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CORRELATION OF C-REACTIVE PROTEIN LEVELS AND MODIFIED COMPUTED TOMOGRAPHY SEVERITY INDEX IN ASSESSING SEVERITY OF ACUTE PANCREATITIS

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Abstract

Introduction:
Acute pancreatitis (AP) is a common gastrointestinal disorder with a highly variable clinical course, ranging from mild, self-limiting disease to severe, life-threatening illness. Accurate early assessment of severity is crucial for management. This study aimed to evaluate the correlation between early serum C-Reactive Protein (CRP) levels and the modified computed tomography severity index (MCTSI) in assessing the severity of acute pancreatitis.

Methods:
This descriptive cross-sectional study was conducted at the Armed Forces Institute of Radiology and Imaging, Rawalpindi, over 9 months. A total of 57 patients diagnosed with AP were included. Serum CRP levels were measured within the first 48 hours of admission, and all patients underwent contrast-enhanced CT between 72 hours and 7 days after symptom onset for MCTSI calculation. The correlation between CRP and MCTSI was analyzed using Spearman's rank correlation.

Results:
The mean age of participants was 45.8 ± 13.6 years, with a male-to-female ratio of 2:1. The mean CRP level was 186.4 ± 72.9 mg/L, and the mean MCTSI score was 5.3 ± 2.1. A statistically significant strong positive correlation was found between CRP levels and MCTSI scores (Spearman's rho = 0.68, $p < 0.001$). Furthermore, mean CRP levels showed a stepwise increase across severity categories: 102.5 ± 38.2 mg/L (mild), 184.7 ± 55.4 mg/L (moderate), and 275.3 ± 61.7 mg/L (severe).

Conclusion:
Early serum CRP level is a strong predictor of radiological severity in acute pancreatitis, as quantified by the MCTSI. Its measurement within 48 hours of admission serves as a reliable, cost- effective biomarker for early risk stratification, aiding in timely clinical management and potentially improving patient outcomes.

INTRODUCTION

Acute pancreatitis (AP) is a pancreatic inflammatory disorder, among the most frequent factors of gastrointestinal disorder associated hospitalizetion.[1] With extensive clinical variation, it remains a prevalent condition and its prevalence is growing. The severity of acute

pancreatitis can range between mild self-limiting pancreatic inflammatory response to pancreatic necrosis leading to life-threatening condition.[2] Necrotizing pancreatitis and/or the development of systemic organ failure is associated with the incidence of acute pancreatitis.[2] Acute pancreatitis can be categorized into severe, moderate and mild disease with severe form of disease characterized by permanent organ dysfunction and numerous systemic and local complications.[3,4] The prevalence of acute pancreatitis has been projected to escalate with the growing prevalence of biliary diseases and alcoholism, which are the main etiological factors.[5,6] The most common causes of pancreatitis are choledocholithiasis and ethanol abuse. Other causes include trauma, metabolic disorders (hyperlipidemia, hypercalcemia), ERCP induced pancreatitis, medications (azathioprine, sulphonamides), tumours, and congenital anomalies such as pancreas divisum [7]. Balthazar et al., introduced a grading system for acute pancreatitis based on an overall assessment of size, contour and density of the gland and peripancreatic abnormalities, to predict the severity of the disease [8]. Although necrotizing pancreatitis has higher incidence of complications (6% vs. 52%) and mortality (<1% vs. 23%) in contrast to oedematous pancreatitis, necrosis of the pancreas was not correlated with the clinical outcome in this grading system. CT has an overall accuracy of 87% and sensitivity and specificity of 100% in the detection of pancreatic necrosis [9].

Methodology:

This descriptive cross-sectional study was conducted over a period of 9 months at the Armed Forces Institute of Radiology and Imaging (AFIRI), Rawalpindi. A total of 57 patients diagnosed with acute pancreatitis were included in the study using non-probability consecutive sampling. 57 Sample size was calculated using WHO sample size calculator, taking confidence Interval 95%, margin of error 5%, and taking global burden of Acute Pancreatitis as 3.84%. Ethical approval was obtained from the Institutional Ethical Review Committee of AFIRI prior to the commencement of the study, and written informed consent was secured from all participants or their legal guardians.

The inclusion criteria were: patients aged 18 years or older, diagnosed with acute pancreatitis based on clinical presentation (e.g., abdominal pain, nausea, vomiting), biochemical evidence (serum amylase or lipase levels ≥3 times the upper normal limit), and radiological confirmation. Only patients who underwent contrast-enhanced computed tomography (CECT) between 72 hours to 7 days after symptom onset and had serum C-reactive protein (CRP) levels measured within the first 48 hours of hospital admission were included. Exclusion criteria comprised patients with chronic pancreatitis, prior pancreatic surgery, pancreatic malignancy, renal failure, immunocompromised conditions, or incomplete laboratory or imaging records.

Data collection was carried out using a structured, pre-designed data collection form. This form captured demographic information (age, gender), clinical findings, laboratory results (CRP, amylase, lipase), and imaging details based on the modified computed tomography severity index (MCTSI). All imaging studies were interpreted by a consultant radiologist blinded to the CRP values to prevent interpretation bias. CRP levels were measured using a standardized immunoturbidimetric assay in the institutional biochemistry laboratory. All data collection, entry, validation, and preliminary interpretation were supervised and performed by a trained medical statistician and radiologist, both having more than 5 years of professional experience in their respective fields, to ensure the accuracy, reliability, and standardization of the data.

