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Original Research Article

A study of serum albumin levels in acute coronary syndrome and its correlation with clinical outcome

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ABSTRACT

Background: Coronary artery disease (CAD) is major cause of death and mortality in the developed world. Coronary atherosclerotic disease involves the epicardial coronary arteries and may manifest as an acute or chronic coronary syndrome. Acute coronary syndrome (ACS) arises from atherosclerotic plaque rupture leading to coronary thrombosis and/or spasm.
Methods: The present study was conducted in department of medicine, Guru Nanak Dev hospital attached to government medical college, Amritsar from May 2021 to December 2021. This was a prospective observational study in which a total of 50 patients of ACS were enrolled. Serum albumin levels of the patients were recorded and clinical outcomes based on the albumin levels were compared between the patients.
Results: The patients with low serum albumin levels had worse outcomes. The mean serum albumin level of STEMI and NSTEMI patients in hypoalbuminemia group was 2.88±0.11 g/dl and 3.15±0.26 g/dl (p=0.047). The mean serum albumin level of patients having mortality in hypoalbuminemia group was 2.87±0.06 g/dl and those who didn't have mortality was 3.19±0.21 g/dl (p=0.013). The mean serum albumin level of patients developing new onset heart failure in hypoalbuminemia group was 2.85±0.06 g/dl and those not developing had 3.11±0.19 g/dl (p=0.021).
Conclusions: We conclude that ACS patients presenting with hypoalbuminemia are more likely to develop worse outcomes in the form of heart failure, cardiogenic shock and mortality. ACS patients presenting with low serum albumin levels have more chances of developing STEMI.

Keywords: Acute coronary syndrome, Serum albumin, Hypoalbuminemia, Normoalbuminemia, ST elevation myocardial infarction

INTRODUCTION

CAD is one of the major causes of death and mortality in the developed world.[1] Coronary atherosclerotic disease involves the epicardial coronary arteries and may manifest as an acute or chronic coronary syndrome. ACS arise from atherosclerotic plaque rupture leading to coronary thrombosis and/or spasm. It results in occlusion of the coronary arteries which leads to intense myocardial ischaemia or even myocardial necrosis which eventually manifests as unstable angina or myocardial infarction.[2] ACS patients with acute myocardial infarction are classified into two main groups based on their presenting electrocardiogram (ECG) as ST segment elevation myocardial infarction (STEMI) or non-ST segment elevation myocardial infarction (NSTEMI).[3] Albumin is the most abundant protein found in plasma which constitutes about half of the total protein content (3.5 g/dl to 5 g/dl) of plasma. It is synthesized by hepatocytes and rapidly excreted into the bloodstream at the rate of about 10 g to 15 g per day.[4] It also plays a role in atherothrombogenesis, a key event in ACS. Albumin is also an inhibitor of endothelial apoptosis.[5] Albumin is a significant inhibitor of platelet activation and aggregation

and an inhibitor of platelet induced coronary artery vasoconstriction. Plasma albumin concentration is related to inflammatory and hemostatic processes.[6] ACS is considered an inflammatory condition and in response to an inflammatory state, there will be a decline in serum albumin concentration.[7,8] The aim of the study was to determine the serum albumin levels in patients of acute coronary syndrome and to determine the correlation between serum albumin levels and development of STEMI or NSTEMI or new onset heart failure or cardiogenic shock or in-hospital mortality in these patients.

METHODS

Current prospective observational study was conducted in the medicine department, Guru Nanak Dev hospital attached to government medical college, Amritsar from May 2021 to December 2021. A total of 50 patients of ACS were enrolled in this study. They were diagnosed as ACS on basis of clinical symptoms, cardiac biomarker levels and/or ECG findings. The patients were divided into two groups based on serum albumin levels as hypoalbuminemia group (serum albumin <3.5 g/dl) and normoalbuminemia group (serum albumin ≥3.5 g/dl). The endpoint of the study was the association between serum albumin levels and development of ACS in the form of NSTEMI, STEMI and the complications in the form of new onset heart failure, cardiogenic shock and in-hospital mortality in these patients.

Inclusion criteria

Patients with acute myocardial infarction both STEMI and NSTEMI proven by cardiac enzymes, ECG and symptoms suggestive of acute coronary syndrome were included in the study.

Exclusion criteria

Acute renal failure on admission, pregnancy, chronic liver disease, end stage renal disease (ESRD), malignancy, septicemia, malnutrition and nephrotic syndrome.

The data was summarized as mean±SD (standard deviation). The association between independent and dependent variables was done by chi-square (χ^2) test. The p value less than 0.05 ($p<0.05$) was considered statistically significant. The analysis was performed on SPSS software (Windows version 21.0).

