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Research Article

# A COMPARATIVE STUDY BETWEEN APACHE II AND RANSON'S SCORING SYSTEMS IN PREDICTING THE SEVERITY OF ACUTE PANCREATITIS

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**ABSTRACT**

**Objectives:** The aims and objectives of the study are to compare the Ranson's scoring system with APACHE II score in predicting the severity of acute pancreatitis.

**Methods:** 50 cases having acute pancreatitis were included in this study on the basis of a predefined inclusion and exclusion criteria. Institutional ethical committee was approved the study. The duration of study was 2 years. Informed consent was obtained from the patients. Assessment of severity of pancreatitis was done on the basis of Ranson's scoring as well as APACHE II score. Final severity score of the patients on the basis of both the scoring systems was assessed to determine the efficacy of each scoring system in predicting the severity.

**Results:** Out of these 50 cases, there were 37 (74%) males and 13 (26%) females. The mean age of affected cases was found to be 36.86±7.91 years. The most common etiological factor was chronic alcoholism which was seen in 22 (44%) patients followed by biliary tract disease or stones (24%), hypertriglyceridemia (14%), post ERCP (2%), idiopathic (14%), and autoimmune pancreatitis (2%). Mild and severe pancreatitis was seen in 35 (70%) and 15 (30%), respectively. APACHE II score was found to be having more sensitivity and positive predictive value for the diagnosis of severe pancreatitis as compared to Ranson's score. There was no significant difference in specificity, negative predictive value, and accuracy as determined by Ranson's and APACHE II Score.

**Conclusion:** APACHE II score is better in predicting severity of acute pancreatitis as it is found to have a better sensitivity and positive predictive value for the diagnosis of severe pancreatitis as compared to Ranson's score.

**Keywords:** Acute pancreatitis, Ranson's, APACHE II score, Complications, Sensitivity.

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## INTRODUCTION

Acute pancreatitis can be defined as inflammation of pancreatic parenchyma as well as surrounding peri-pancreatic tissue. It is one of the leading causes of gastrointestinal system-related morbidity as well as mortality in surgical practice. The pre-disposing factors for development of pancreatitis include cholelithiasis, hypertriglyceridemia, chronic alcoholism, trauma, and viral infections such as cytomegalovirus, mums, and Epstein–Bar virus. Drug-induced pancreatitis can be secondary to the drugs such as azathioprine, sulfonamides, tetracycline, and didanosine. The less common causes include autoimmune pancreatitis, neoplastic diseases, and procedures such as endoscopic retrograde cholangiopancreatography [1].

Acute pancreatitis usually presents as dull abdominal pain which gradually increases in severity and is usually associated with nausea vomiting as well as anorexia. The abdominal pain in pancreatitis characteristically reduces upon sitting but this improvement is usually temporary and there is gradual worsening of abdominal pain [2]. Unless it is diagnosed early and appropriately managed acute pancreatitis has the potential to culminate into catastrophic complications such as shock multi-organ dysfunction that may eventually cause death. According to the severity, acute pancreatitis is divided into mild acute pancreatitis (absence of organ failure and local or systemic complications, moderately acute pancreatitis (no organ failure or transient organ failure <48 h with or without local complications) and severe acute pancreatitis (persistent organ failure more than 48 h that may involve one or multiple organs) [3].

Since in many cases, abdominal pain initially is dull and bearable and many times associated with nausea, vomiting as well as diarrhea, it may be attributed to other gastrointestinal diseases and a high index of suspicion, particularly in individuals known to have risk factors for development of acute pancreatitis, is essential for early diagnosis of acute pancreatitis [4]. Serum amylase and lipase levels are increased in cases with acute pancreatitis, however, these enzymes are non-specific and cannot be relied upon for the diagnosis. The diagnosis of pancreatitis is usually confirmed on the basis of imaging techniques such as ultrasound imaging, computed tomography, and in selected cases, magnetic resonance imaging can be done [5]. In cases of acute pancreatitis, on ultrasound, pancreas usually appears to be having heterogeneous echotexture with decreased echogenicity and presence of peripancreatic fluid collection. Ultrasound examination, however, is having less sensitivity particularly in obese and non-cooperative patients. On computerized tomography, acute pancreatitis may present as diffusely enlarged pancreas with indistinct margins and surrounding fat stranding. On MRI diffusion-weighted images, it may present as hyperintense signal of the involved parenchyma [6].