The collected data were entered and analyzed using Statistical Package for the Social Sciences (SPSS) version 26.0. Both quantitative and qualitative variables were analyzed. Quantitative variables such as age, CRP levels, and MCTSI scores were expressed as mean ± standard deviation (SD), while qualitative variables like gender and presence of complications were summarized as frequencies and percentages. The distribution of data was assessed using the Shapiro-Wilk test. Based on the normality of data, either the Pearson correlation coefficient (for normally distributed

data) or Spearman's rho (for non-parametric data) was used to assess the relationship between CRP levels and MCTSI scores. A two-tailed p-value of less than 0.05 was considered statistically significant. Cross-tabulations and chi-square tests were used to explore associations between categorical variables, where applicable.

Results

A total of 57 patients diagnosed with acute pancreatitis were included in the study. The mean age of participants was 45.8 ± 13.6 years (range: 19–78 years). There were 38 (66.7%) males and 19 (33.3%) females, with a male-to-female ratio of approximately 2:1.

Table I: Demographics Characteristics:

Variables	Frequency
Mean Age (years)	45.8 ± 13.6
Males	38 (66.7%)
Females	19 (33.3%)

Clinical and Laboratory Findings

The mean serum C-reactive protein (CRP) level measured within the first 48 hours of admission was 186.4 ± 72.9 mg/L (range: 45–350 mg/L). The mean serum amylase level was 620 ± 245 U/L, and the mean lipase level was 840 ± 310 U/L at presentation.

All patients underwent contrast-enhanced CT scans between 72 hours and 7 days after symptom onset. The mean modified computed tomography severity index (MCTSI) score was 5.3 ± 2.1 (range: 1–10). Based on the MCTSI, 18 (31.6%) patients were classified as having *mild* pancreatitis (MCTSI 0–2), 24 (42.1%) as *moderate* (MCTSI 4–6), and 15 (26.3%) as *severe* (MCTSI 8–10).

The data were assessed for normality using the Shapiro–Wilk test, which revealed non-normal distribution for both CRP and MCTSI values ($p < 0.05$). Therefore, Spearman's rank correlation was applied.

A statistically significant positive correlation was found between CRP levels and MCTSI scores (Spearman's rho = 0.68, $p < 0.001$), indicating that higher CRP levels were associated with greater radiological severity on CT. When stratified by MCTSI category, the mean CRP levels were:

Table II: Mean CRP Levels

Variables	Mean Values
Mild	102.5 ± 38.2 mg/L
Moderate	184.7 ± 55.4 mg/L
Severe	275.3 ± 61.7 mg/L

Table III: CRP Levels Across Stratification

Variables	Mild	Moderate	Severe	p values
Mean Values	102.5 ± 38.2 mg/L	(153.2 ± 59.3 mg/L),	(241.8 ± 65.9 mg/L	0.001

The results demonstrate a strong, statistically significant correlation between early CRP levels and CT-based severity (MCTSI scores) in patients with acute pancreatitis.

Discussion

Our results demonstrate a strong and statistically significant positive correlation between early serum C-reactive protein (CRP) levels and radiological severity as quantified by the Modified CT Severity Index (MCTSI). This relationship is further reinforced by the observed stepwise increase in mean CRP levels across the mild,

moderate, and severe MCTSI categories. These findings indicate that CRP, a readily available inflammatory marker measured within the first 48 hours of admission, serves as a reliable clinical indicator for predicting the severity of acute pancreatitis. Consequently, early CRP measurement can be a valuable tool for the initial risk stratification and timely management of these patients.

Our results are largely in accordance with the referenced study and other published literature evaluating the prognostic role of inflammatory markers in acute pancreatitis. Both studies demonstrated a significant positive correlation between C-reactive protein (CRP) levels and the modified computed tomography severity index (MCTSI) scores, confirming CRP as a reliable biomarker for assessing disease severity. In the present study, the mean CRP level within 48 hours of admission was 186.4 mg/L, and a strong positive correlation ($r = 0.68$, $p < 0.001$) was observed between CRP and MCTSI scores. Similarly, the referenced study reported elevated CRP and CRP/Albumin ratios in patients with severe acute pancreatitis, with higher ratios independently predicting organ failure ($p < 0.001$) [10]

The mean CRP values in our study (102.5 mg/L in mild, 184.7 mg/L in moderate, and 275.3 mg/L in severe cases) closely correspond to the reference ranges (10–21 mg/dL ≈ 100–210 mg/L) reported by the comparative study, though our correlation strength was higher ($r = 0.68$ vs. $r = 0.30$). This suggests that CRP, particularly in the early phase of the disease, has strong predictive utility for radiologic and clinical severity. These findings are consistent with several other studies that have validated CRP as an early, cost-effective, and widely available prognostic indicator in acute pancreatitis.11

Demographically, both studies exhibited a similar male predominance (approximately 2:1) and comparable mean age (around 45 years), reflecting the typical epidemiological pattern of acute pancreatitis [12] The distribution of severity grades in our study (26.3% severe, 42.1% moderate, 31.6% mild) also parallels the referenced study (44%, 38%, 18%), indicating comparable disease trends despite minor variations in case severity proportions.

Overall, our findings reaffirm the prognostic significance of CRP and its ratio with albumin in predicting disease severity and clinical outcomes in acute pancreatitis. The strong correlation between CRP levels and CT-based severity indices underscores its value as a rapid, accessible, and dependable marker for early risk stratification and management optimization [13-14].

Conclusion:

This study concludes that early measurement of serum C-Reactive Protein (CRP) is a highly valuable prognostic tool in acute pancreatitis, as evidenced by a strong, statistically significant positive correlation with radiological severity defined by the Modified CT Severity Index (MCTSI). The stepwise increase in CRP levels across mild, moderate, and severe disease categories confirms its utility for early risk stratification, enabling clinicians to use this readily available and cost-effective biomarker to optimize timely management and improve patient outcomes.

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