

# THE ROLE OF C-REACTIVE PROTEIN TESTING IN PREDICTING THE SEVERITY OF ACUTE PANCREATITIS

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## ABSTRACT

Acute pancreatitis is a clinical condition characterized by enzymatic inflammation of the pancreatic parenchyma due to several etiologies. Its severity and diagnosis are based on the revised Atlanta Classification. Most cases resolve without any complications but few proceeds towards severe acute pancreatitis. Hence, several scoring systems have been formulated to predict the severity of acute pancreatitis and out of them, C-reactive protein (CRP) is one of the easily accessible markers used to predict the severity. This was a single center descriptive observational cross-sectional study conducted at Nepal Medical College Teaching Hospital, Kathmandu from June 2024 to June 2025. All patients who were admitted with acute pancreatitis and had undergone CRP test within 48 hours of admission falling into our inclusion criteria were included after obtaining an informed consent. Of 110 patients 23 (20.9%) were classified as severe acute pancreatitis and 9 (8.2%) died. Seventy-five cases were male and 35 cases were female. CRP values within 48 hours were comparable to Atlanta classification and other severity indices of pancreatitis.

## KEYWORDS

Acute pancreatitis, C-reactive protein, Nepal

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## INTRODUCTION

Acute pancreatitis is a typical clinical condition characterized by enzymatic degradation and inflammation of the pancreatic parenchyma. Its severity and diagnosis protocols are based on the revised Atlanta Classification (2012).<sup>1</sup> The most common causes are gallstones and alcohol consumption. Other causes include metabolic abnormalities, duct obstruction, drugs (azathioprine, thiazide, estrogens) and trauma.<sup>2</sup> In most of the cases, the disease usually succeeds without complications but 20.0% of cases can progress to severe acute pancreatitis (SAP).<sup>3</sup> So, in this regard the severity of acute pancreatitis has to be predicted. Ranson developed a criterion to grade acute pancreatitis using the biochemical profile of the patients.<sup>4</sup> The acute physiology and chronic health evaluation II (APACHE II) scoring system was created to evaluate any severe acute illness and has successfully been used to predict AP severity.<sup>5</sup>

In addition to clinical scoring systems, numerous individual biomarkers have been proposed as having a predictive value in acute pancreatitis: C-reactive protein (CRP), blood urea nitrogen, hematocrit. Out of the many laboratory parameters used to test the predictive of severity of acute pancreatitis, CRP an acute phase reactant remains one of the superior parameter, as it is easily accessible, inexpensive and accurate.<sup>6</sup> Many studies have shown that CRP level more than 150 mg/L at 48 hours has been associated with severe pancreatitis. Our study aims to estimate the role of CRP in predicting the severity of acute pancreatitis.

## MATERIALS AND METHODS

This study was a hospital based descriptive observational cross-sectional study carried out from June 23, 2024 to June 24, 2025 among patients who had been clinically diagnosed with pancreatitis and who had undergone CRP test in order to predict the severity of acute pancreatitis by revised Atlanta classification of 2012 who were visiting the inpatient department of Internal Medicine at Nepal Medical College Teaching Hospital, Attarkhel, Gokarneswor Municipality-8, Kathmandu. The ethical clearance was taken from Nepal Medical College Institutional Review Committee (NMC-IRC Ref.: 72-080/081). The convenient sampling method was employed with self-made questionnaires and the data was filled up in the proforma along with the detailed history taken from the patients. The admitted case of

acute pancreatitis with CRP tests done within 48 hours of admission and those patients above the age of 18 years were included in the study. The patients who had no CRP test done within 48 hours of admission, patients with chronic pancreatitis and those under the age of 18 years were excluded from the study. The data were entered in MS Excel and were analyzed using SPSS-16. Correlation of CRP with other indices was checked using chi-square test and area under curve was obtained.

