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Study of Serum C-Reactive Protein and Albumin Ratio in Acute Pancreatitis

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ABSTRACT

Acute pancreatitis (AP) is a severe inflammation of the pancreas presented with sudden onset and severe abdominal pain and has high morbidity and mortality rate. Serum albumin levels can be an indicator of malnutrition that in turn is associated with impaired immune response in cancer patients. Aim: To evaluate the role of C-Reactive protein and albumin ratio in acute pancreatitis. Methods: This was a Prospective study started after approval from institutional research review board to April 2021 and another 2 months were required for the write up at Department of General Medicine, SMS Medical College and attached group of hospitals, Jaipur. The study included Sample size of 55 cases of acute pancreatitis as per previous studies showing the CRP/Albumin ratio correlation with Ranson and calcium is r -0.518 and 0.504 for 80% power and 0.05 a error. The patients were taken for detailed history including past treatment and personal history to identify possible etiologies and a thorough clinical examination to identify the evidence of acute pancreatitis. This study included sample size of 55 cases. Here, we found that out of 55 patient majority (38.18%) of patients were of age 20-35 years and 51-65 years each followed by 20% patients of 36-50 years age group. The mean age of our study by 44.23 years. In our study out of 55 patient 65.4% (36) patients were male and 34.5% patients were female. Here, in the ward found that majority (43.6%) of patients were diagnosed with alcoholic pancreatitis followed by 25.4% with gall stone pancreatitis followed by 18.18% of idiopathic acute pancreatitis. We found that a higher CRP/ALB ratio at presentation was associated with a higher risk of death before discharge.

INTRODUCTION

Acute pancreatitis (AP) is a severe inflammation of the pancreas presented with sudden onset and severe abdominal pain and has high morbidity and mortality rate. Although its etiology is not known for certain, it is mostly associated with gallstones and alcohol[1]. It is associated with intra-acinar activation of proteolytic enzymes, leukocyte chemo attraction, release of cytokines, oxidative stress and microcirculatory injury[2]. The annual incidence of AP ranges from 15.9-36.4 per 100000 persons. The burden of the disease on healthcare resource utilization is expected to increase in the near future[3].

Approximately 75-80% of cases progress mildly and can be cured solely with intravenous fluid treatment and supportive care. The remaining cases progress with mortality and severe complications up to 30-50%[4]. For this reason, early diagnosis of the disease and determination of a therapeutic strategy according to disease severity are of great importance. Serum albumin levels can be an indicator of malnutrition that in turn is associated with impaired immune response in cancer patients[5]. Due to their close link, the ratio of CRP to albumin (CAR) has been proposed as a marker to identify patients at risk for early mortality from sepsis[6]. Pancreatic cancer is the fourth leading cause of cancer-related deaths worldwide, with a 5-year survival rate of 9% for all stages combined[7]. For pancreatic tumours, surgical resection is the mainstay of treatment while (neo-) adjuvant therapy is gaining ground. Since morbidity and mortality rates after surgery are high, there is a need for identifying preoperative biomarkers that would enable better stratification of patients who may benefit from surgery. In recent years, emerging evidence has shown the potential value of a variety of systemic inflammation-based prognostic scores in pancreatic cancer[8].

Serum elevation of C-reactive protein (CRP), an acute-phase protein, has been shown to be a prognostic indicator in a variety of neoplasms. Moreover, hypoalbuminemia brought about by malnutrition and related to cachexia has been reported to be correlated with an unfavourable prognosis of gastrointestinal tumours[9]. An elevated C-reactive protein-to-albumin ratio (CAR) or a composite score such as the modified Glasgow Prognostic Score (mGPS) seems to be potentially useful biomarkers for survival but the evidence remains controversial.

Aim: to evaluate the role of C-Reactive protein and albumin ratio in acute pancreatitis patients.

MATERIALS AND METHODS

This was a prospective study started after approval from institutional research review board to April 2021 and another 2 months were required for the write up at Department of General Medicine, SMS Medical College and attached group of hospitals, Jaipur. The study included. Sample size of 55 cases of acute pancreatitis.

Inclusion criteria:

- Patients >18 years of age
- Presented within 72 hrs of onset of epigastric pain

Exclusion criteria:

- Patient with concomitant history of chronic liver disease
- Patient on corticosteroids or cytotoxic drugs
- Pregnant and lactating women

RESULTS

Here, we found that out of 55 patient majority (38.18%) of patients were of age 20-35 years and 51-65 years each followed by 20% patients of 36-50 years age group. The mean age of our study was 44.23 years. In our study out of 55 patient 65.4% (36) patients were male and 34.5% patients were female (Table 1).

Here, in the ward found that majority (43.6%) of patients were diagnosed with alcoholic pancreatitis followed by 25.4% with gall stone pancreatitis followed by 18.18% of idiopathic acute pancreatitis (Fig. 1).

