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Original Article

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Assessment of C Reactive Protein versus High Sensitivity C Reactive Protein as an Indicator of Severity in Acute Pancreatitis at a Tertiary Care Centre: A Cross Sectional Study

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ABSTRACT

Background: Acute pancreatitis is a condition with a spectrum of severity, and early assessment of its severity is crucial for effective management. C-reactive protein (CRP) and high-sensitivity C-reactive protein (hs-CRP) are potential biomarkers for this purpose.

Methods: This single-center, cross-sectional observational study assessed 50 patients with acute pancreatitis at Sapthagiri Institute of Medical Sciences and Research Center, Bangalore, from October 2019 to July 2021. The study aimed to evaluate the efficacy of CRP and hs-CRP as indicators of severity, using Ranson's and Glasgow scores for severity assessment. CRP and hs-CRP levels were measured and correlated with these scores.

Results: Of the 50 patients, the age group most affected was 51-60 years (40%), with a male predominance (66%). Patients with a Ranson's score ≥3 had a mean serum CRP level of 29.38 ± 6.31 mg/l, significantly higher than those with a score <3 (22.32 ± 4.52 mg/l, $p<0.01$). Similarly, mean hs-CRP levels were significantly higher in patients with more severe disease (Ranson's score ≥3: 243450.81 ± 28541.13 ng/dl vs. <3: 173541.84 ± 18472.25 ng/dl, $p<0.0001$).

Conclusion: The study demonstrates a significant correlation between elevated levels of CRP and hs-CRP with higher severity scores in acute pancreatitis. These biomarkers could potentially serve as effective tools in the early identification of patients at risk for severe disease.

Key Words: *Acute Pancreatitis, C-Reactive Protein, High-Sensitivity C-Reactive Protein, Ranson's Score, Glasgow Score, Biomarkers*

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INTRODUCTION

Acute pancreatitis, a sudden inflammation of the pancreas, presents a significant challenge in clinical practice due to its varied etiologies, presentations, and potential for severe complications. The assessment of the severity of acute pancreatitis is crucial for guiding therapeutic interventions and predicting patient outcomes. Traditionally, several biochemical markers have been employed to assess the severity of acute pancreatitis. Among these, C-reactive protein (CRP) and its high-sensitivity variant (hs-CRP) have garnered considerable attention in recent years [1].

CRP, an acute-phase protein synthesized by the liver in response to inflammation, has been a long-standing biomarker in the context of various inflammatory conditions [2]. Its levels rise in response to pro-inflammatory cytokines, notably interleukin-6. In the setting of acute pancreatitis, CRP levels correlate with the extent of pancreatic inflammation and necrosis, thus serving as a potential indicator of disease severity [3].

High-sensitivity C-reactive protein (hs-CRP), an assay with increased sensitivity for CRP, detects lower levels of the protein, allowing for finer discrimination in conditions with low-grade inflammation. While the role of hs-CRP in cardiovascular diseases has been extensively studied, its utility in acute pancreatitis is an area of growing interest [4].

The rationale for assessing the severity of acute pancreatitis lies in its clinical implications. Acute pancreatitis ranges from mild, self-limiting disease to severe, life-threatening illness with multi-organ failure. Early identification of severe

cases is imperative to guide therapeutic decision-making, such as the need for intensive care or aggressive fluid resuscitation [5].

Historically, several scoring systems, such as the Ranson's criteria and the Acute Physiology and Chronic Health Evaluation (APACHE II) score, have been used to predict the severity of acute pancreatitis [6]. However, these scoring systems are often complex and require data that may not be readily available in the initial hours of presentation. This limitation underscores the need for simpler, more readily available biomarkers like CRP and hs-CRP.

In recent years, a plethora of studies have evaluated the utility of CRP and hs-CRP in predicting the severity of acute pancreatitis. A meta-analysis by Mustafa et al. demonstrated that elevated CRP levels within the first 48 hours of symptoms correlated with severe pancreatitis [7]. Similarly, hs-CRP, due to its higher sensitivity, might offer advantages in early detection of severe cases, although its role is less clear and requires further elucidation.

