

## ORIGINAL RESEARCH

# Procalcitonin as an Early Prognostic Marker in Acute Pancreatitis

<sup>1</sup>Dr. Mangat Ram Passi, <sup>2</sup> Dr. Amitabh Singhal

<sup>1</sup> Associate Professor, Department of Medicine, Muzaffarnagar Medical College, Muzaffarnagar, UP, India

<sup>2</sup> Assistant Professor, Department of General Surgery, Muzaffarnagar Medical College, Muzaffarnagar, UP, India

## Corresponding Author

Dr. Mangat Ram Passi

Associate Professor Department of General Medicine Muzaffarnagar Medical College, Muzaffarnagar

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## ABSTRACT

**Background:** Acute pancreatitis is an inflammatory disease of the pancreas classified as severe, is associated with high morbidity and mortality. Various methods are available to predict the severity and outcome of acute pancreatitis.

**Aims and Objective:** The present study was aimed to find out the utility of serum procalcitonin in predicting the severity and outcome of acute pancreatitis.

**Material and Methods:** This study was carried in department of surgery and department of medicine, Muzaffarnagar Medical College, Muzaffarnagar from June 2022 to February 2023. This study includes 67 acute pancreatitis patients and all the investigation were done on fully auto-analyzer (Access-2).

**Results:** In this study, the serum procalcitonin (PCT) was found below 0.5 ng/ml in 62.69% (42 out of 67) patients, out of these, none had any complication, antibiotics use, low CT Severity Index (CTSI) score, early recovery and no death. Serum procalcitonin (PCT) was increased significantly in 37.31% (25 out of 67) patients. CTSI score in 20 of these patients were greater than 5. Hypotension and respiratory failure were seen in 21 and 20 patients respectively with a significant p value of 0.001. Antibiotic use was observed in all the 25 patients in this group. Duration of hospital stay was longer in patients with increased procalcitonin level. Five participants with mean procalcitonin level 4.29 ng/ml were died due to the complications related to acute severe pancreatitis.

**Conclusion:** Serum procalcitonin can be a new promising marker to predict severity and outcome of acute pancreatitis.

**Keywords:** Acute Pancreatitis, Procalcitonin, Inflammatory Disease, Prognostic Marker

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## Introduction

Acute pancreatitis (AP) is an inflammatory debilitating disease of the exocrine pancreas with a rapid, and uncontrolled onset that progresses from a self-limiting disease to a more severe progressive disease with organ dysfunction and death.[1] AP can progress to severe acute pancreatitis (SAP) associated with multiple organ failure and systemic inflammatory response syndrome (SIRS). The causative factors of SAP are complex and closely related to poor lifestyle, gallstone disease, alcohol, etc. [2] and has a high morbidity, causing enormous physical, financial and emotional stress to the affected person. [3-4] The incidence of acute pancreatitis appears to be increasing. [5] As the population becomes overweight, the incidence of gallstones, the most common cause of acute pancreatitis, increases. Although gallstones and alcohol appear to be the cause of acute pancreatitis in most cases, many other conditions, such as hypertriglyceridemia, predispose to acute pancreatitis to varying degrees. [6] Predicting

the severity of pancreatitis early in the course of the disease is critical to maximizing treatment and preventing and minimizing organ dysfunction and complications. Unfortunately, the inability to distinguish mild from severe disease in the early stages complicates the treatment of patients with acute pancreatitis. The prognosis of severe acute pancreatitis is poor, and early prediction of severity helps us take appropriate measures to stop the progression of the disease and reduce complications. [6] Procalcitonin (PCT) is a 116 amino acid propeptide of calcitonin with a molecular weight of 13 kDa. [7] It was introduced as an early sign of severe infection and inflammation. [8] Serum procalcitonin can be very useful in predicting the severity of acute pancreatitis at an early stage and helps us start effective treatment before complications develop. Several studies have been conducted to confirm its role in early prognosis of the severity of acute pancreatitis. [9] But such studies have not been conducted in our country so far. Hence the aim of this

study is to determine the role of serum procalcitonin in predicting the severity and outcome of acute pancreatitis.

#### MATERIAL AND METHODS:

The observational prospective study was carried out in the department of surgery and department of medicine Muzaffarnagar Medical College and Associated hospital, Muza ffarnagar from June 2022 to February 2023. A total of 67 Patient who were diagnosed as case of acute pancreatitis were included. All patients were examined and detailed clinical history and informed consent was taken prior to the study.

#### Inclusion Criteria

All the diagnosed patient of acute pancreatitis with age more than 18 years and those who gave consent for study were included in this study.

#### Exclusion Criteria

All the patients with Co-infections like hepatitis B, C, and HIV infection, Presence of any wound or septic foci which can lead to increase in serum PCT level, acute pancreatitis due to any intervention like surgery and traumatic pancreatitis were excluded from the study.