Here, we found that mean serum bilirubin was 2.32 mg dL^{-1}, mean ALP was 110.08 U L^{-1}, mean serum Calcium was 7.07 mg dL^{-1} and serum albumin was 4. 21 mg dL^{-1}. In our study we found that mean haemoglobin was 11.6 g dL^{-1}, mean TLC was 13.75 1000×CU mm^{-1}, mean Platelets was 2.59 lakh mL^{-1} and mean LDH was 348.05 U L^{-1}. Here in this study we calculated mean HCT, amylase and lipase for our study group. Mean HCT was 35.69%, mean Amylase was 197.25 U L^{-1} and mean lipase was 274.3 U L^{-1} (Table 2 and Fig. 2).

Here, we found that mean CRP was 84.2 and mean CRP/Albumin ratio was 2.25. Here we found that mean SGOT was 74.2 U L^{-1}, mean SGPT was 89.5 U L^{-1} and

Table 1: Sociodemography

Age distribution (years)	No. of patients	Percentage
20-35	21	38.18
36-50	11	20
51-65	21	38.18
>65	2	3.63
Total	55	100
Mean ± SD	44.23±13.6	
Gender		
Female	19	34.54
Male	36	65.45

Table 2: Distribution of cases according to Serum bilirubin, ALP, serum calcium and serum albumin

Parameter	Mean	Standard deviation
Serum Bilirubin	2.32	1.94
ALP	110.08	47.94
Serum Calcium	7.07	0.90
Serum Albumin	42.12	6.59

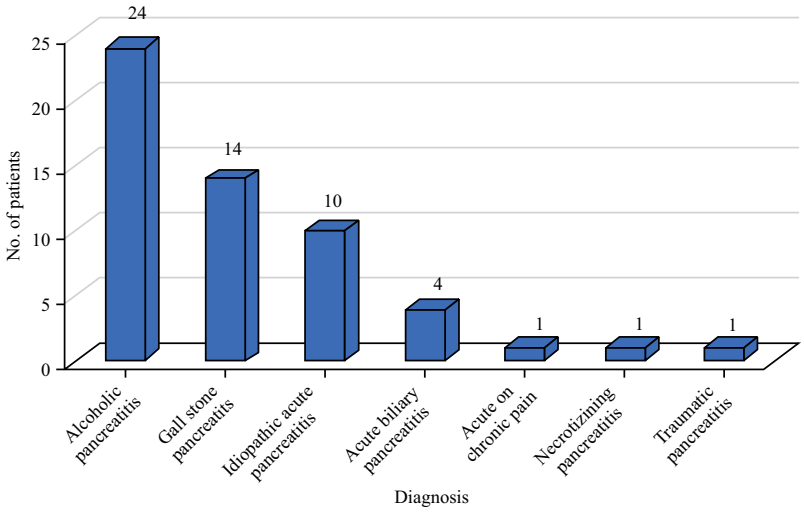

Fig. 1: Etiology

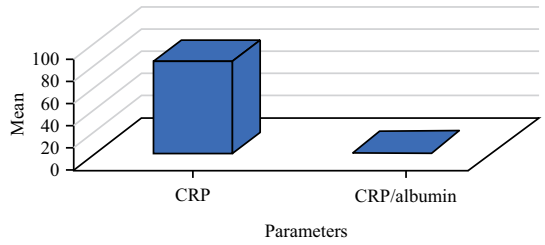

Fig. 2: Distribution of cases according to CRP and CRP/albumin ratio

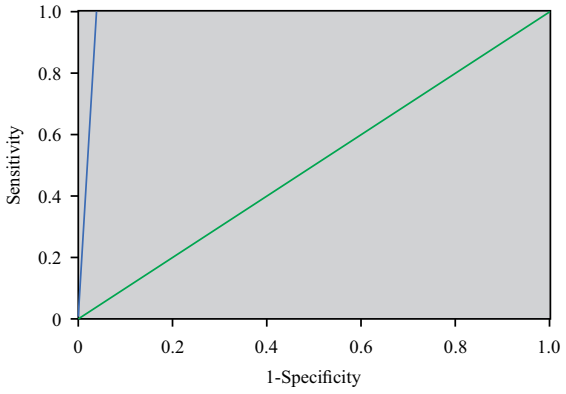

Fig. 3: ROC for CRP/albumin for prediction of mortality

mean S. PCT was 2.81 ng mL^{-1}. Here we distributed our patients according to Ranson score. Majority (43.63%) of patients were of Ranson score 2 followed by 34.5% patients of Ranson score 1. We found that 9.09% patients were of Ranson score 3 (Fig. 3).

Here, we found that area under the curve for CRP/Albumin was 0.981 (p = 0.02) with 100% sensitivity and 94.3 specificity. In our study we found that mean CRP/Albumin ratio for expired patients was 8.7 and for survived patients was 2.01. There was no-significant difference found as p>0.05 (Fig. 4).