Moreover, the kinetics of CRP and hs-CRP levels in the course of acute pancreatitis have been a subject of interest. It is known that CRP levels typically rise within the first 24 to 48 hours of illness onset and peak at around 48 to 72 hours. This timing is crucial, as early identification of patients at risk for severe pancreatitis could potentially improve outcomes [8].

The present cross-sectional study aims to compare the efficacy of CRP and hs-CRP as indicators of severity in patients presenting with acute pancreatitis at a tertiary care center. Understanding the predictive value of these biomarkers in a contemporary clinical setting is imperative, given the advances in the management of acute pancreatitis and the evolving landscape of biomarkers in clinical medicine.

AIM AND OBJECTIVES

The primary aim of this study was the assessment of C-reactive protein (CRP) versus high sensitivity C-reactive protein (hs-CRP) as indicators of severity in acute pancreatitis. To achieve this, the study was designed with specific objectives in mind. Firstly, it aimed to assess the clinical profile of patients presenting with acute pancreatitis. Secondly, the study sought to evaluate the efficacy of CRP versus hs-CRP in predicting the severity of acute pancreatitis.

MATERIALS AND METHODS

The study was a single-center, hospital-based cross-sectional observational study. It was conducted on patients admitted with acute pancreatitis in the Department of General Surgery at Sapthagiri Institute of Medical Sciences and Research Center, Bangalore. The study period spanned from October 2019 to July 2021. Before the commencement of the study, ethical and research committee clearance was obtained from the Sapthagiri Institute of Medical Sciences and Research Center, Bangalore.

During the study period, a total of 82 acute pancreatitis cases were reviewed in the Department of General Surgery. Out of these, 50 patients, accounting for 60.97% of the cases, were enrolled into the study based on the inclusion criteria set for the study. The remaining 32 patients, which made up 39.02% of the cases, were excluded according to the study's exclusion criteria.

The inclusion criteria for the study were specific. Only patients who were willing to give informed consent and those who presented with acute pancreatitis, characterized by elevated Serum Amylase & Serum Lipase levels, were included. On the other hand, patients were excluded from the study if they had chronic pancreatitis or acute on chronic pancreatitis. Additionally, patients with other inflammatory conditions that could present with elevated CRP levels, such as pneumonitis, rheumatoid arthritis, heart disease, or a history of recent surgery, were also excluded.

The sample size for this study was a crucial aspect. It was initially calculated using EPI INFO Software, referencing the article by Imamura et al. on the significance of measurement of high-sensitivity C-reactive protein in acute pancreatitis. This initial calculation yielded a sample size of 9. However, considering the higher incidence of acute pancreatitis in the country, the sample size for the study was increased to 50.

Regarding the study design, it was meticulously conducted on 50 individuals who were confirmed with acute pancreatitis with elevated Serum Amylase & Serum Lipase levels. These patients, who met the inclusion criteria and had given informed written consent about the protocol of the study, were enrolled. Upon admission, a detailed history of the patient, general physical examination, and systemic examination were recorded in a study proforma. Blood samples were drawn from patients diagnosed with acute pancreatitis upon admission and sent for the evaluation of CRP & hs-CRP levels.

The method of data collection involved a thorough clinical and radiological analysis of cases selected from the patients with acute pancreatitis, after obtaining consent. All the patients selected for the study underwent examinations according to the protocol, and clinical and laboratory investigations were carried out.

Informed consent was a critical aspect of the study. All patients who met the selection criteria were thoroughly informed about the details of the disease process, treatment options, ultimate outcomes, possible effects, complications, and chances of recurrence in both procedures. A written informed consent was obtained before their enrollment in the study. They were also informed of their right to withdraw from the study at any stage.

Data collection was comprehensive and involved gathering information from patients admitted in the General Surgery wards with acute pancreatitis and those attending in-patient and out-patient departments. The data encompassed details such as age, sex, nationality, complaints, and duration of symptoms. Contact numbers and addresses were also collected for follow-up purposes.