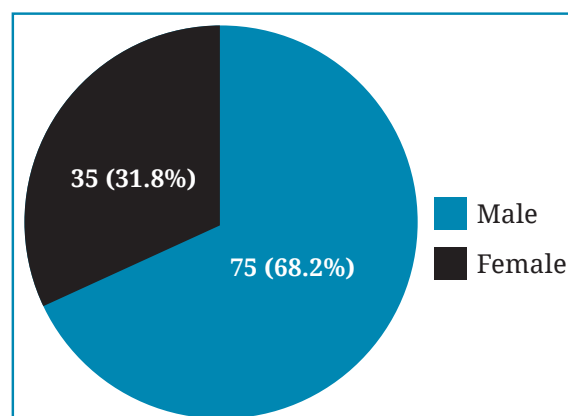
## RESULTS

Total of 110 patients were enrolled in the study. As shown in Table 1, majority of the patient 32.7% fell in age group 41-50, followed by age group 31-40 (23.6%). Two patients (1.8%) were aged less than 20 years and 3 patients (2.7%) fell in the age group greater than 70 years.

The number of male patients (68.2%) were higher as compared to the female patients as shown in figure 1. The mean age of the male patients was 42.5 years while mean age for the female patients was 46.7 years.

**Table 1: Age group distribution of the patients with acute pancreatitis**

Age group (years)	n	%
≤ 20	2	1.8
21-30	15	13.6
31-40	26	23.6
41-50	36	32.7
51-60	18	16.4
61-70	10	9.1
≥71	3	2.7
<b>Total</b>	<b>110</b>	<b>100</b>



**Fig 1: Sex wise distribution of study population n=110**

As shown in Table 2, alcohol was the most common etiology accounting for about 60.0% of total cases followed by gallstone pancreatitis about 21.8%. Hyperlipidemia accounted for about 5.4% of the cases followed by post ERCP pancreatitis of about 4.54% of the cases.

**Table 2 : Etiology of pancreatitis**

Sex	Etiology	n	%
<b>Male</b>	Alcohol	46	61.3
	Drug	2	2.7
	Gall stone	14	18.7
	Hypertriglyceridemia with alcohol	5	6.7
	Idiopathic	5	6.7
	Post ERCP	2	2.7
	Viral	1	1.3
	<b>Total</b>	<b>75</b>	<b>100</b>
<b>Female</b>	Alcohol	20	57.1
	Gall stone	10	28.6
	Hypertriglyceridemia with alcohol	1	2.9
	Idiopathic	1	2.9
	Post ERCP with gall stone	3	8.6
<b>Total</b>	<b>35</b>	<b>100</b>	

Idiopathic pancreatitis accounted for about 5.50% of cases whereas 2 cases (1.8%) were of drug induced and 1 case was found to be post viral.

Categorizing on the basis of Atlanta classification, on table 3, 35 patients were in mild category, 52 patients were in moderate category, and 23 patients were in severe category. While comparing this result with CRP value, in severe category all the patient had CRP level more than 100mg/L between 24 hours to 48 hours of admission. The result of the mild case was also comparable as CRP value less than 50 was seen in 65.7 % of patient. However, in the moderate group of Atlanta classification, CRP was less predictive with only 34.6% of cases having CRP value between 50-100 mg/L.

As shown in Table 6, there were a total 9 death among 110 patients, all of whom had severe acute pancreatitis according to the Atlanta classification and all of them had CRP level more than 150 mg/L.

As shown in Table 4, the hospital stay was significantly longer in severe disease (8.7±1.8 days). Mean duration of stay for mild pancreatitis was 3.31±0.9 days and for moderate was 5.88±2.0 days. Almost all patient had duration of stay more than 5 days in severe cases. As shown in Table 5, when compared to CRP level, 43 out of 62 patients had duration of stay less than 5 days (69.35%) had CRP level less

**Table 3: Correlation of Atlanta classification with the value of CRP (n=110)**

Atlanta classification	CRP (mg/l)	(n)	(%)	CRP (mg/L) Mean ± SD
Mild	<50	23	65.7	51.8± 24.8
	50-100	10	28.6	
	>100	2	5.7	
	<b>Total</b>	<b>35</b>	<b>100</b>	
Moderate	<50	1	1.9	104.9± 24.1
	50-100	18	34.6	
	>100	33	63.5	
	<b>Total</b>	<b>52</b>	<b>100</b>	
Severe	>100	23	100	174.5± 23.3

**Table 4: Mean duration of hospital stay according to Atlanta classification**

Atlanta classification	Mean duration of stay (±SD)
Mild (n=35)	3.31 (±0.9)
Moderate (n=52)	5.88 (±2.0)
Severe (n=23)	8.7 (±1.7)

than 100. Out of 48 patients with duration of stay more than 5 days, 39 had CRP more than 100 i.e. 81.3%. Among those with long duration and low CRP level, comorbid condition and alcohol withdrawal were important contributors.