Identification of severity is one of the essential parts of management of patients with acute pancreatitis and is essential in further guiding management strategies in cases of pancreatitis [7]. Several scoring system, such as APACHE II, Ranson's score bedside index for severity in acute pancreatitis (BISAP), and modified Glasgow score, is in use for the assessment of severity. Out of these scores, APACHE II and Ranson's score are more commonly used for the assessment of severity in cases of acute pancreatitis [8].

We conducted this study to compare the efficacy of APACHE II and Ranson's score in the assessment of severity of cases having acute pancreatitis.

## METHODS

This was a comparative study conducted in the department of general surgery of PDU Medical College and Hospital of Saurashtra University to compare the RANSON scoring system with APACHE II score in predicting the severity of acute pancreatitis. 50 patients diagnosed to be having acute pancreatitis were included in this study on the basis of a predefined inclusion and exclusion criteria. Institutional ethical committee approved the study. The duration of study was 2 years. Informed and written consent was obtained from the patients before enrolling them in the study.

Sample size calculation was calculated on the basis of pilot studies done for analyzing cases of acute pancreatitis. Keeping power (1-Beta error) at 80% and confidence interval (1-alpha error) at 95%, the minimum sample size required was 40 patients; therefore, we included 50 cases in this study. A detailed history was taken in all the cases particularly with respect to predisposing factors such as alcohol intake, cholelithiasis, and drug intake for the development of pancreatitis. A thorough clinical examination was done in all the cases. Routine investigations such as complete blood count, renal function tests, hepatic function test, and coagulation profile was done in all cases. Diagnosis of acute pancreatitis was made on the basis Atlanta criteria that consisted of acute abdominal pain suggestive of pancreatitis along with either serum amylase or lipase level >3 times the upper normal value or characteristic imaging findings. Imaging studies consisted of ultrasound as well as computerized tomography. In addition to the diagnosis of pancreatitis, imaging also was used for the detection of biliary causes of pancreatitis such as cholelithiasis and/or choledocholithiasis. Acute pancreatitis was classified as alcohol related when the patient reported a regular higher intake of alcohol or an alcoholic binge directly before the onset of the disease and no signs of possible other causes will be found like gall stones pancreatitis. The cases were classified as severe pancreatitis if there was presence of multiorgan failure or complications such as hypotension and shock (systolic BP <90 mmHg), pulmonary insufficiency ($PaO_2$ 60 mmHg or less), renal failure (serum creatinine >2 mg), or gastrointestinal bleeding (>500 mL/24 h).

Assessment of severity of pancreatitis was done on the basis of Ranson's scoring [9] as well as APACHE II score [10]. Final severity score of the patients on the basis of both the scoring systems was assessed to determine the efficacy of each scoring system in predicting the severity. For statistical purposes, SSPS 21.0 software was used. Sensitivity, specificity, positive predictive value, and negative predictive value were calculated. $p<0.05$ was taken as statistically significant.

### Inclusion criteria

1. Patients admitted and diagnosed to be having acute pancreatitis on the basis of imaging
2. Age above 20 years
3. Patients who gave informed written consent to be part of study.

### Exclusion criteria

1. Patient who refused consent to be part of study
2. Known cases of chronic pancreatitis
3. Recurrence of acute pancreatitis
4. Patients with severe comorbid conditions such as uncontrolled diabetes, uncontrolled hypertension, and severe systemic autoimmune conditions.

## RESULTS

Total 50 patients were studied. Out of these 50 cases, there were 37 (74%) males and 13 (26%) females. There was a male preponderance with an M: F ratio being 1:0.35 (Fig. 1).

The analysis of patients on the basis of age group showed that the most common affected age group was between 31 and 40 (42%) years followed by 41–50 (36%) years and 20–30 years (16%). 3 (6%) patients were above 50 years of age. The mean age of affected cases was found to be 36.86±7.91 years (Table 1).

