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**Original Research Article**

# Comparative study between Ranson's scoring system and C reactive protein analysis in predicting the severity of acute pancreatitis

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## ABSTRACT

**Background:** Acute pancreatitis is a self-limiting disease process which when diagnosed at the primary stages helps us manage the condition with utmost care, however in severe cases it has been deemed to be one of the most common lethal conditions. The various prognostic indicators to predict the severity of the acute pancreatitis includes Ranson, modified Glasgow, MOSS, CT severity index, Apache II scoring systems and biochemical markers like C-reactive protein (CRP), IL 6 and serum prolactin level.
**Methods:** A total of 50 patients with clinical diagnosis of acute pancreatitis were studied at the Sri Siddhartha institute of medical sciences and research centre during the period of October 2019 to September 2021. We assessed the Ranson's score as well as the CRP levels in the patients at 24, 48 and 72 hours respectively.
**Results:** In this study, 47 patients were male and only 3 were females. The patients with the Ranson's score of 2 or <2, 3-4, 5 or >5 were seen in 21, 22 and 7 cases respectively. Further, the mean ± SD level of CRP at 24, 48 and 72 hours was 120.348±47.51, 134.926±47.26 and 146.57±44.43 respectively. It was found to be statistically significant. We report 8% mortality rate in our study.
**Conclusions:** Our study showed that both CRP as well as Ranson's score is good predictors of the disease process. Ranson's score was a one-time assessment of the disease severity of acute pancreatitis, while CRP levels showed a concurrent increase in the CRP levels after each 24 hour interval which reflects the increased progression of the disease process with time at the initial stage of acute pancreatitis.

**Keywords:** Acute pancreatitis, Ranson's score, CRP, Biochemical markers, Prognosis, Mortality

## INTRODUCTION

Pancreas is an organ which has exocrine as well as endocrine secretions. It is an important organ whose role was understood over the period of time and also the pathophysiology helped us elicit the signs and symptoms associated with the disease process.

Acute pancreatitis is a self- limiting disease process which when diagnosed at the primary stages helps us manage the condition with utmost care, however in severe cases it has been deemed to be one of the most common lethal conditions.[1,2]

Assessment of the severity of the disease process, many scoring systems have been proposed and in action since 1974. The ideal scoring system should be easy to apply, flawless and be capable of predicting the severity of the disease process. Even though there are many grading systems it is important to know which system is useful.[3,4]

The various prognostic indicators to predict the severity of the acute pancreatitis includes Ranson's, modified Glasgow, MOSS, CT severity index, Apache II scoring systems and biochemical markers like CRP, IL 6 and serum prolactin level.4,5 Lately, BISAP scoring system

and CRP level are established for extrapolation of the clinical outcome in acute pancreatitis.[3,4]

The major shortcoming of Ranson's criteria is that it does not give the clear picture of the severity at the time of admission because six out of total eleven parameters can be assessed only after 48 hour, which leads to delayed prediction and increasing the chances of mortality in such patients.[5]

The acute physiology and chronic health evaluation when initially launched were criticized because of its major drawbacks. However, over the time the system has rapidly improved to Apache- I and then Apache-II scoring system. Apache-II can be used on admission and can be repeated at any time, the complexity of the parameters may not be specific for acute pancreatitis.[6]

Biomarker like CRP is a neutrophil activating peptide which is synthesized in hepatocyte by multiple cell line. It's production is induced by release of IL-1 and IL-6, several studies evaluated this marker as predictor for severity of acute pancreatitis, when measured at 24, 48 and 72 hours after admission and employed variable cut-off level to assess the severity of acute pancreatitis.[1,3]

Here in this study, we are considering Ranson's scoring systems and CRP for analysis and comparing their values to assess the severity of acute pancreatitis and hence taking decision in the management and prognosis of the disease.

### *Aim and objectives*

Aim and objectives were to compare the ability of Ranson's score with CRP analysis to predict the severity and prognosis of acute pancreatitis and its management.

## METHODS

### *Type of study*

Prospective comparative study type was used.

### *Subjects and source of data*

The study was conducted on all patients admitted with suspected acute pancreatitis in department of general surgery, Sri Siddhartha institute of medical sciences and research institute T. Begur.

### *Method of collection of data*

Detailed medical history and clinical examination and routine investigations.

### *Inclusion criteria*

All cases of acute pancreatitis which is proven by clinical, radiological and biochemically with raised amylase and lipase by three-fold were included in study.

