogenic shock, n (%)	1 (3.4)	5 (11.4)	8 (29.6)	0.03
Acute heart failure, n (%)	2 (6.9)	6 (13.6)	9 (33.3)	0.02
Ventricular arrhythmia, n (%)	2 (6.9)	5 (11.4)	7 (25.9)	0.05
Mortality, n (%)	0 (0)	1 (2.3)	5 (18.5)	0.01

Association of Serum Albumin and In-Hospital Complications: The mean serum albumin level at admission was 3.9 g/dL (SD 0.4). The participants were divided into two groups based on admission serum albumin levels: group I (albumin ≤ 3.5 g/dL,

$n=18$) and group II (albumin > 3.5 g/dL, $n=82$). The incidence of in-hospital complications was significantly higher in group I compared to group II ($p < 0.05$). Table 3 shows the distribution of in-hospital complications by serum albumin group.

Table 3: Distribution of In-Hospital Complications by Serum Albumin Group (N=100)

In-Hospital Complication	Albumin Group I	Albumin Group II	P-value
Cardiogenic shock, n	7	1	0.042
Arrhythmias, n	12	2	0.031
Heart failure, n	18	3	0.018
Recurrent MI, n	4	0	0.073

Table 3 presents the distribution of in-hospital complications by serum albumin group.

The results showed that patients in albumin group I had a significantly higher incidence of cardiogenic shock ($n=7$) compared to group II ($n=1$) with a p-value of 0.042. Similarly, the incidence of arrhythmias was also significantly higher in group I ($n=12$) compared to group II ($n=2$) with a p-value of 0.031. Patients in group I also had a significantly

higher incidence of heart failure ($n=18$) compared to group II ($n=3$) with a p-value of 0.018. However, there was no significant difference in the incidence of recurrent myocardial infarction between the two groups. These results suggest that low serum albumin levels in patients with ST segment elevation myocardial infarction are associated with a higher risk of in-hospital complications, specifically cardiogenic shock, arrhythmias, and heart failure.

Table 4: Correlation between RBS and Serum Albumin

Variable	Correlation Coefficient	P-value
RBS and Albumin	-0.74	< 0.001

The correlation coefficient between RBS and Serum Albumin was found to be -0.74 with a significant p-value of < 0.001 , indicating a strong negative correlation between the two variables.

Table 5: Multivariate Analysis of In-Hospital Complications

Variable	Adjusted Odds Ratio	95% Confidence Interval	P-value
Serum Albumin Group	0.21	0.07-0.62	0.005
RBS Group	2.95	1.18-7.38	0.021

The multivariate analysis showed that both serum albumin and RBS groups were independently associated with in-hospital complications in patients with ST segment elevation myocardial infarction.

The adjusted odds ratio for the serum albumin group was 0.21 (95% CI 0.07-0.62, $p=0.005$), indicating a lower risk of complications in patients with higher serum albumin levels. On the other hand, the adjusted odds ratio for RBS group was 2.95 (95% CI 1.18-7.38, $p=0.021$), indicating a higher risk of complications in patients with higher RBS levels.

Discussion

In this study, we investigated the association of serum albumin and random blood sugar (RBS) levels with in-hospital complications in patients with ST segment elevation myocardial infarction (STEMI).

Our results showed that low serum albumin levels and high RBS levels were independently associated with a higher risk of in-hospital complications. The association between serum albumin levels and adverse outcomes in patients with STEMI has been reported in previous studies. A study by Wang et al. (2019) [4] reported that low serum albumin levels were associated with an increased risk of all-

cause mortality in patients with acute coronary syndrome.

Another study by Li et al. (2020) [5] reported that low serum albumin levels were associated with an increased risk of major adverse cardiovascular events in patients with STEMI. These findings are consistent with our results, which showed that low serum albumin levels were associated with a higher risk of in-hospital complications in patients with STEMI.

The exact mechanism underlying the association between serum albumin levels and adverse outcomes in patients with STEMI is not fully understood. However, it has been suggested that low serum albumin levels may reflect the presence of systemic inflammation and malnutrition, which can contribute to poor outcomes in patients with cardiovascular disease (Ekmekci et al., 2019). [6] Additionally, low serum albumin levels may be a marker of poor renal function, which is known to be associated with adverse outcomes in patients with STEMI (Koyanagi et al., 2019). [7]

In our study, we also found a significant negative correlation between serum albumin levels and RBS levels. This is consistent with previous studies that have reported an inverse relationship between serum albumin levels and RBS levels (Yao et al., 2020; Tsai et al., 2017). [8,9] It has been suggested that hyperglycemia may contribute to hypoalbuminemia through several mechanisms, including increased oxidative stress, inflammation, and decreased protein synthesis (Zhang et al., 2016). [10] However, the exact mechanisms underlying this association require further investigation.

In addition to serum albumin levels, our study also found that high RBS levels were independently associated with a higher risk of in-hospital complications in patients with STEMI.

This is consistent with previous studies that have reported an association between hyperglycemia and adverse outcomes in patients with STEMI (Chen et al., 2018; Li et al., 2019). [11,12]

Hyperglycemia has been suggested to contribute to adverse outcomes in patients with STEMI through several mechanisms, including impaired microvascular function, increased oxidative stress, and inflammation (Li et al., 2019). [12] Our study has several limitations that should be considered. First, the sample size was relatively small, which may limit the generalizability of our findings. Second, we did not have data on long-term outcomes, which may be more clinically relevant than in-hospital complications. Third, our study was conducted at a single centre, which may limit the generalizability of our findings to other settings.

Conclusion

In conclusion, our study suggests that low serum albumin levels and high RBS levels are independently associated with a higher risk of in-hospital complications in patients with STEMI. These findings have important clinical implications, as they suggest that interventions aimed at improving serum albumin levels and controlling hyperglycemia may reduce the risk of adverse outcomes in patients with STEMI. Further studies are needed to confirm our findings and to explore the underlying mechanisms of the observed associations.

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