RESULTS

Total of 50 patients were enrolled in the study. The mean age of the study population was found to be 61.50±9.77 years. The age groups were divided as 30-40, 41-50, 51-60, 61-70 and >70 years. Maximum number of patients were in the age group of 61-70 years which included 18 patients. Out of these 50 patients, 22 were in the hypoalbuminemia group and 28 were in the normoalbuminemia group. There were 12 and 17 females respectively in hypoalbuminemia and normoalbuminemia group (Figure 1).

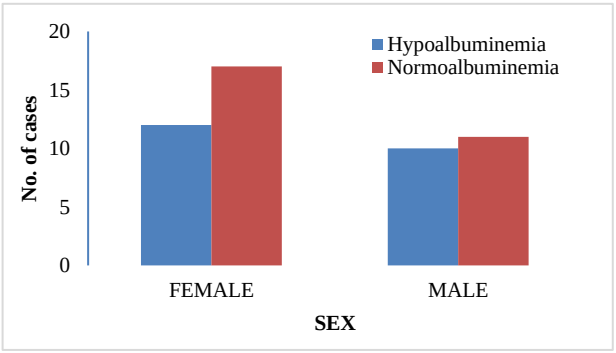

Figure 1: Gender wise distribution between two groups in the study population.

The males were 10 and 11 in numbers respectively. This association between gender wise distribution among the two groups was not found to be significant (p=0.661). The serum albumin level in patients who developed new onset heart failure among the two groups is shown in (Figure 2).

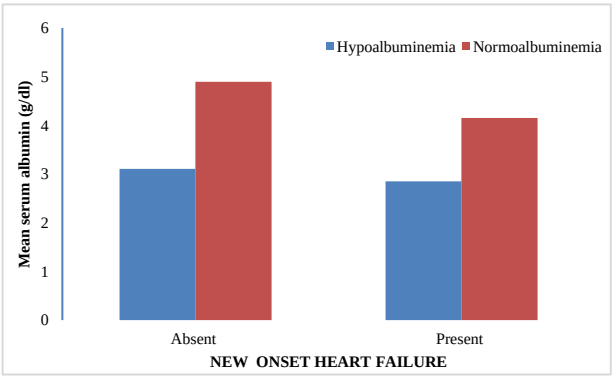

Figure 2: Distribution and comparison of mean albumin level with new onset heart failure between two groups of study population.

In hypoalbuminemia group, serum albumin level in those who developed new onset heart failure was 2.85±0.057 g/dl and those who didn't develop it was 3.106±0.198 g/dl and this was found to be statistically significant (p=0.021). Mean serum albumin level in hypoalbuminemia group who developed and didn't develop cardiogenic shock was 2.980±0.054 g/dl and 3.124±0.188 g/dl respectively and this relation was found to be statistically insignificant (p=0.126) as shown in (Figure 3). The mean serum albumin level in normoalbuminemia group was 5.40±1.979 g/dl in those who developed cardiogenic shock and 4.8±0.873 g/dl in those who didn't develop and this was statistically insignificant (p=0.393). Mean serum albumin level in hypoalbuminemia group who had mortality and who didn't have was 2.867±0.057 g/dl and 3.189±0.205 g/dl

respectively and this relation was found to be statistically significant (p=0.013) as shown in (Figure 4).

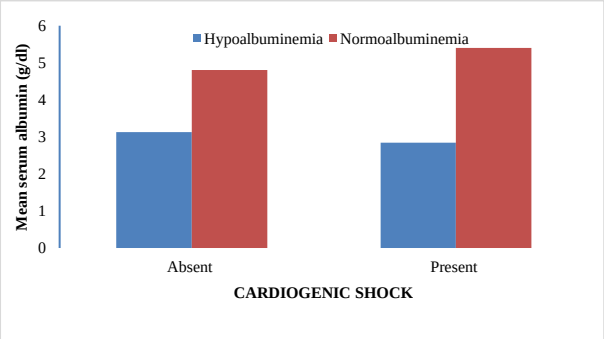

Figure 3: Distribution and comparison of mean albumin level with cardiogenic shock between two groups of study population.

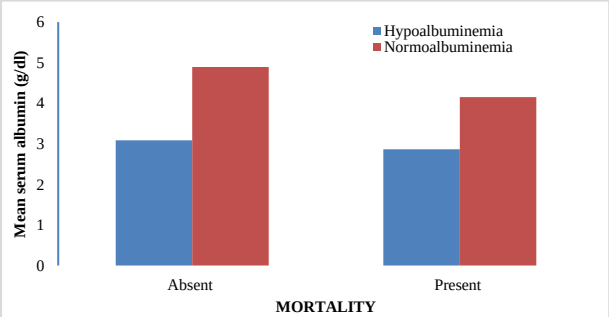

Figure 4: Distribution and comparison of mean albumin level with mortality between two groups of study population.