Finally, the statistical analysis of the collected data was a crucial part of the study. The data was entered into a Microsoft Excel Worksheet-2010 and then transferred to IBM SPSS Statistics for Windows, version 24 (IBM Corp., Armonk, N.Y., USA) software. This software was used for the calculation of frequency, percentage, mean, standard deviation, and Probability value, facilitating a comprehensive analysis of the study's findings.

RESULTS

During present study, out of a total 82 acute pancreatitis cases, patients were reviewed in OPD and IPD& 50 (60.97%) patients were enrolled into the study according present study inclusion criteria and 32 (39.02%) patients were excluded according exclusion criteria.

TABLE 1: DISTRIBUTION ACCORDING TO AGE

AGE GROUP (IN YEARS)	NO. OF PATIENTS	PERCENTAGE	P VALUE
21-30	3	6	
31-40	5	10	
41-50	10	20	
51-60	20	40	**0.13**
61-70	7	14	
71-80	5	10	
TOTAL	50	100	

In the current study, the patients were categorized into six age groups and more patients were found in the age group of 51-60 years, 20 (40%) followed by 10 (20%) in the 41-50 years age group, 7 (14%) in the 61-70years age group, 5 (10%) in the 31-40 years and 71-80years age group and 3 (6%) in the 21-30years age group.

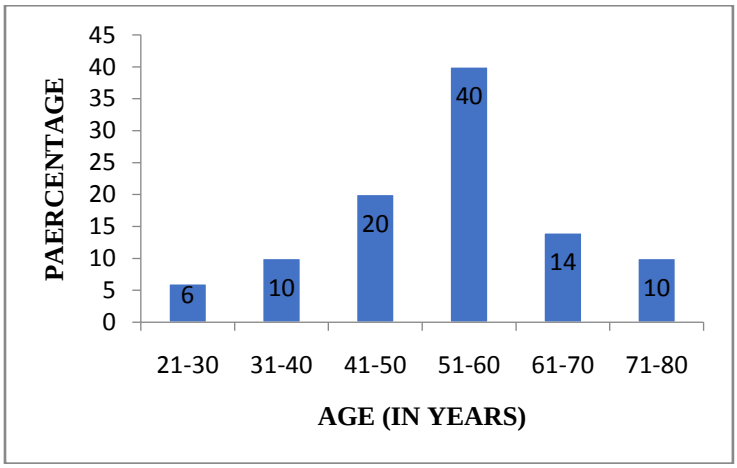

FIG 1: DISTRIBUTION ACCORDING TO AGE

TABLE 2: DISTRIBUTION ACCORDING TO SEX

SEX	NO. OF PATIENTS	PERCENTAGE	RATIO (M:F)
MALE	33	66	

FEMALE	17	34	**1.9:1**
TOTAL	50	100	

Among 50patients, 33 (66%) were male and 17 (34%) were female. The ratio between male and female was 1.9:1. This indicated that males are at more risk than female for acute pancreatitis.

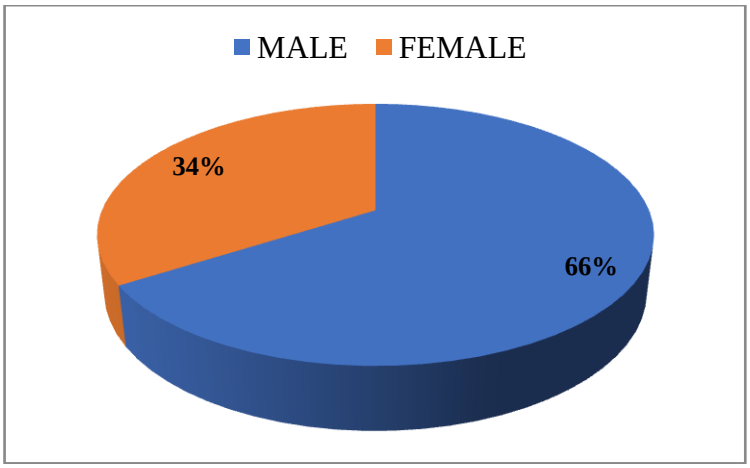

FIG 2: DISTRIBUTION ACCORDING TO SEX

All the 50 enrolled patients were assessed with Ranson's and Glasgow score.
Details are given in the following tables.