#### Biochemical Measurement:

After enrolment, patient's demographic data was taken along with a comprehensive history. All the investigations were recorded. The data were expressed in mean and standard deviation and SPSS version 21 was used. A p-value less than 0.05 were considered as statistically significant.

#### Results:

This observational study was conducted to evaluate the role of serum procalcitonin in predicting the severity and outcome of acute pancreatitis. A total of 67 patients with acute pancreatitis who met the inclusion criteria participated in this study. Of all patients, 40 (59.7%) were men and 27 (40.3%) were women. The average age of the study population was 45.38, the minimum age was 18 years, and the

maximum age was 69 years. In this study, alcohol was the cause of acute pancreatitis in 40 patients (59.7%), 39 of whom were male (97.5%) and 1 female (2.5%). Gallstones were the main etiologic factor in 31 patients (46.27%). Of 31 patients, 22 were women (70.97%) and 9 were men (29.03%). Serum procalcitonin levels were measured in all 67 patients after diagnosis of acute pancreatitis within 48 hours of admission. The mean PCT level of all studied patient was found to be 0.94 ng/mL. CT severity assessment was performed in all subjects, in our study a severity score > 5 was found in 25 patients, of which 20 patients had procalcitonin levels above the cutoff. Eight of 25 patients with elevated procalcitonin had hypotension compared with none of 42 patients with normal procalcitonin. The mean procalcitonin in patients with CNS complications was 1.45 n g/mL with a standard deviation of 0.85 ng/mL and was statistically insignificant. The mean procalcitonin value for respiratory complications was 2.43 ng/mL with a standard deviation of 0.29 ng/mL and was statistically significant. Antibiotics were used by 37.31% of the total study population, and all 25 patients with elevated procalcitonin received antibiotics. The mean procalcitonin level of the patient who received antibiotics was  $2.12 \pm 0.42$  ng/ml with a p-value less than 0.05. None of the 67 underwent surgery for acute pancreatitis or its complications. In our study, 11 of 25 patients with elevated procalcitonin levels were readmitted, compared to 5 of 42 patients with normal procalcitonin. The mean PCT in readmitted patients was 1.76 ng/ml with a standard deviation of 0.88 ng/ml and it was statistically insignificant. Of all 67 subjects, 5 died, all had elevated procalcitonin levels during the intake; The mean PCT of deceased participants was  $4.38 \pm 3.54$  ng/ml with a p-value less than 0.05.

