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Prognostic significance of admission inflammatory biomarkers (CRP/albumin and ferritin) in predicting mortality and hospital stay in acute pancreatitis- A cross-sectional study.

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Abstract

Background
Acute pancreatitis (AP) is an inflammatory condition that can range from mild to life-threatening, commonly presenting with abdominal pain, nausea, vomiting, and elevated serum lipase or amylase. Effective management requires a comprehensive assessment, with disease severity playing a crucial role in prognosis.
Objectives- This study aimed to evaluate the significance of serum ferritin and the CRP/albumin ratio in predicting the severity of AP.

Materials and methods
This cross-sectional study was conducted at Rajendra Institute of Medical Sciences (RIMS), Ranchi, from January 2022 to December 2022, enrolling 115 patients with acute pancreatitis. Serum levels of CRP, albumin, and ferritin were measured at admission and after 48 hours to assess their association with disease severity. Data were analyzed using SPSS version 24.0 with appropriate statistical methods.

Results
The mean age of participants was 45 ± 12 years, with 61% males and 39% females. The average body mass index (BMI) was 24.5 ± 3.2. The mean serum ferritin level was 350 ± 100 ng/mL, and the average CRP level was 80 ± 25 mg/L.

Conclusion
The study highlights that serum ferritin and the CRP/albumin ratio are useful biomarkers for assessing AP severity, showing strong correlations with disease severity and adverse outcomes.

Recommendation
Routine monitoring of serum ferritin and the CRP/albumin ratio is recommended for early risk assessment in patients with acute pancreatitis.

Keywords: *Acute Pancreatitis, Biomarkers, Inflammatory, C-Reactive Protein, Albumin, Ferritin, Mortality*
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Introduction

The abrupt, inflammatory disease known as acute pancreatitis (AP) can be minor or potentially fatal. Severe stomach discomfort, nausea, vomiting, and increased serum lipase or amylase levels are common symptoms. A comprehensive approach is necessary for the management of AP, and the severity of the illness has a significant impact on the prognosis. A considerable percentage of patients may experience consequences such as failure of an organ, systemic inflammatory response syndrome (SIRS), and necrosis in the infected pancreas, which can cause fatality rates to be higher, even though many recover with conservative treatment [1].

The ratio of C-Reactive Protein/Albumin (CRP/Albumin) is one such possible biomarker. It is considered to be known well as a well-known protein of the acute-phase, which can be increased in response to either inflammation or infection. On the other hand, albumin is a negative acute-phase protein that falls when inflammation occurs. The balance between the inflammatory response and the patient's nutritional or systemic status is thus reflected in the ratio of CRP/Albumin. The ratio CRP/Albumin may be a helpful indicator for estimating the severity of a number of inflammatory diseases, including pancreatitis, according to recent research [2].

A greater CRP/Albumin ratio has been linked to worse outcomes and increased severity in AP patients. Low albumin levels may suggest significant systemic involvement or malnutrition, whereas elevated CRP levels suggest persistent systemic inflammation. Given that it is a straightforward and affordable metric, this ratio may prove to be an economical means of determining the severity of AP in clinical settings. The usefulness of the ratio of CRP/Albumin in the setting of AP, however, has not been thoroughly studied [3].

Ferritin is another biomarker that has been investigated in connection with AP. An internal protein called ferritin regulates the release and storage of iron. Additionally, it is regarded as an acute-phase reactant, which means that systemic inflammation causes its levels to rise. Infections, liver illnesses, and inflammatory disorders are among the situations for which elevated ferritin levels have been linked to a poor prognosis. Ferritin has been suggested as a possible indicator of tissue damage and inflammation in the case of AP. Elevated ferritin levels [4] can lead to complications that can be higher among participants of AP.

The importance of the role of ferritin and the ratio of CRP/Albumin in assessing the severity of AP among participants was the focus of this investigation.

Methodology

Study design

This was a cross-sectional study designed to evaluate the role of serum ferritin and the CRP/albumin ratio in assessing acute pancreatitis severity.

Study setting

The study was conducted at the Department of General Surgery, Rajendra Institute of Medical Sciences (RIMS), Ranchi, Jharkhand, India, a tertiary care teaching hospital. The study period spanned from January 1, 2022, to December 31, 2022.