TABLE 3: DISTRIBUTION ACCORDING TO RANSON'S AND GLASGOW SCORE

SCORE LEVELS	RANSON'S SCOREN (%)	GLASGOW SCORE N (%)	P VALUE
LESS THAN 3	16 (32%)	19 (38%)	0.37
MORE THAN 3	34 (68%)	31 (62%)	
TOTAL	50	50	

Among 50 patients, the number of patients with Ranson's score ≥3was 34 (68%), Glasgow ≥3was 31 (62%) and the number of patients with Ranson's score <3was 16 (32%), Glasgow <3was 19 (38%). P-Value 0.37 - statistically not significant.

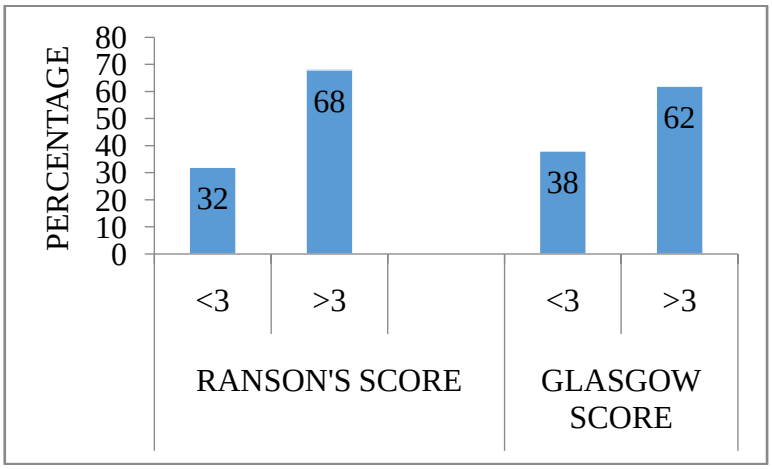

FIG 3: DISTRIBUTION ACCORDING RANSON'S & GLASGOW SCORE

TABLE 4: COMPARISON OF THE CRP LEVELS WITH RANSON'S SCORE

RANSON'S SCORE	CRP LEVELSMEAN ± SD	PVALUE
LESS THAN 3	22.32 ± 4.52	0.01
MORE THAN 3	29.38 ± 6.31	

The mean serum CRP level of patients with Ranson's score ≥3 was significantly higher as compared to mean serum CRP level of patients with Ranson's score <3 (22.32 ± 4.52 mg/l v/s 29.38 ± 6.31 mg/l). There was significant association of serum CRP and Ranson's score of patients as per Student t-test (p<0.01).

