

# To Study the Role of C-Reactive Protein to Predict the Risk of Pancreatic Necrosis

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**Abstract:** Acute pancreatitis is an inflammation of the pancreas of variable severity. Its severity varies from mild to severe attacks like necrotizing pancreatitis which has a poor prognosis. C-reactive protein in an inflammatory mediatory synthesized in the liver and is raised in acute pancreatitis. Aim: To study the role of C-reactive protein in predicting the risk of pancreatic necrosis and other severe complications of acute pancreatitis. **Methods:** 50 patients admitted to the medical ward with features suggestive of acute pancreatitis from June 2022 to June 2023 were taken for the study. **Results:** Based on 5<sup>th</sup> day CRP values 50 patients are divided into 3 groups, 1<sup>st</sup> group (n-30) CRP less than 100 mg/dl, 2<sup>nd</sup> group (n-8) CRP level between 100-200 mg/dl, 3<sup>rd</sup> group (n-12) CRP levels more than 300 mg/dl. The development of necrotizing pancreatitis in correlation with CRP was out of 30 patients in the 1<sup>st</sup> group, 4 (13.33 %) developed necrotizing pancreatitis, in the 2<sup>nd</sup> group, out of 8 patients, 4 (50%) developed necrotizing pancreatitis, in the 3<sup>rd</sup> group, out of 12 patient, all 12 (100%) of them developed necrotizing pancreatitis. **Conclusion:** CRP levels peaked on the 5<sup>th</sup> day of illness and a cut-off value of 150 mg/dl can be taken above pancreatic necrosis can be predicted with high probability. This value has a specificity of 80%. CRP values above 200 mg/dl have a specificity of 100%.

**Keywords:** C-Reactive Protein, Pancreatic Necrosis, inflammation, Acute pancreatitis, and Prognosis

## 1. Introduction

Acute pancreatitis (AP) is a systemic immunoinflammatory response to auto-digestion of the pancreas and peri-pancreatic organs. AP is a common and life-threatening disease with an annual incidence worldwide is 4.9-73 cases per 100, 000 people<sup>1</sup>. The severity of AP varies from mild to severe attacks like necrotizing pancreatitis which has a poor prognosis. It is diagnosed based on the revised Atlanta classification, with the presence of at least two of three criteria (upper abdominal pain, serum amylase or lipase level greater than three times the upper limit of normal, or characteristic findings on imaging studies)<sup>2</sup>. A severe complication of acute pancreatitis necrotizing pancreatitis when the inflamed pancreas leaks out enzymes that cause activation of inflammatory cytokines (IL-1, IL-6), leading to dead tissue<sup>11</sup>.

The inflammatory marker C-Reactive protein (CRP) is synthesized in the liver and is raised in the setting of acute pancreatitis<sup>2</sup>. Although serum amylase and lipase levels are used as diagnostic markers for acute pancreatitis, they are not good prognostic indicators. Other biochemical markers like CRP are under evaluation as prognostic indicators<sup>4</sup>. Therefore, predicting whether CRP is an important prognostic marker in the case of acute pancreatitis can ultimately determine disease outcome<sup>5</sup>.

We have studied the role of CRP in predicting the risk of pancreatic necrosis and other severe complications of acute pancreatitis.

## 2. Materials and Methods

### Setting:

The study was conducted at NRI General Hospital, Guntur

### Design of Study:

Observational study-prospective study design. Patients were followed up for a period of 1 year.

### Period of Study:

The study was conducted from June 2022 to June 2023.

### Sample Size:

50 patients with features suggestive of acute pancreatitis

### Selection of Study Subjects:

50 patients who were admitted to the medical wards with features suggestive of acute pancreatitis.