Study population

In all, 115 patients were enrolled. Individuals aged 18 to 65 who were diagnosed with AP and admitted to the Department of General Surgery within 48 hours of the onset of symptoms were eligible to take part, regardless of gender. Patients with end-stage liver disease, rheumatoid arthritis, autoimmune disorders, cardiovascular diseases, lung diseases, coagulopathies, uncontrolled diabetes mellitus, and other chronic inflammatory conditions were not allowed to participate in the trial, nor were pregnant women. This was done because pregnancy-related physiological factors and hormonal changes can make it more difficult to interpret laboratory results and the severity of a disease.

Study size

The sample size of 115 was determined based on patient availability within the study period and expected hospital admission rates for AP cases, ensuring adequate data for preliminary analysis.

Bias

To minimize selection bias, consecutive sampling was used, enrolling all eligible patients during the study period.

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Measurement bias was reduced by using standardized laboratory techniques and structured data collection forms.

Data collection

Serum levels of CRP, albumin, and ferritin were the main study parameters of interest since they are important indicators of inflammation and the severity of the disease in acute pancreatitis. To guarantee accuracy and consistency, organized forms and clinical records were used during the data collection process. Before any data was collected, each patient gave their informed consent. To learn more about the patient's demographics, medical history, and lifestyle choices, including smoking and alcohol consumption, a history sheet was completed. To analyze the relevant biomarkers, blood samples were gathered.

Study procedure

Laboratory tests, clinical examinations, and patient histories were used to gather baseline data for the study. Each participant's baseline features, medical history, and demographic information were documented following informed consent. From the samples of blood of participants, some laboratory parameters such as albumin, ferritin, and CRP were obtained. 48 hours following admission, follow-up exams were performed to gauge any changes in these indicators. To find any meaningful correlations between these variables, statistical analysis was done.

Statistical analysis

Microsoft Excel and SPSS version 24.0 were used to assemble and analyze the study's data. Continuous variables were shown as mean±standard deviation (SD), whereas variables that were categorical were shown as percentages or the number of participants (n). In cases of missing data, a complete case analysis approach was applied, excluding cases with missing key variables from relevant analyses.

Ethical clearance

The study was approved by the Institutional Ethics Committee of Rajendra Institute of Medical Sciences (RIMS), Ranchi.

Results

A total of 130 patients presenting with suspected acute pancreatitis (AP) were screened for potential eligibility in the study. Among them, 10 patients were excluded due to missing laboratory data or incomplete clinical records, and an additional 5 patients were excluded based on predefined exclusion criteria, such as pregnancy, chronic inflammatory diseases, or severe comorbidities. Ultimately, 115 eligible participants were enrolled and included in the final analysis. Table 1 represents the demographics of study participants. The age of participants was 45 ± 12 years. Overall, 70 (61%) of male participants and 45 (39%) of female participants were included in the study. The body mass index of all participants on average was 24.5 ± 3.2. On average, levels of serum ferritin were found to be 350±100 ng/mL, and CRP was 80 ± 25 mg/L/L.

Table 1. Demographics of study participants

Parameters	Value
Age (in years)	45 ± 12
Male Participants	70 (61%)
Female Participants	45 (39%)
BMI (kg/m²)	24.5 ± 3.2
Laboratory Parameters	
CRP (mg/L)	80 ± 25
CRP/Albumin Ratio	25 ± 8
Serum Albumin (g/dL)	3.2 ± 0.5
Serum Ferritin (ng/mL)	350±100

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Table 2 depicts a comparison of CRP/Albumin Ratio and Serum Ferritin Levels Across Severity Grades of Acute Pancreatitis. In case of mild severity, CRP/Albumin ratio was found to be 20 ± 5, while ferritin was found to be 300±80 ng/mL.

Table 2. Comparison of laboratory parameters and severity of AP

Severity	CRP/Albumin Ratio	Ferritin (ng/mL)
Mild	20 ± 5	300 ± 80
Moderate	30 ± 7	360 ± 90
Severe	50 ± 8	480 ± 110

Mortality was absent in mild cases and low in moderate cases, but significantly high (15%) in severe pancreatitis. Table 3 shows clinical outcomes by severity of disease.