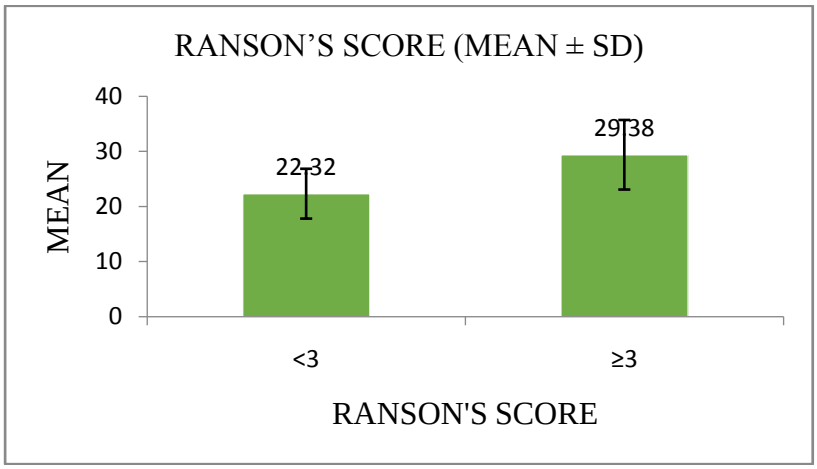

FIG 4: COMPARISON OF THE CRP LEVELS WITH RANSON'S SCORE

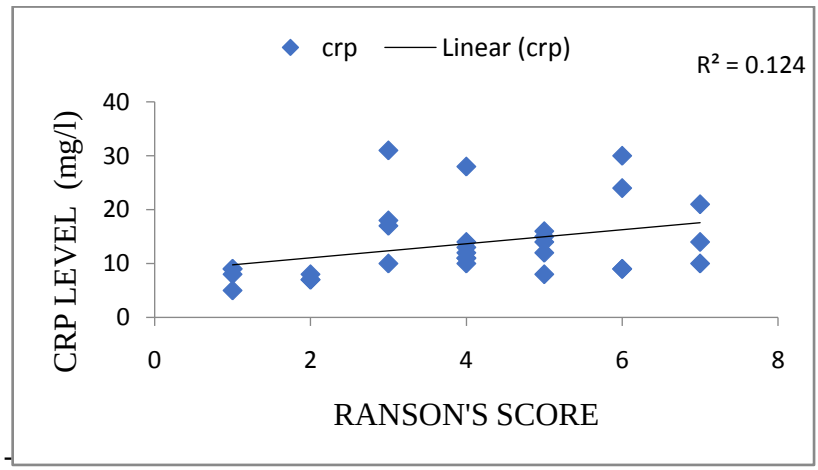

FIG 5: CORRELATION BETWEEN CRP LEVELS & RANSON'S SCORE

TABLE 5: COMPARISON BETWEEN THE CRP LEVELS & GLASGOW SCORE

GLASGOW SCORE	CRP LEVELS MEAN ± SD	PVALUE
LESS THAN 3	21.41 ± 3.35	
MORE THAN 3	29.43 ± 5.31	0.01

The mean serum CRP level of patients with Glasgow score ≥3 was significantly higher as compared to mean serum CRP level of patients with Glasgow score <3 (21.41 ± 3.35 mg/l v/s 29.43 ± 5.31 mg/l). There was significant association of serum CRP and Glasgow score of patients as per Student t-test (p<0.01).