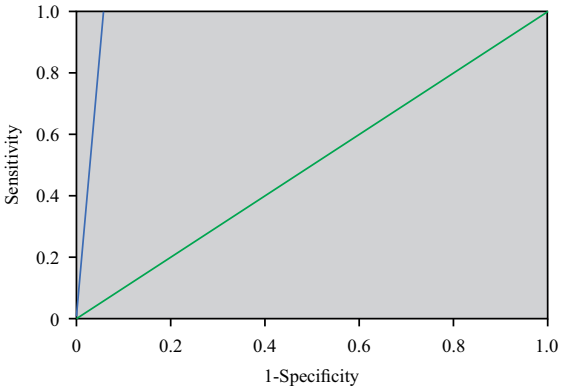

Fig 4: ROC for ranson score for prediction of mortality

In our study, we found that area under the curve for ranson score was 0.972 (p = 0.025) with 100% sensitivity and 94.3% specificity. In this study We observed that out of 55 patients only 2 patient died. The mean Ranson score was 2.05. Here we found that 80% patients were of mild acute pancreatitis followed by 5.45% patients were of severe acute pancreatitis. In our study, we found that area under the curve for atlanta classification criteria was 0.91 (p = 0.04) with 100% sensitivity and specificity.

DISCUSSIONS

AP is a common gastrointestinal emergency and its mortality can reach up to 40%. For this reason, it is of great importance to identify patients to be treated aggressively at the time of admission. There is a need for a simple, repeatable and non-invasive laboratory procedure that does not require additional time and is easy to measure at the time of admission.

Thus, we investigated the usability of the CRP/albumin ratio for the determination of prognosis and mortality in patients who are admitted to our clinic

with an AP diagnosis. Several studies showed that both markers are used in the diagnosis, treatment follow-up and prognosis determination CRP especially was very valuable in acute response due to its short half-life CRP levels are frequently used at the time of admission and later during the treatment in AP patients[10,11].

Mean serum bilirubin was 2.32, mean ALP was 110.08, mean serum Calcium was 7.07 and serum albumin was 42.12. We found that mean SGOT was 74.2, mean SGPT was 89.5 and mean S. PCT was 2.81. Martin *et al*.[12] found that CRP measurements ranged from 0.2-336, with an average of 19.37±42.77, Albumin measurements ranged from 1.8-5.2, with an average of 4.14±0.43, CRP/Alb measurements ranged from 0.1-98.5, with an average of 5.10±11.48. Neutrophil measurements ranged from 1.4-56.3, with an average of 7.77±5.37, Lymphocyte measurements ranged from 0.2-12.3, with an average of 2.02±1.21, NLR measurements ranged from 0.3-58.9, with an average of 6.47±8.59. A statistically significant difference was found between albumin measurements according to the groups and the measurements of the patient group were lower than the control group ($p = 0.010$, $p<0.05$). Han *et al*.[13] found that There was no significant difference between gender, RDW, AMY, WBC, AST, $Ca2^{+}$, PDW and TG between the 2 groups ($p> 0.05$).

We found that mean CRP was 84.2 and mean CRP/Albumin ratio was 2.25. Tanoue *et al*.[14] found that median value of the CRP/Alb ratio was 0.241 (range, 0.002-6.728). Martin *et al*.[12] found that the cut-off point for CRP/Alb was found to be 1.08 and above. CRP/Alb for a cut-off value of 1.08, sensitivity 76.64%, specificity 97.20%, positive predictive value 96.47%, The negative predictive value is 80.62% and the accuracy is 86.92%. The area under the ROC curve was 89.9% and the standard error was 2.2%.

We found that area under the curve for CRP/Albumin was 0.981 ($p = 0.02$) with 100% sensitivity and 94.3 specificity and area under the curve for ranson score was 0.972 ($p = 0.025$) with 100% sensitivity and 94.3% specificity. In our study area under the curve for atlanta classification criteria was 0.91 ($p = 0.04$) with 100% sensitivity and specificity.

Kaplan *et al*.[15] demonstrated that the CRP/albumin ratio was higher in deceased AP patients compared to those survived and it was a prognostic factor. Wang *et al*.[16] found that the ROC curve for prediction of mortality using CRP/albumin ratio revealed that at a cutoff of 25.83 had significant good discriminatory power in predicting mortality (AUC¼ 0.795 and $p<0.001$) with 85.4% accuracy. Han *et al*.[13] found that The area under ROC curve of CRP, Ranson scale was 0.940, 0.815, respectively. The best cut-off value was >121, >3 respectively and sensitivity was 81.48 and 96.30%, respectively.

Kim et al showed that the CRP/albumin ratio was superior to the CRP level in predicting mortality in patients with septic shock; if the cut-off value is 5.09, the sensitivity and specificity of this ratio were 61% and the Kaplan-Meier curve analysis showed a significantly higher 180-day mortality rate in patients with a CRP/albumin ratio >5.09, compared to patients with a lower CRP/albumin ratio[17]. In our study, compared with patients who had a CRP/albumin ratio 16.28 supports the findings of the above mentioned study.

CONCLUSION

In conclusion, we found that a higher CRP/ALB ratio at presentation was associated with a higher risk of death before discharge. This study demonstrated that as a cheap, repeatable, non-invasive systemic inflammation-based marker, the CRP/albumin ratio is an independent predictor of overall survival for patients with AP. The CRP/ albumin ratio could be used to predict prognosis in patients with AP like other prognostic scores or laboratory parameters.

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