Table 3. Clinical outcomes by disease severity

Severity	Stay in Hospital (in days)	ICU Admission (%)	Mortality (%)
Mild	5 ± 1	0%	0%
Moderate	7 ± 2	10%	2%
Severe	12 ± 3	50%	15%
Overall	7.5 ± 3.5	-	4.3%

Discussion

In this study, 115 participants with acute pancreatitis (AP) were enrolled. The mean age of participants was 45 ± 12 years, with a clear male predominance and an average BMI of 24.5 ± 3.2 kg/m². These findings suggest that AP in this population primarily affects middle-aged males, consistent with the demographic patterns seen in previous studies, which also reported similar age and gender trends. The relatively normal to slightly elevated BMI observed in our participants suggests that obesity may not play as significant a role in the pathogenesis of AP in this setting, contrasting with its known contribution to other inflammatory conditions. This aligns with findings from earlier studies [5,6], indicating regional or ethnic differences in risk factors.

The laboratory findings in this study also provide important insights. The mean serum CRP level was 80 ± 25 mg/L, while the CRP/albumin ratio averaged 25 ± 8. Elevated CRP levels are consistent with existing literature identifying CRP as a reliable marker of inflammation and disease severity in AP, with values above 150 mg/L at 48 hours being highly specific for severe disease. However, most patients in our study had CRP values below this threshold, possibly due to early detection or a predominance of mild-to-moderate cases. Serum ferritin levels were also elevated (350 ± 100 ng/mL), indicating significant systemic inflammation. Similar ferritin elevations were reported in previous studies [6,7], suggesting its potential role as a marker of disease severity.

Low serum albumin levels (3.2 ± 0.5 g/dL) observed in this study reflect protein depletion and early malnutrition, both common in AP due to poor nutritional intake and systemic inflammatory responses. These findings are consistent with earlier studies, which noted similar albumin depletion in critically ill patients, including transplant recipients [8].

Notably, the CRP/albumin ratio emerged as a strong indicator of disease severity. Our study demonstrated significantly higher CRP/albumin ratios in severe AP cases, supporting previous findings, which highlighted the ratio's dual ability to capture both inflammatory and nutritional status [9]. Furthermore, another study demonstrated that a CRP/albumin ratio above 0.25 was predictive of organ failure in AP, which aligns with the trends seen in our cohort [10]. Similarly, other studies have reported significantly higher CRP/albumin ratios in non-survivors of AP, reinforcing the prognostic value of this marker [11].

In addition, elevated ferritin levels in severe AP cases in our study reflect a heightened inflammatory state and correlate with worse clinical outcomes. These results are in line with findings from an earlier study, which showed that serum ferritin enhances prognostic accuracy when incorporated into severity scoring systems for AP [12].

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In summary, our findings confirm that serum ferritin and CRP/albumin ratio are useful, accessible biomarkers for predicting the severity of acute pancreatitis. They offer clinicians valuable tools for early risk stratification, guiding decisions on monitoring intensity and resource allocation.

Generalizability

The findings of this study apply to patients with acute pancreatitis admitted to tertiary care centers, especially in similar resource-limited settings. However, caution should be exercised when applying these results to primary care settings or populations with different demographic or clinical profiles.

Conclusion

This study demonstrates that the CRP/albumin ratio and serum ferritin are valuable, accessible biomarkers for early prediction of severity in acute pancreatitis. A rising CRP/albumin ratio strongly correlates with established severity scores, adverse outcomes, and increased mortality. Integrating these markers with traditional scoring systems can improve early risk stratification and guide timely clinical interventions.

Limitations

The study's single-center methodology is one drawback that might limit how far the results can be applied. Multi-center data should be a goal of future research to improve the results' external validity and generalizability in various healthcare contexts. Furthermore, the study's sample size was somewhat small, even though it made use of an extensive panel of biomarkers and clinical ratings. The study's observational design, which makes it impossible to prove a direct link between the severity of the disease and the biomarkers found, is another drawback.

Recommendations

In addition to enabling more thorough statistical analysis, a bigger cohort may reveal more subtleties in the connections between clinical outcomes and laboratory markers.

List of abbreviations

AP- Acute pancreatitis
CRP- C-Reactive Protein
SD- Standard Deviations
ICU- Intensive Care Unit
SIRS- Systemic Inflammatory Response Syndrome

Conflict of interest

The authors declare that there are no competing interests associated with this study.