### *Exclusion criteria*

Patients with pediatric age group and traumatic pancreatitis were excluded.

### *Study period*

The study conducted for two years (Oct 2019 to Oct 2021).

### *Follow up period*

The follow up period was for 30 days.

### *Sample size estimation*

Total 50 participants were included in study.

We arrived at the sample size after taking the average of total number of acute pancreatitis admitted in the past 3 year in our hospital.

### *Statistical analysis*

Data will be presented as mean ± standard deviation and median with rangewhichever is appropriate. In the case of qualitative variables the groups will be compared by chi-square test, in case of quantitative variables the groups will be compared with students unpaired T test or Mann-Whitney U test whichever is appropriate with 95% confidence interval. P value of less than 0.05 is considered significant. Statistical analysis will be done using SPSS version 20.0.

## RESULTS

In our study, the number of patients as per their age group in the descending order was found to be 17, 15, 11, 4, 2 and 1 in 31-40,41-50, 21-30, 51- 60, 61 -70 and 71-80 respectively.

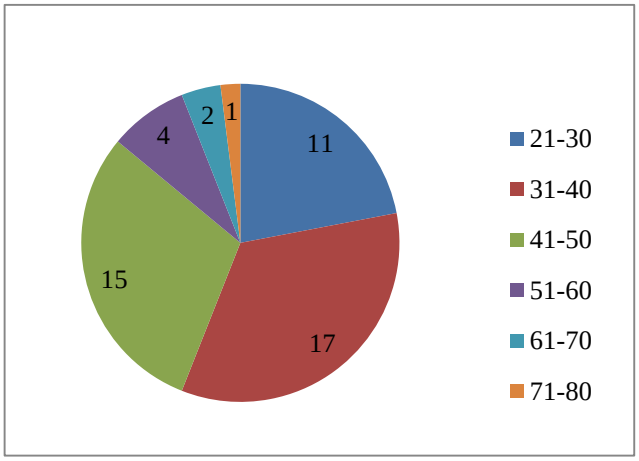


**Figure 1: Age.**

Out of the total 50 subjects, 47 subjects were males and 3 were females.

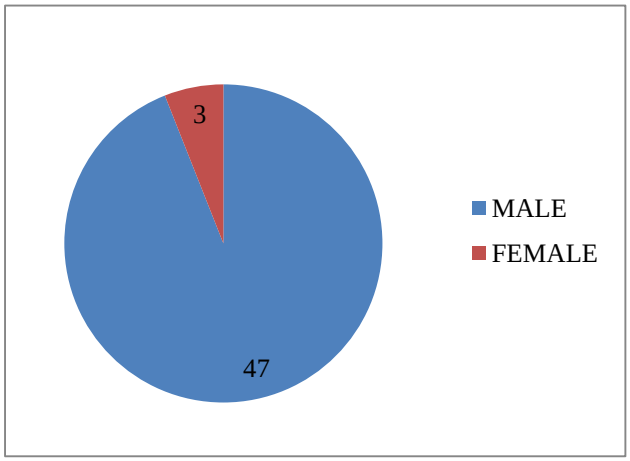


**Figure 2: Gender.**

The causative etiology/ etiological agents, in the study we found 41 subjects with alcohol, 6 with gallstone and 3 having idiopathic causative etiology.

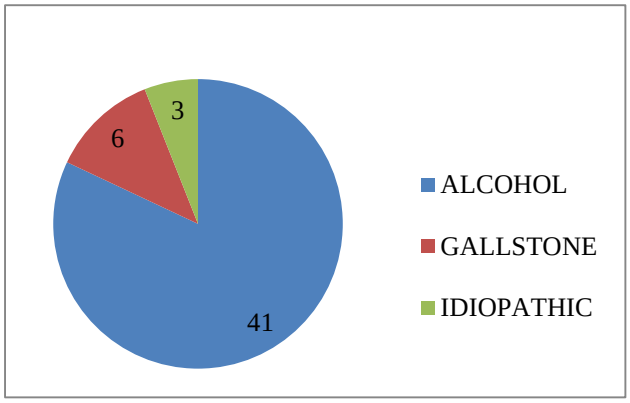


**Figure 3: Etiology.**

The distribution as per the type of treatment the subjects underwent, 49 subjects underwent conservative type of treatment whereas 1 subject underwent surgery.