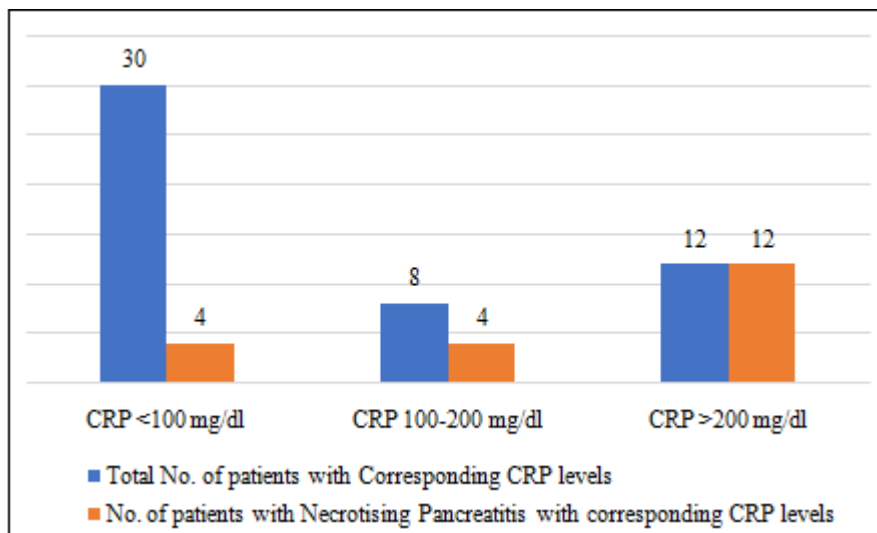
### Inclusion Criteria:

- Patients of any age and sex presenting with acute pain abdomen with a four-fold elevation of serum amylase and/or lipase.

### Exclusion Criteria:

- Patients with ischemic heart disease and angina
- Patients with prior history of fever before the onset of pain
- Patient with chronic infectious disease and known case of collagen vascular disease.

## 3. Results



The 1<sup>st</sup> group (n-30) had CRP of less than 100 mg/dl, the 2<sup>nd</sup> group (n-8) had CRP levels between 100-200 mg/dl, 3<sup>rd</sup> group (n-12) had CRP levels of more than 300 mg/dl. The development of necrotizing pancreatitis in correlation with CRP was out of 30 patients in the 1<sup>st</sup> group, 4 (13.33 %) developed necrotizing pancreatitis, in the 2<sup>nd</sup> group, out of 8 patients, 4 (50%) developed necrotizing pancreatitis, in the 3<sup>rd</sup> group, out of 12 patient, all 12 (100%) of them developed necrotizing pancreatitis.

**Table 1:** Etiology & Sex Predominance

Etiology	Males	Females
Alcohol	34	0
Gallstones	4	4
Hypertriglyceridemia	0	0
Idiopathic	2	0

The predominant etiology of pancreatitis is alcohol in the male sex (34 patients), and the predominant etiology for pancreatitis is gallstones in the female sex (4 patients). The most common etiology is alcohol followed by gallstones.

**Table 2:** CRP Values in correlation with disease severity

CRP Value	Pancreatic Edema	Pancreatic Necrosis
Less than 100 mg/dl (N-30)	26	4
Between 100-200 mg/dl (N-8)	4	4
More than 200 mg/dl (N-12)	0	12

Pancreatic edema was predominantly seen in patients with CRP values less than 100 mg/dl (26) whereas pancreatic necrosis was predominantly seen in patients with CRP values more than 200 mg/dl (12). In patients with CRP values between 100-200 mg/dl, pancreatic edema and necrosis were equal.

**Table 3:** CRP and its significance to severity in study groups

Study groups	No. of SAP patients	CRP > 150 mg/dl	CRP < 150 mg/dl
Present Study	20	16	4
Ajay K. Khanna et al	29	25	4