The analysis of predisposing factors for the development of pancreatitis showed that the most common etiological factor was chronic alcoholism which was seen in 22 (44%) patients followed by biliary tract disease or stones (24%), hypertriglyceridemia (14%), post-ERCP (2%), idiopathic (14%), and autoimmune pancreatitis (2%) (Fig. 2).

The analysis of patients on the basis of severity showed that out of 50 studied cases, mild and severe pancreatitis was seen in 35 (70%) and 15 (30%), respectively. Most common age group to be affected by severe pancreatitis was between 31 and 40 years (12%) followed by 31–40 years (10%). Only 1 patient (2%) above 50 years was found to be above 50 years of age (Table 2).

The analysis of patients on the basis of clinical classification showed that 15 (30%) were having severe pancreatitis. 9 (18%) and 13 (26%) patients were found to be having severe pancreatitis as assessed by Ranson's and APACHE II score, respectively (Table 3).

The analysis of severity of pancreatitis as assessed by Ranson's score as well as APACHE II score showed that the sensitivity of Ranson's and APACHE II score for the diagnosis of severe pancreatitis was 60%

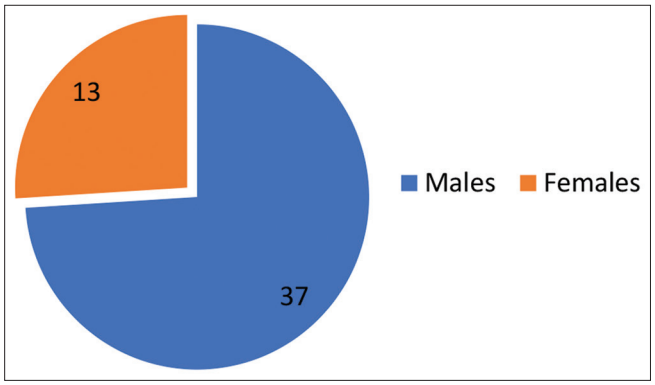


**Fig. 1: Gender distribution of the studied cases**

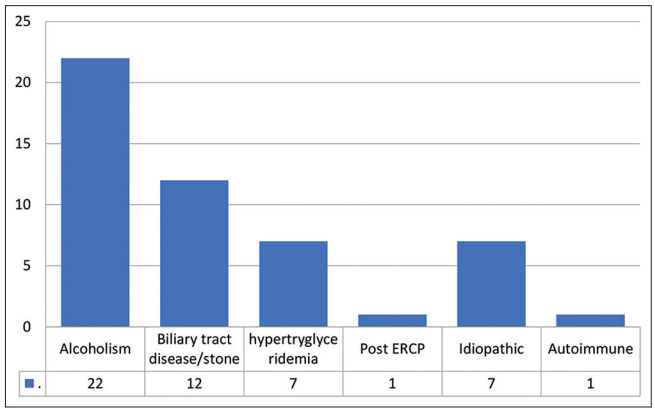


**Fig. 2: Predisposing factors for the acute pancreatitis**

**Table 1: Gender-wise distribution of age in studied cases**

| Age | Male | | Female | |
|---|---|---|---|---|
| | No of cases | Percentage | No of cases | Percentage |
| 20–30 years | 5 | 10 | 3 | 6 |
| 31–40 years | 16 | 32 | 5 | 10 |
| 41–50 years | 14 | 28 | 4 | 8 |
| Above 50 years | 2 | 4 | 1 | 2 |
| Total | 37 | 74% | 13 | 26 |

Mean age=36.86±7.91 years

and 80%, respectively. APACHE II score was found to be having more sensitivity and positive predictive value for the diagnosis of severe pancreatitis as compared to Ranson's score. There was no significant difference in specificity, negative predictive value, and accuracy as determined by Ranson's and APACHE II score (Table 4).

The analysis of complications in the studied cases showed that out of 50 studied cases, complications were seen in 11 (22%) patients. The most common complication was found to be local peripancreatic collection which was seen in 3 (6%) patients. The other complications included biliary obstruction (4%), respiratory failure (4%), and multiorgan dysfunction (6%). Renal failure was seen in 1 (2%) patient (Fig. 3).