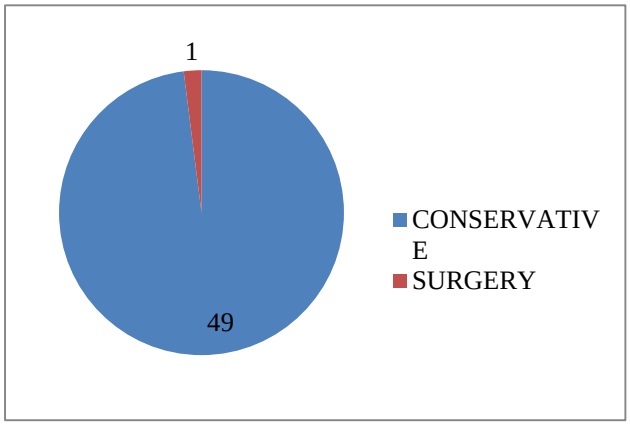


**Figure 4: Type of treatment.**

Duration of the hospital stay. The duration of the hospital stays for a period of 0-5, 6-10, 11-15 and 16-20 days was seen in 21, 11, 9 and 5 cases respectively.

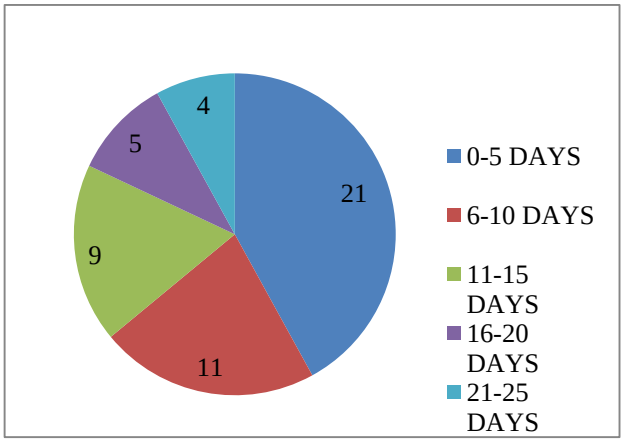


**Figure 5: Duration of hospital stay**

Distribution of subjects as per the complications suffered. Complications like pancreatic necrosis, haemmorhagic pancreatitis, pseudocyst and SIRS was found to be seen in 6, 4, 6 and 3 subjects respectively.

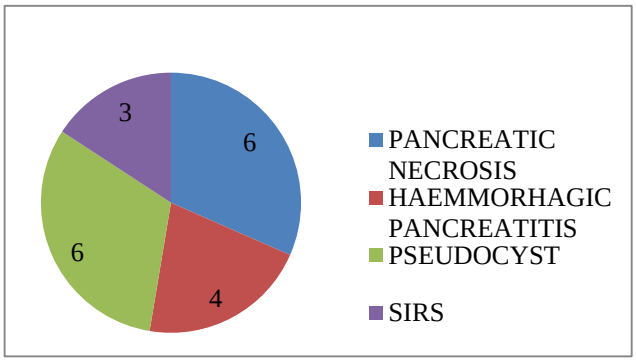


**Figure 6: Complications.**

Distribution of subjects depicting the mortality rate, 46 subjects survived, while 4 subjects lost their lives.

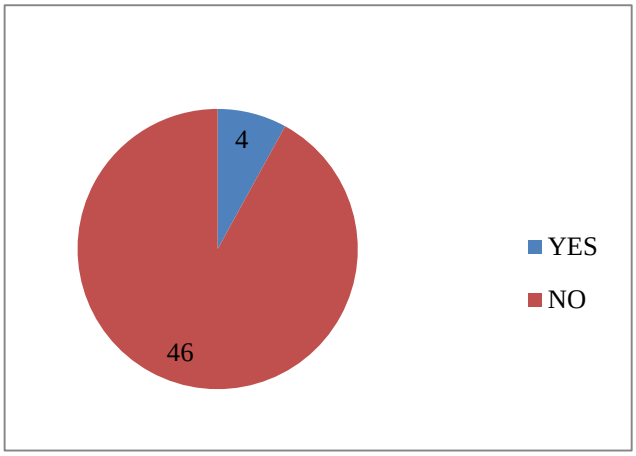


**Figure 7: Mortality.**

Distribution of subjects as per Atlanta classification. In study subjects were distributed into mild, moderate and severe type with 28, 0 and 22 cases respectively.