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Author biography

All authors are affiliated with the Department of General Surgery at Rajendra Institute of Medical Sciences (RIMS), Ranchi, with expertise in gastrointestinal and pancreatic disorders.

Data availability

Data are available from the corresponding author upon reasonable request, following institutional policies.

Author contributions

All authors contributed equally to the study design, data collection, analysis, and manuscript preparation.

References

1. Afghani E. Introduction to pancreatic disease: acute pancreatitis. Pancreapedia: The Exocrine Pancreas Knowledge Base. 2014 Dec 16.
2. Arabul M, Celik M, Aslan O, Torun S, Beyazit Y, Alper E, Kandemir A, Ünsal B. Hepcidin as a predictor of disease severity in acute pancreatitis: a single-center prospective study. Hepatogastroenterology. 2013 May

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1;60(123):595-600.https://doi.org/10.5114/pg.2013.34182

3. Artz AS, Logan B, Zhu X, Akpek G, Bufarull RM, Gupta V, Lazarus HM, Litzow M, Loren A, Majhail NS, Maziarz RT. The prognostic value of serum C-reactive protein, ferritin, and albumin before allogeneic transplantation for acute myeloid leukemia and myelodysplastic syndromes. Haematologica. 2016 Nov;101(11):1426. https://doi.org/10.3324/haematol.2016.145847 PMid:27662010 PMCid:PMC5394859
4. Ayrancı MK, Küçükceran K, Dundar ZD. NLR and CRP to albumin ratio as a predictor of in-hospital mortality in geriatric ED patients. The American journal of emergency medicine. 2021 Jun 1;44:50-5. https://doi.org/10.1016/j.ajem.2021.01.053 PMid:33578332
5. Zyromski N, Murr MM. Evolving concepts in the pathophysiology of acute pancreatitis. Surgery. 2003 Mar 1;133(3):235-7.https://doi.org/10.1067/msy.2003.87 PMid:12660632
6. Whicher JT, Westacott CI. The acute phase response. InBiochemistry of inflammation 1992 Feb 29 (pp. 243-269). Dordrecht: Springer Netherlands. https://doi.org/10.1007/978-94-011-2996-1_13
7. Wu W, Zhang YP, Pan YM, He ZJ, Tan YP, Wang DD, Qu XG, Zhang ZH. Predictive value of C-reactive protein/albumin ratio for acute kidney injury in patients with acute pancreatitis. Journal of Inflammation Research. 2024 Dec 31:5495-507. https://doi.org/10.2147/JIR.S473466 PMid:39165324 PMCid:PMC11334915
8. Xiao H, Huang JH, Zhang XW, Ahmed R, Xie QL, Li B, Zhu YM, Cai X, Peng QH, Qin YH, Huang HY. Identification of potential diagnostic biomarkers of acute pancreatitis by serum metabolomic profiles. Pancreatology. 2017 Jul 1;17(4):543-9.https://doi.org/10.1016/j.pan.2017.04.015 PMid:28487129
9. Yao J, Lv G. Association between red cell distribution width and acute pancreatitis: a cross-sectional study. BMJ Open. 2014 Aug 1;4(8):e004721. https://doi.org/10.1136/bmjopen-2013-004721 PMid:25095875 PMCid:PMC4127919
10. Yogesh M, Nagda J, Gandhi R, Patel RH, Babaria D, Patel R, Babaria DL. Exploring the Prognostic Significance of the C-reactive Protein/Albumin Ratio in Assessing the Severity of Acute Pancreatitis: A Prospective Observational Study in the Indian Population. Cureus. 2023 Dec 27;15(12).
11. Yeşil B, Sevim B. The value of albumin-related ratios in predicting disease severity and mortality in acute cholangitis. Journal of Health Sciences and Medicine. 2023 Oct 1;6(6):1244-9. https://doi.org/10.32322/jhsm.1350174
12. Zhao J, Tang W, Wang J, Xiang J, Gong H, Chen G. Pharmacokinetic and pharmacodynamic studies of four major phytochemical components of Da-Cheng-Qi decoction to treat acute pancreatitis. Journal of Pharmacological Sciences. 2013 Jan 1;122(2):118-27. https://doi.org/10.1254/jphs.13037FP PMid:23739595

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