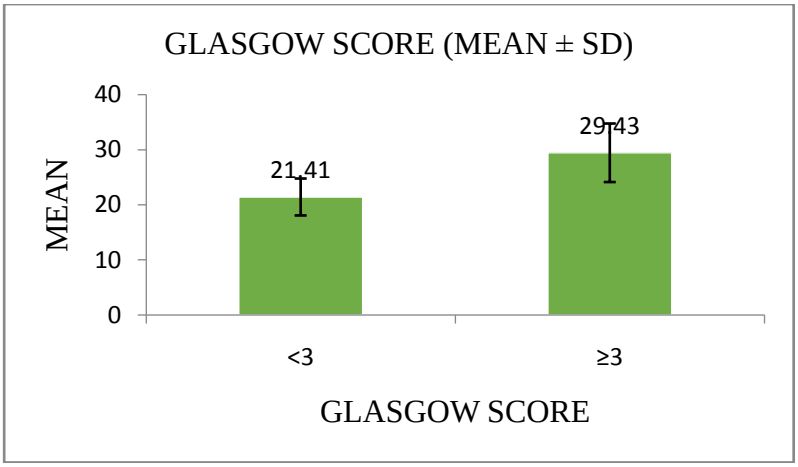

FIG 6: COMPARISON OF CRP LEVELS WITH GLASGOW SCORE

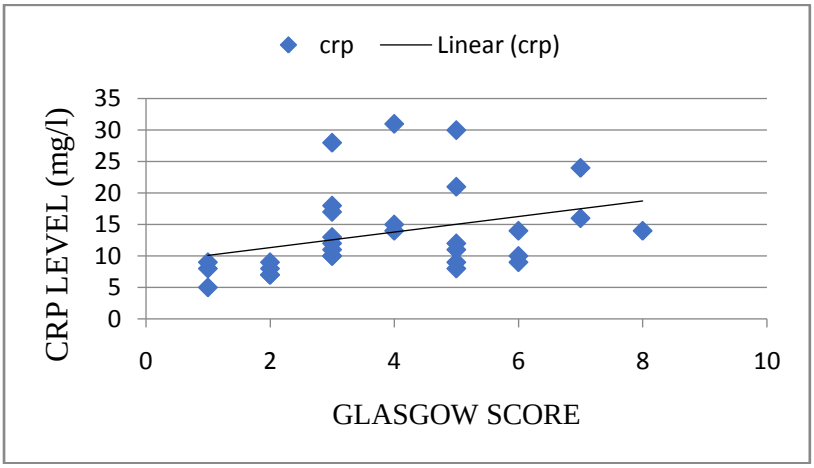

FIG 7: CORRELATION BETWEEN CRP LEVELS & GLASGOW SCORE

TABLE 6: COMPARISON OF hs-CRP LEVELS WITH RANSON'S SCORE

RANSON'S SCORE	hs-CRP LEVELS MEAN ± SD	PVALUE
LESS THAN 3	173541.84 ± 18472.25	
MORE THAN 3	243450.81 ± 28541.13	0.0001

The mean serum hs-CRP level of patients with Ranson's score ≥3 was significantly higher as compared to mean serum hs-CRP level of patients with Ranson's score <3 (173541.84 ± 18472.25 ng/dl v/s 243450.81 ± 28541.13 ng/dl). There was significant association of serum CRP and Ranson's score of patients as per Student t-test ($p<0.0001$).