Mean serum albumin level in hypoalbuminemia group who presented with STEMI was 2.883±0.111 g/dl and who presented with NSTEMI was 3.150±0.259 g/dl and this relation was found to be statistically significant (p=0.047) as shown below in the (Figure 5). In normoalbuminemia group the mean serum albumin level in patients of STEMI was 4.838±0.838 g/dl and that of those with NSTEMI was 4.847±1.043 g/dl and this was statistically insignificant (p=0.982).

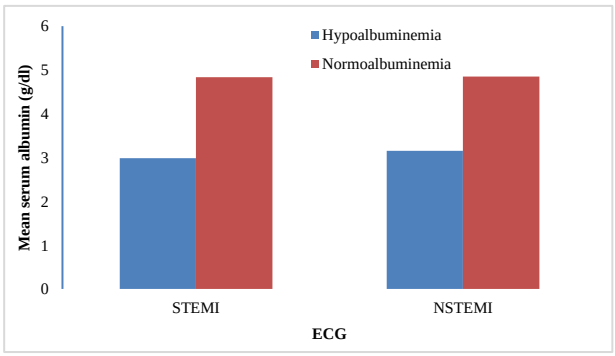

Figure 5: Distribution and comparison of mean albumin level with ECG findings between two groups of study population.

DISCUSSION

Albumin selectively inhibits tumor necrosis factor-alpha induced VCAM-1 expression, monocyte adhesion and nuclear factor-kappa B activation in endothelial cells of human aorta, suggesting its role as an anti-inflammatory and anti-thrombogenic substance.[9] Low serum albumin level has been linked with worse clinical outcomes and mortality in patients of ACS. In this background, this study was conducted to study the association between serum albumin levels and clinical outcomes in ACS patients. In the study of 50 patients, they were grouped in age groups of 30-40, 41-50, 51-60, 61-70, >70 years. Maximum number of patients were in the age group of 61-70 years, 18 patients and the mean age of the study population was 61.50±9.77 years. Mean age in the study of Hartopo et al was 57.5±10.0 years.[10] In their study Sujino et al recorded the mean age to be 88.1±2.5 years.[11] Hypoalbuminemia was seen in 22 (44%) patients and normoalbuminemia was seen in 28 (56%) patients out of total 50 patients. In study conducted by Hartopo et al out of total of 82 patients, 35 (43%) were in hypoalbuminemia group and 47 (57%) were in normoalbuminemia group.[10] In another study conducted by Polat et al hypoalbuminemia was detected in 34% of the patients.[12] Findings of our study were similar to these studies.

In hypoalbuminemia group out of 22 patients,12 (54%) presented with STEMI and 10 (46%) presented with NSTEMI. In normoalbuminemia group of 28 patients, STEMI was seen in 13 (46%) patients and NSTEMI in 15 (54%) patients. González-Pacheco et al also found that the patients with serum albumin levels <3.5 g/dl were more likely to present with STEMI.[13] In our study population in hypoalbuminemia group, the mean serum albumin level in patients who presented with STEMI was 2.883±0.111 g/dl and those presented with NSTEMI was 3.150±0.259 g/dl and this association was statistically significant (p=0.047). The mean serum albumin levels in patients of hypoalbuminemia group who developed new onset heart failure was 2.85±0.057 g/dl and those who didn't develop was 3.106±0.918 g/dl and this association was found to be statistically significant (p=0.021). Oduncu et al also concluded that hypoalbuminemia on admission was a strong independent predictor for long-term mortality and development of advanced Heart Failure in patients with STEMI undergoing p-PCI.[14] The mean serum albumin level in hypoalbuminemia group who had mortality was 2.867±0.057 g/dl and who didn't was 3.189±0.205 g/dl. This association was found to be statistically significant (p=0.013). Plakht et al, Zhu L et al and Xia M et al also observed that low serum albumin level was associated with increased mortality among the ACS patients.[15-17] Boaci et al and Sujino et al also recorded that low serum albumin level was associated with adverse in-hospital outcomes in STEMI patients.[18,11] No significant association was seen between the serum albumin levels and cardiogenic shock in our study population.

Limitations

The limitation of our study was the small sample size which may limit the clinical applicability of our results and this needed to be confirmed by a large-scale study. Secondly, we did not have access to information about patient's prior serum albumin levels, so we cannot be sure that hypoalbuminemia in our sample didn't represent a chronic inflammatory state.

CONCLUSION

It was concluded that low serum albumin levels on admission are associated with worse in hospital outcomes in ACS patients and also that patients with low serum albumin levels are more likely to present with STEMI.

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Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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