As shown in table 7, CRP level was also comparable with other index of severity of pancreatitis such as BISAP score, Ranson criteria and CT severity index.

**Table 5: Association of CRP value range with duration of hospital stay**

Severity range of pancreatitis as per CRP (mg/L)	Duration of hospital stay in range (days)			p value
	≤5 days	>5 days	Total	
<50 (mild pancreatitis)	23	1	24	<0.001*
50-100 (moderate pancreatitis)	20	8	28	
>100 (severe pancreatitis)	19	39	58	
<b>Total</b>	<b>62</b>	<b>48</b>	<b>110</b>	

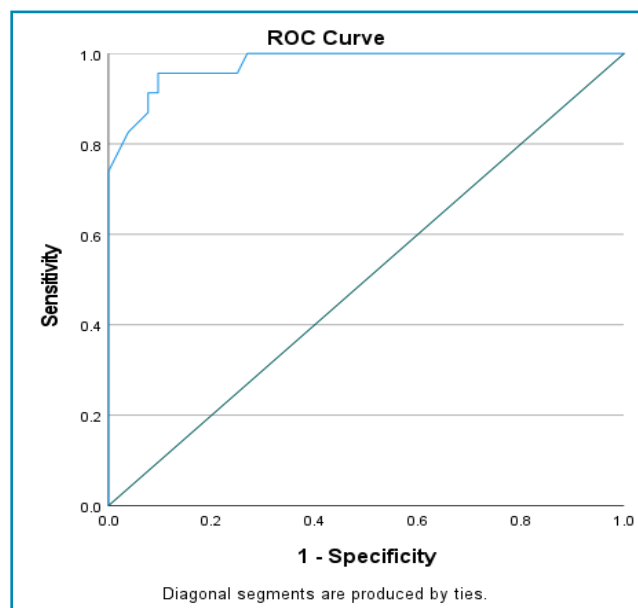
\*Chi square | P value <0.001 highly significant showing the increase in duration of hospital stay with increase in CRP quantitative value

**Table 6: Outcome of the patient according to the severity of pancreatitis**

Atlanta classification	Outcome	n	%
Mild	Discharge	35	100
Moderate	Discharge	52	100
Severe	Discharge	14	60.9
	Expired	9	39.1
<b>Total</b>		<b>23</b>	<b>100</b>

As shown in Fig. 2 of Receiver Operator Characteristic (ROC) curve for determining CRP value for predicting severity of acute pancreatitis (Atlanta classification) had shown area under the ROC curve is 0.977 with 95% of Confidence Interval (CI) indicating good diagnostic accuracy.

The area under the ROC curve for CRP in predicting severe acute pancreatitis is 0.977 with a 95% of confidence interval (CI): 0.88–

**Fig 2:** ROC curve of CRP value for predicting severity of Acute Pancreatitis (Atlanta classification)**Table 7: Correlation of CRP value with other indices of severity of pancreatitis**

Variables	CRP value	BISAP score	Ranson score	CTSI score
CRP	1	0.825**	0.809**	0.802**
BISAP	0.825**	1	0.860**	0.783**
Ranson score	0.809**	0.860**	1	0.783**
CTSI score	0.802**	0.783**	0.783**	1

\*\* Correlation is significant at the 0.01 level (2- tailed)

0.96 indicating good diagnostic accuracy. The curve's proximity to the upper left corner reflects high sensitivity and specificity across multiple cut-off values.