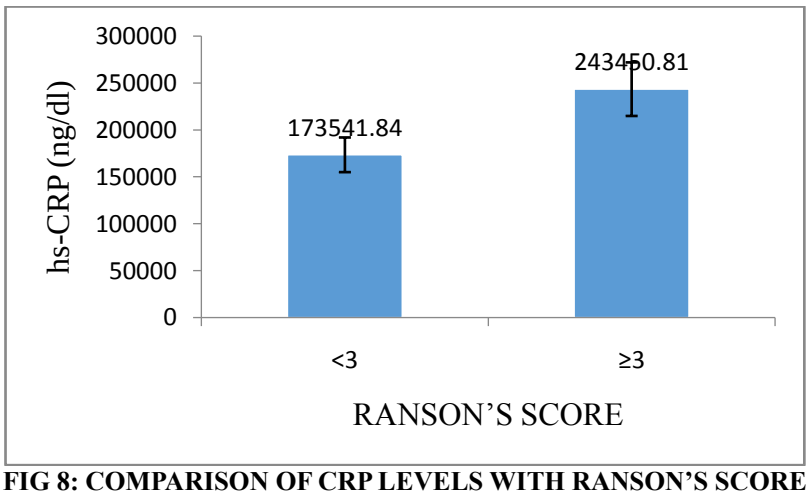

FIG 8: COMPARISON OF CRP LEVELS WITH RANSON'S SCORE

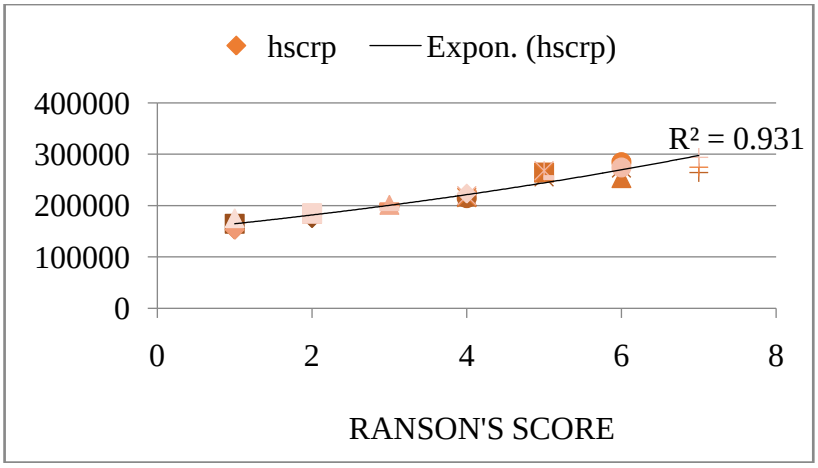

FIG 9: CORRELATION BETWEEN HS-CRP LEVELS & RANSON'S SCORE

TABLE 7: COMPARISON OF hs-CRP LEVELS WITH GLASGOW SCORE

GLASGOW SCORE	hs-CRP LEVELS MEAN ± SD	P-VALUE
LESS THAN 3	175328.25±18211.11	
MORE THAN 3	245172.38±26745.71	0.0001

The mean serum hs-CRP level of patients with Glasgow score ≥3 was significantly higher as compared to mean serum hs-CRP level of patients with Glasgow score <3 (175328.25 ± 18211.11 ng/dl v/s 245172.38 ± 26745.71 ng/dl). There was significant association of serum CRP and Glasgow score of patients as per Student t-test (p<0.0001).

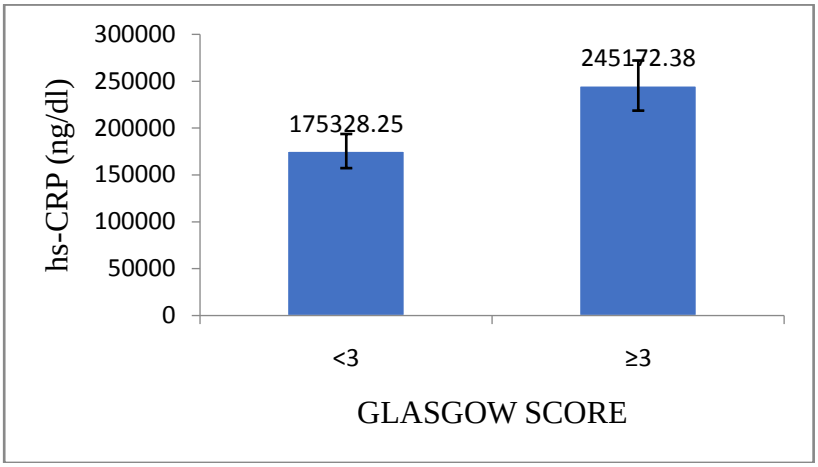

FIG 10: COMPARISON OF hs-CRP LEVELS WITH GLASGOW SCORE

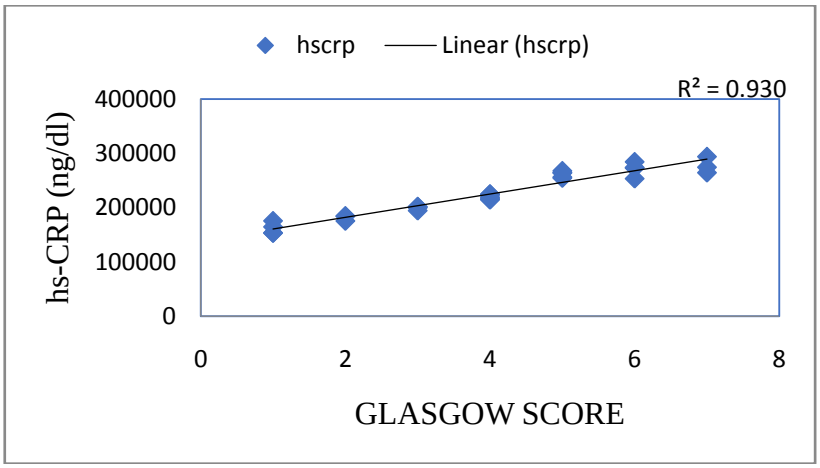

FIG 11: CORRELATION BETWEEN hs-CRP LEVELS AND GLASGOW SCORE

DISCUSSION

The findings of this study highlight significant insights into the role of C-reactive protein (CRP) and high-sensitivity C-reactive protein (hs-CRP) in assessing the severity of acute pancreatitis. The study demonstrated a clear correlation between elevated levels of CRP and hs-CRP with higher Ranson's and Glasgow scores, indicating more severe disease.