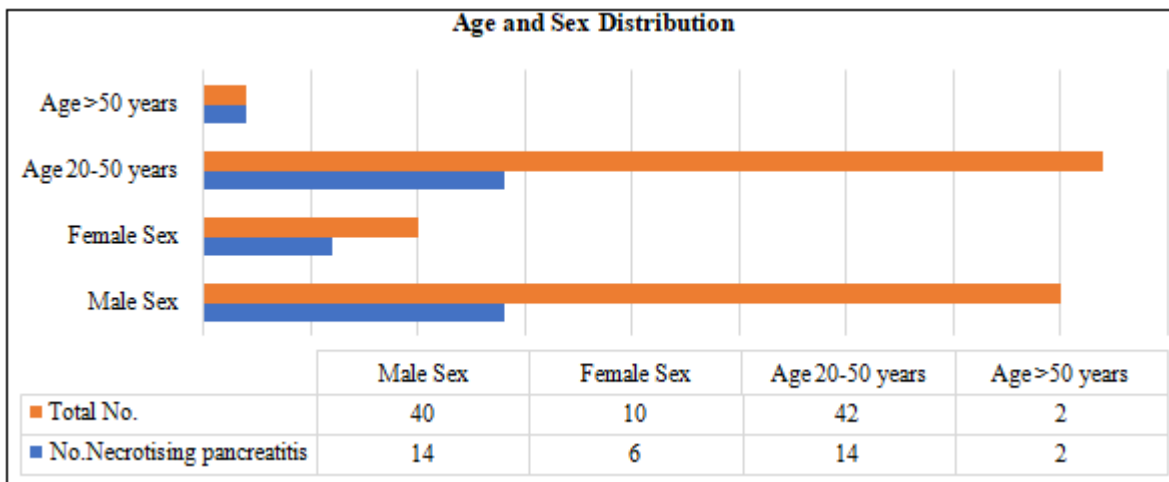
Patients with severe acute pancreatitis are 20, and of those 20 patients 16 patients have CRP levels of >150 mg/dl, and of the 20 patients, 4 patients have CRP <150 mg/dl. This shows that 80% of patients with SAP have elevated levels of CRP of >150 mg/dl.

#### 4. Discussion

Acute pancreatitis is a condition characterized by a constellation of clinical symptoms, laboratory findings, and radiological findings. There are many complications leading to morbidity and mortality in acute pancreatitis. Pancreatic necrosis is a local complication that can lead to morbidity and mortality. Thus, earlier diagnosis helps initiate prompt treatment. Various inflammatory markers are used in the early prediction of acute pancreatic necrosis. In our study, we used CRP, an inflammatory marker, as the mode of diagnosis. CRP has been established as a prognostic variable in humans. CRP is an acute-phase reactant and is synthesized by hepatocytes. This synthesis is induced by the release of interleukin 1 and 6. Thus the CRP peak in serum is usually not maximal until after day 3 of pain and is always later than the peak of these interleukins.

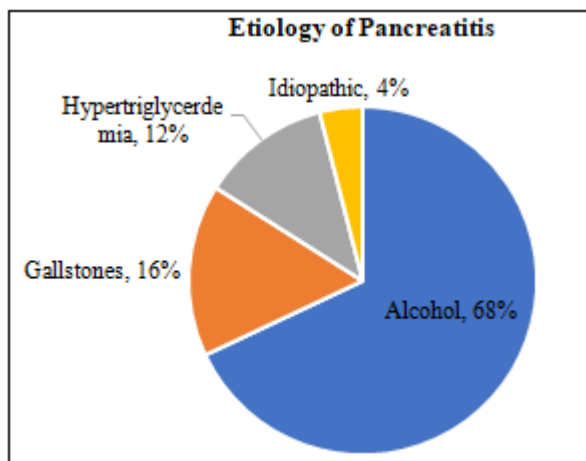
#### Sex Distribution:

Of the 50 patients in our study, 40 (80%) were male and 10 (20%) were female. Thus, there is a male predominance when compared to females. The age predominance in the present group was between 25 to 45 years of age. Out of the 50 people taken for the study, 42 people (84%) were of the age group 25-45, 6 people (12%) were of the age group 15-25, in the age group of more than 65, there are 2 people (4%). Thus, the age suggests that the predominance of the disease is between the mid-second to late fourth decade.



**Etiological factors:**

The most etiological factor in males is alcohol-induced and in females is bile stones. In our study, out of 50 cases, the most common etiological factor is alcohol followed by gallstones and hypertriglyceridemia. In the present study, patients who developed acute pancreatitis due to alcohol were 34 out of 50 patients (68%), gall stones were 8 out of 50 patients (16%), due to hypertriglyceridemia 6 out of 50 patients (12%), and the cause is idiopathic in 2 patients (4%).