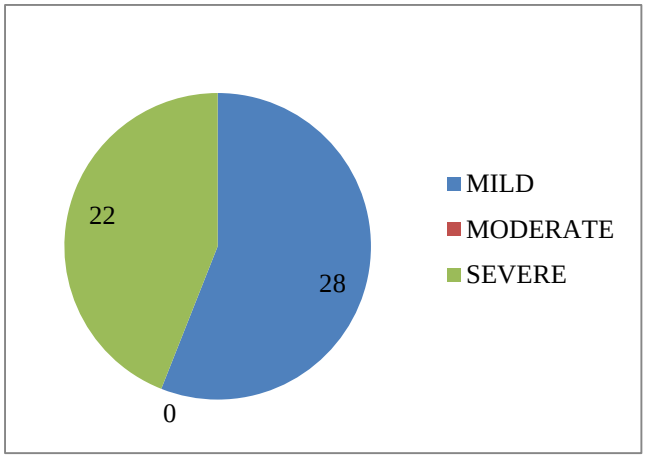


**Figure 8: Atlanta classification.**

Distribution of subjects as per the Ranson's score. In the study the subjects were distributed as per a score of 2 or <2, 3-4, 5 or >5 with 21, 22 and 7 cases respectively.

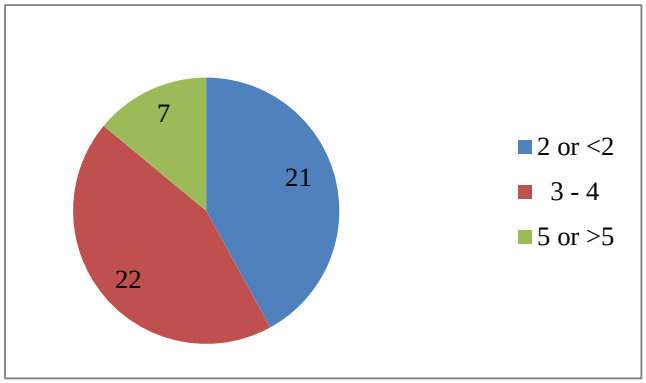


**Figure 9: Ranson's score.**

Mean levels of CRP at 24, 48 and 72 h respectively. Mean ± SD level of CRP at 24, 48 and 72 hours was 120.348±47.51, 134.926±47.26 and 146.57±44.43 respectively. It was found to be statistically significant.

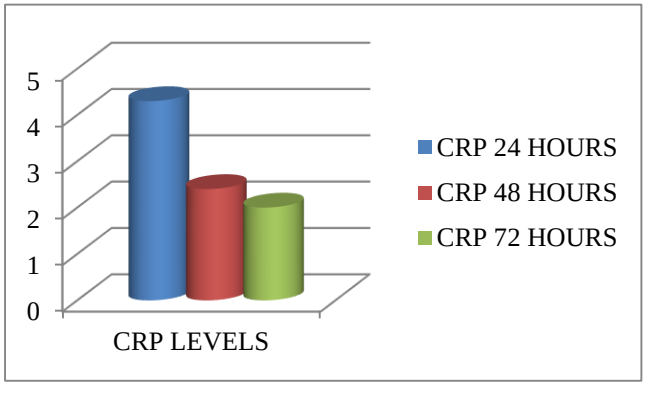


**Figure 10: Mean levels of CRP.**

## DISCUSSION

Acute pancreatitis is an inflammatory process which occurs in a normal organ and which is diagnosed generally by acute abdominal pain associated with a related increase in serum amylase and lipase concentration levels.[1,2]

Over the years, many biomarkers and scoring systems have been used to assess the severity of the disease process. Scoring systems such as CRP, Apache system, Ranson's scoring system which assess multiple parameters have been used. However, the sensitivity and specificity of each scoring system have not been assessed completely.[3]

CRP is a neutrophil activating peptide which is amalgamated in hepatocyte by multiple cell line, induced by discharge of IL 1 and 6. Assessment of CRP at 24-, 48- and 72-hour intervals has been tried to assess the severity of the disease process and the clinical outcome.[4,5]

Ranson's criteria are based on 11 clinical and laboratory parameters measured within the first 48 hours of admission to the hospital. And for complete assessment of patients, 48 hours is required and Ranson's score ≥3 defines severe pancreatitis.[4,5]

In case of alcoholic pancreatitis about 11 parameters are used, whereas only 10 parameters are used to score gallbladder pancreatitis.[6]

In our study, the majority of the patients belonged to the 30-50 age groups and later by 21-30 age groups.