The distribution of acute pancreatitis across various age groups in our study is consistent with findings from other studies. The predominance of acute pancreatitis in the 51-60 age group aligns with the research conducted by Yadav et al., which also found a higher incidence in the middle-aged population [9]. The gender distribution in our study, with a higher prevalence in males, mirrors the findings of Forsmark et al., emphasizing a gender disparity in acute pancreatitis cases [10].

Our study's observation that patients with a Ranson's score of ≥3 had significantly higher mean serum CRP levels compared to those with a score of <3 resonates with the conclusions drawn by Petrov et al., who found a similar relationship between CRP levels and acute pancreatitis severity [11]. The association between CRP levels and Glasgow scores in our study is also supported by the work of Mounzer et al., highlighting the utility of CRP as a marker for predicting severity in acute pancreatitis [12].

The novel aspect of our study was the comparison of hs-CRP levels with Ranson's and Glasgow scores. The significant elevation of hs-CRP in more severe cases (scores ≥3) underscores its potential as a sensitive biomarker for acute pancreatitis severity. This finding is in line with the study by Bollen et al., which suggested that hs-CRP could provide more nuanced insights into the inflammatory state of acute pancreatitis patients [13].

The statistical significance ($p<0.0001$) of the elevation of hs-CRP in patients with higher severity scores in our study is noteworthy. This finding is congruent with the research by Papachristou et al., where hs-CRP was also noted to be a reliable marker of severity in acute pancreatitis [14]. However, it contrasts slightly with the study by Singh et al., where the correlation between hs-CRP levels and pancreatitis severity was found to be significant but less pronounced [15].

Our study had limitations common in single-center studies, including a relatively small sample size and the potential for selection bias. However, the findings contribute valuable data to the existing literature on biomarkers in acute pancreatitis. Future studies with larger, multi-center cohorts are needed to further validate these results.

Our study adds to the growing body of evidence suggesting that both CRP and hs-CRP are valuable biomarkers for assessing the severity of acute pancreatitis. The significant association between elevated levels of these biomarkers and higher Ranson's and Glasgow scores indicates their potential utility in clinical practice for early identification of patients at risk of severe disease.

CONCLUSION

This study's exploration into the role of C-reactive protein (CRP) and high-sensitivity C-reactive protein (hs-CRP) as indicators of severity in acute pancreatitis has yielded significant insights. Our findings demonstrate a strong correlation between elevated levels of CRP and hs-CRP with increased severity of acute pancreatitis, as quantified by Ranson's and Glasgow scores. Specifically, patients with a Ranson's score of ≥3 exhibited a mean serum CRP level of 29.38 ± 6.31 mg/l, significantly higher than those with a score of <3, who had a mean of 22.32 ± 4.52 mg/l. Similarly, hs-CRP levels were considerably elevated in more severe cases, with mean values of 243450.81 ± 28541.13 ng/dl in patients with a Ranson's score of ≥3, compared to 173541.84 ± 18472.25 ng/dl in those with a score of <3.

These results suggest that both CRP and hs-CRP are valuable biomarkers for assessing the severity of acute pancreatitis. Their significant association with higher severity scores implies that they could be effective in the early identification of patients at risk for severe disease. This could potentially guide clinicians in making timely and appropriate therapeutic decisions, thereby improving patient outcomes. Future research, particularly multi-center studies with larger sample sizes, is warranted to further validate and expand upon these findings.

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