**CRP Values in Correlation to disease severity:**

Most patients with acute pancreatitis present with two symptoms, pain abdomen and nausea with or without vomiting. Out of the 50 patients in our group, all the patients have similar complaints. The clinical presentation is one of the important findings to define pancreatitis according to modified Atlanta criteria. In the present study, we used inflammatory markers like CRP done by immunoelectrophoretic methods on the 3<sup>rd</sup>, 5<sup>th</sup>, and 9<sup>th</sup> days of admission. The CRP values peaked on the 5<sup>th</sup> day and were taken for the present study and divided into 3 groups. 1) CRP levels less than 100mg/dl 2) CRP levels between 100-200mg/dl 3) CRP levels more than 200mg/dl Out of the 50 patients taken for the present study, 30 patients had a CRP value of less than 100mg/dl, whereas 8 patients had a CRP value between 100-200mg/dl and 12 patients had a CRP value of more than 200mg/dl. Cut-off levels have been discussed in the literature, and levels between 120 and 210mg/dl have been agreed upon as distinguishing between

mild and severe disease. The patients in the present study with a CRP value of 100-200mg/dl and those above 200mg/dl are 20 people and they come under moderate to severe acute pancreatitis group. According to our study, patients who had a CRP value of less than 100mg/dl have mostly pancreatic edema rather than necrosis, except for 4 patients who had pancreatic necrosis despite a CRP value of less than 100mg/dl. Out of 30 patients with CRP values less than 100mg/dl, 26 (86.66%) of them had no necrosis but pancreatic edema alone taken on CT scan between 5-9 days whereas 4 (13.33%) had pancreatic necrosis. The occurrence of pancreatic necrosis was dependent on age and sex in the present study group, out of 20 patients who presented with pancreatic necrosis in our group 14 were of male sex and 6 were of female sex so out of 10 females in the study group, 6 had necrotizing pancreatitis (60%) compared to that of males 14 out of 40 (35%). In the age predominance, out of 20 patients with necrotizing pancreatitis, 14 patients were of age 20-50 years, 4 patients below the age of 20 years and 2 patients in the study group above 50 years of age developed pancreatic necrosis. In the etiological predominance, out of 20 patients with necrotizing pancreatitis 14 are due to the consumption of alcohol and 4 are due to bile stones and 2 are idiopathic.

The morbidity and mortality were high in patients with necrotizing pancreatitis when compared to edematous pancreatitis patients. The average hospital stay in the present study group was 8 days, but when these patients were divided into two groups the patients in the edematous pancreatitis group had an average of 5.4 days, whereas patients with necrotizing pancreatitis group had an average hospital stay of 11.8 days. 4 patients in the present study group died secondary to respiratory failure associated with MODS. The 4 patients who died had CRP values of more than 200mg/dl on the 5th day and had elevated serum lipase and amylase levels. The CT scan of these patients revealed extensive necrosis of the pancreas, other lab findings such as serum creatinine and serum calcium were all deranged in these patients. The serum lipase average of the 50 patients in the present study group was 306.52U/L which was more than two times from baseline. The average of 30 patients with mild acute pancreatitis (edematous pancreatitis) was 230.33U/L which was lower than the total average taken in the 50 patients. The average of 20 patients with severe acute

pancreatitis (necrotizing pancreatitis) was 420.8U/L which was higher than the total average of 50 patients.

The 50 patients in the present study group have undergone contrast-enhanced CT abdomen on the 5<sup>th</sup> to 9<sup>th</sup> day of the study out of which 20 patients had necrotizing pancreatitis and the remaining 30 patients had edematous or interstitial pancreatitis. The predictive value of CT was superior to both the serum lipase levels and the CRP levels done on day 3, 5, 9. But CRP is a cheap investigation and the risk of radiation due to CT is absent, it has a predictive value of 80% if the CRP cut-off value was taken more than 150mg/dl.

## 5. Conclusion

Initially, the study shows that CRP levels are elevated in Necrotizing pancreatitis. CRP level can be used as a prognostic factor for necrotizing pancreatitis. In this study, CRP levels peaked on the 5<sup>th</sup> day of illness and a cut-off value of 150mg/dl can be taken above which pancreatic necrosis can be predicted with high probability. This value has a specificity of 80%. CRP values above 200mg/dl have a specificity of 100%.

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