The 47 patients were males and only 3 were females and about 41 subjects showed alcohol as the etiological agent whereas 6 patients had gallstone as the etiological agent.

Available literature has always made it evident that males most commonly suffer from alcoholic pancreatitis while females suffer from gallstone pancreatitis. Hence when we correlate the gender with the etiological agent, the results from our study is in agreement with the available literature.

In either of the etiological cases, the severity of the disease process is usually mild with 20% of the patients showing severe injury who lose their lives as an end result.[7,8]

In our study, 49 subjects underwent conservative type of treatment whereas 1 subject underwent surgery. About 41 patients showed a short hospital and were discharged within 15 days and about 5 patients stayed for more than 15 days.

Complications like pancreatic necrosis, hemorrhagic pancreatitis, pseudocyst and SIRS was found to be seen

in 6, 4, 6 and 3 subjects respectively, 4 patients lost their lives in our study, which accounts for 8% mortality rate.

On an average, 15% of the individuals lose their life and can go up to 40%.[9]

As per the Atlanta classification, the subjects were classified into mild, moderate and severe type with 28, 0 and 22 cases respectively.

In our study, the Ranson's score in the subjects with a score of 2 or <2, 3-4, 5 or >5 with 21, 22 and 7 cases respectively.

In a study done by, Leung et al in the year 2005 from their study found that the Ranson's and Apache II scores had lower sensitivity for complications, mortality, and the length of stay for AP than the Balthazar score.[10]

Kim et al from their study conducted in the year 2008 reported that the Ranson's score had the highest accuracy based on AUC.[11]

Khanna et al from their study conducted in the year 2013 reported that the Ranson's score had better AUC for predicting severity.[12]

Papachristou et al from their study conducted in the year 2013 reported that Ranson's score had better AUC for predicting severity (0.94) and mortality (0.95), in comparison to this study.[13]

Cho et al in their study conducted in the year 2015 reported that the AUC for Ranson's score for predicting severity in AP was 0.804 (0.717-0.892) with a sensitivity of 81.8%, specificity of 59.1%, and PPV of 76.9% and for association with mortality 0.861 (0.734-0.988) with sensitivity of 87.5%, specificity of 57.2%, and PPV of 5.3%.[14]

The mean ± SD level of CRP at 24, 48 and 72 hours was 120.348±47.51, 134.92±47.26 and 146.57±44.43 respectively, which was found to be statistically significant.

As per Wilson et al CRP reflects the severity in case of pancreatitis and it is a measure of hepatic acute phase response with the raised levels seen usually after 48-72 hours of the start of inflammation and helps to evaluate the change in the severity of the disease process during the follow-up phase.[15]

CRP is elevated in cases of coronary heart disease, insulin resistance, diabetes, dental disorders, smoking, overweight, obesity, Alzheimer's disease, rheumatoid arthritis, cancer.

As per a study done by Chen et al they found that the mean serum CRP levels at 2-, 4- and 7-day interval was found to be 13.71, 9.00 and 6.02 in severe cases and 4.78, 3.30 and 1.43 mg/dl in mild cases of acute pancreatitis. The sensitivity and specificity in predicting the severity of the disease process was found to be 94 and 76% respectively.

In a study done by Machindra et al in the year 2021 showed that comparison of serum CRP levels between the Atlanta classified groups shows that severe group has the maximum value of 340.966 and mild has the minimum value of 55.38. On comparison of the test group, Ranson's score with the BISAP score, the test group had a sensitivity of 89.3% and specificity of 77.3%. The study demonstrated the concordance between Ranson's score, BISAP score and serum CRP level as predictors of clinical outcome in acute pancreatitis.[15]

Over the years, there have been many parameters to diagnose and assess the severity of the disease process; these parameters should be more of reproducible and consistent to understand the state of the disease process. However, it is not possible to make every laboratory investigation as reliable and reproducible as other standardized parameter.

The need for such laboratory investigations measures to predict the severity of the disease process makes the research for such investigations the need of the hour.

## CONCLUSION

Our study showed that both CRP as well as Ranson's score is good predictors of the disease process. Ranson's score was a one-time assessment of the disease severity of acute pancreatitis, while CRP levels showed a concurrent increase in the CRP levels after each 24 hour interval which reflects the increased progression of the disease process with time at the initial stage of acute pancreatitis.

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*Ethical approval: The study was approved by the Institutional Ethics Committee*

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