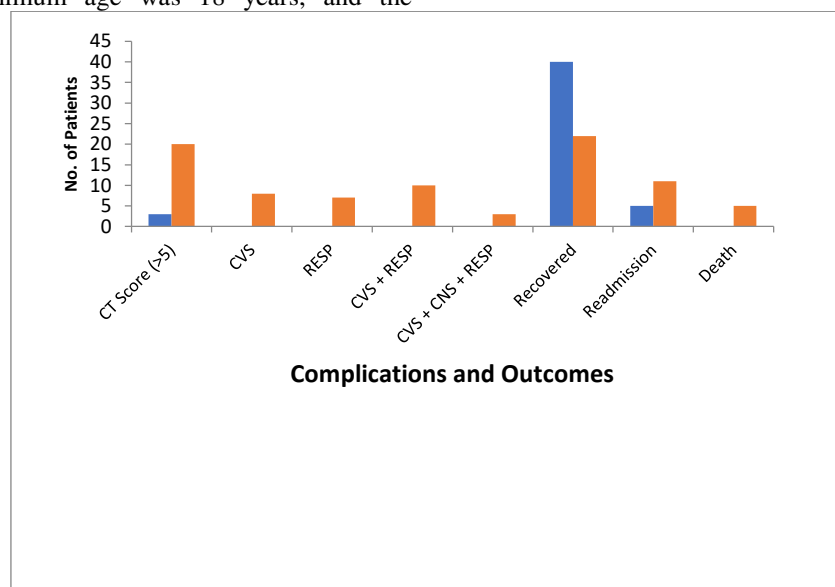


Fig: 1: Showing complications/outcomes and number of patients

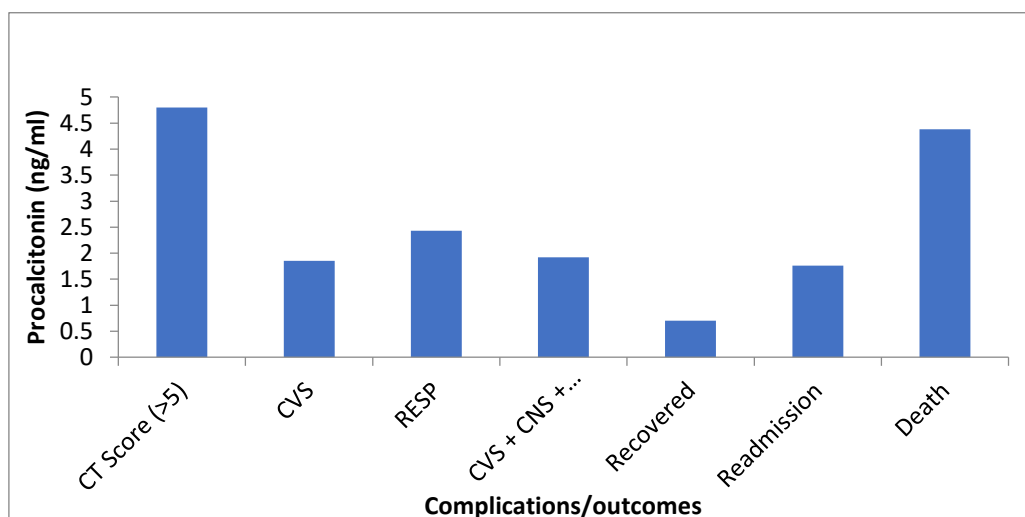


Fig. 2: Showing complications and outcomes with procalcitonin level

Table-1 : Clinical outcomes in patients with raised and normal Procalcitonin level

Procalcitonin	< 0.5 ng/ml	≥0.5 ng/ml
Total Participants	42	25
Mean Procalcitonin	0.30 ± ng/ml	2.0 ± ng/ml
CTSI (>5)	3	20
Complications		
CVS	0	8
Respiratory	0	7
CVS + RS	0	10
CVS + RS + CNS	0	3
Duration of hospital stay (days)	11	22
Antibiotic use	0	25
Surgery	0	0
Recovery	40	22
Re-admission	5	11
Death	0	5

### Discussion:

This observational study was conducted to evaluate the role of serum procalcitonin in predicting the severity and outcome of acute pancreatitis. A total of 67 patients with acute pancreatitis who met the inclusion criteria participated in this study. Of all patients, 40 (59.7%) were men and 27 (40.3%) were women. The average age of the study population was 45.38, the minimum age was 18 years, and the maximum age was 69 years. Khan et al studied 117 patients with acute pancreatitis and the average age of the studied patients was approximately 47.99 years, 57.3% were male and 42.7% were female.[10] In our study, acute pancreatitis was observed more often in males associated with alcoholism, followed by gallstones in females, as Kaur et al. [11] Our study found that procalcitonin levels are high in patients with severe acute pancreatitis, and the same observation was made by Kolber and others in Poland.[12] In their study, Khan et al [10] found that the mean serum procalcitonin level in patients with mild disease was  $146 \pm 165.21$  (mean  $\pm$  SD) pg/ml,

and  $1297 \pm 439.44$  (mean  $\pm$  SD) pg/ml in patients with moderate disease and in severe acute pancreatitis it was  $4361 \pm 1493.55$  (mean  $\pm$  SD) pg/ml. The difference between the groups was statistically significant. He concluded that serum procalcitonin can successfully predict disease severity in the early stages of the disease. In this study, 25 of 67 patients had elevated procalcitonin levels and 42 patients had procalcitonin levels below 0.5 ng/ml. In their study, Cho et al.[10] found 13 seconds as severe acute pancreatitis, 8 seconds as moderately severe, and 79 seconds as mild acute pancreatitis.[13] Many researchers concluded in their study that procalcitonin can be used as a promising single biomarker and is comparable to computed tomography severity index and Ranson score in previous prediction of severity of acute pancreatitis.[14-16] Mo fidi et al. [17] also found serum procalcitonin to be valuable in predicting the severity of acute pancreatitis and the risk of developing septic pancreatic necrosis. Rau et al.[18] suggested that the monitoring of procalcitonin allows early and reliable evaluation of clinically significant

pancreatic infections and general prognosis in acute pancreatitis. In this study, the mean CTSI score was 4.8. 25 patients had a CTSI score greater than 5, especially those with elevated procalcitonin. A similar study was conducted at the Department of Radiology at Brigham and Women's Hospital, Harvard Medical School, Boston on 397 patients with acute pancreatitis and obtained the same results. [19] A study done by Zhu et al in China found 74 patients with acute injury, 47 patients (63.5%) with organ dysfunction, 20 patients (27.0%) with multiple organ failure, and 27 patients (36.5%) with single organ dysfunction. pancreatitis system Respiratory failure was the most common organ dysfunction (23.0%) among individual failures. Similar results were obtained in our study.[20] In the present study, antibiotic use was observed only in patients with procalcitonin above 0.5 ng/mL which was similar to Kaur et al. [11] In this study, none of the patients in our study underwent a surgical procedure. Therefore, this study found a positive correlation between increased serum PCT and CTSI score, systemic complications, prolonged hospital stay, antibiotic use, recurrence of symptoms, and death.

#### CONCLUSIONS:

Serum procalcitonin level in acute pancreatitis was well correlated with cardiovascular disease, respiratory complications, high CT score and longer hospital stay, antibiotic use and death. Therefore, procalcitonin can be used to predict complications in the early stages of acute pancreatitis. Serum procalcitonin can be used as a promising single biomarker that can be easily performed in all settings and with higher accuracy.

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