## DISCUSSION

Acute pancreatitis can be categorized and its severity can be predicted using several clinical, radiological and biochemical profiles. The severity of acute pancreatitis was determined

according to the most recently revised Atlanta Classification. Mild cases were defined by the absence of organ failure and the absence of local or systemic complications. Moderately severe case was defined by the presence of transient organ failure, local complications, or exacerbation of comorbid diseases. Severe acute pancreatitis was defined by persistent organ failure for more than 48 h. Organ failure was defined as a score of 2 or more for one of the three systems (respiratory, cardiovascular,

and renal) using the modified Marshall scoring system.<sup>7</sup>

Radiological interventions such as ultrasonography (USG), contrast enhanced computed tomography (CECT), magnetic resonance imaging (MRI) also help to diagnose and assess the severity of the disease with complications of necrosis, peri-pancreatic fluid collection, pseudoaneurysm and thrombosis.<sup>8-10</sup> The severity of acute pancreatitis is further classified according to the Balthazar Computed Tomography Index.<sup>7</sup> CRP an acute phase reactant has been used recently as a biochemical profile to assess the severity of acute pancreatitis. CRP measurement may be done between 24-72 hours after hospital admission and the most recommended cut off value being 150 mg/dl.<sup>11</sup> It has an estimated sensitivity of 80.0% and a specificity of 76.0% in predicting severe acute pancreatitis.<sup>10</sup> However, its accuracy is low within the first 48 hours and since it is synthesized in the liver, its value may be underestimated in patients with liver diseases due to alcoholism and obesity which is common in acute pancreatitis.<sup>12</sup> In summary, CRP is used as a predictor because of it is simple and cheap compared to other scoring system.<sup>13</sup>

Alzarooni *et al*<sup>14</sup> conducted a retrospective observational study on 99 admitted patients of acute pancreatitis to determine the role of CRP on predicting the severity of the disease. Their study revealed that a CRP >100 mg/dl within 48 hours of admission was an indicator of severe attack of acute pancreatitis which correlated with having APACHE II score of more than 8. Our study revealed the more severe grade of acute pancreatitis based on the Atlanta classification was directly linked with the level of CRP measure after 48 hours of hospital admission. All patients who were graded as severe pancreatitis had CRP level greater than 100mg/dl after 48 hours of hospital admission. A similar study done by Khanna *et al*<sup>15</sup> concluded that serum CRP on the second day of admission as helpful predictor to assess the severity of acute pancreatitis.

A retrospective study conducted by Cho *et al*<sup>16</sup> regarding the comparison of different scoring system in predicting the severity of acute pancreatitis. Among a total of 161 patients, 21 patients were classified as severe pancreatitis. Their study results revealed, Ranson, APACHE II, and CTSI scores were found to be higher among the severe disease group as compared to the mild and moderate severity groups of acute pancreatitis. Similarly, CRP was measured at the time of admission and after 24 hours. Higher value of CRP after 24 hours

directly correlated with severe AP. The results of their study showed significant correlation of Ranson, BISAP, and APACHE-II scores, and CTSI with the length of hospital stay, however, CRP did not show correlation with the length of hospital stay. In a conflicting manner, a study done by Simones *et al*<sup>17</sup> stated CRP was the only score capable of predicting the occurrence of local complications and higher values of CRP correlated with longer hospital stay.

A study conducted by Nagarchi *et al*<sup>18</sup> regarding comparison of CTSI and CRP for pancreatitis severity, higher CTSI score greater than 7 and higher CRP values have shown longer duration of stay. In another study conducted by Kyewhon Kim and Kim,<sup>19</sup> CRP less than 50 at 24 hours after admission predicted mild pancreatitis and more than 100 predicted severe pancreatitis. Both of this study were comparable to our studies.

The C-reactive protein (CRP) test obtained within 48 hours of hospital admission is a helpful tool in predicting the severity of acute pancreatitis, and also useful indicator for outcome of the disease. This has been concluded by several other literatures as discussed above and has been supported through the results of our research.

Among all of the scoring system used to predict the severity of acute pancreatitis, CRP a biochemical acute phase reactant can be used in the hospital setting due to its simplicity, availability and relatively inexpensiveness. It has shown to be a reliable and valuable indicator to predict the severity of acute pancreatitis and its outcome and duration of stay in hospital.

*Limitation of the study:* the study was conducted in single center, multiple center study with randomization studies needed to confirm the study. CTSI score of all the patients was not taken as all patient did not undergo CT abdomen. In this study, the number of severe cases

of AP and mortalities was lower in comparison to other large scale clinical studies as mortality was lower. So, comparison of prognostic value of various scoring systems was somewhat difficult. However, this study was one of the few studies to compare different prognostic scoring systems including BISAP on the basis that severe AP was defined by persistent organ failure for more than 48 h, especially in our country setup.

**Conflict of interest:** None

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