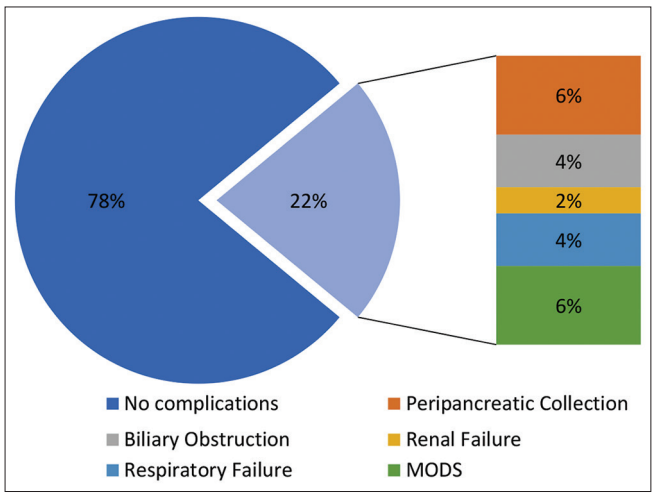


**Fig. 3: Complication in studied cases**

**Table 2: Severity of pancreatitis in studied cases**

| Age | Mild pancreatitis | | Severe pancreatitis | |
|---|---|---|---|---|
| | No of cases | Percentage | No of cases | Percentage |
| 20–30 years | 5 | 10.00 | 3 | 6.00 |
| 31–40 years | 15 | 30.00 | 6 | 12.00 |
| 41–50 years | 13 | 26.00 | 5 | 10.00 |
| Above 50 years | 2 | 4.00 | 1 | 2.00 |
| Total | 35 | 70 | 15 | 30.00 |

**Table 3: Assessment of severity of acute pancreatitis by Ranson's and APACHE II score**

| Severity of pancreatitis | No of cases | Percentage |
|---|---|---|
| Clinical | | |
| Mild pancreatitis | 35 | 70 |
| Severe pancreatitis (multiorgan dysfunction, respiratory failure, renal failure, or significant GI bleeding) | 15 | 30 |
| Ranson's score | | |
| <3 | 41 | 76 |
| ≥3 | 9 | 24 |
| APACHE II scoring system | | |
| <8 | 37 | 74 |
| ≥8 | 13 | 26 |

## DISCUSSION

We conducted this study to compare Ranson's and APACHE II scores in the assessment of severity of acute pancreatitis. Total 50 patients admitted with acute pancreatitis were included in this study on the basis of a predefined inclusion and exclusion criteria. In our study, there were 37 (74%) males and 13 (26 %) females. There was a male preponderance with an M: F ratio being 1:0.35. The most common affected age group was found to be 31–40 years and the mean age was found to be 36.86±7.91 years. Ramu *et al.* conducted a study of patients with acute pancreatitis [11]. In this study, out of 436 cases, 318 (72.9%) were males and 118 (27.1%) were females. The mean age of studied cases was found to be s 43.45 years (median 41 years). Similar male preponderance was also reported by the authors such as Panda *et al.* [12] and Satoh *et al.* [13].

In our study, chronic alcoholism (44%) followed by biliary tract disease or stones (24%), hypertriglyceridemia (14%), post-ERCP (2%), idiopathic (14%), and autoimmune pancreatitis (2%) were common predisposing factors for the development of acute pancreatitis. Prasad and Nagarjuna conducted a study of 40 patients with acute pancreatitis [14]. The common predisposing factors for pancreatitis in this study were found to be biliary causes (55%) followed by alcoholism (32.5%), idiopathic pancreatitis (7.5%), hyperlipidemia (2.5%), and traumatic (2.5%) pancreatitis. Similar to our study, alcoholism and biliary tract diseases were most common causes of acute pancreatitis in this study. Similar predisposing factors were also reported to be the authors such as Spicák [15] and Weiss *et al.* [16].

The most common complication was found to be local peripancreatic collection which was seen in 3 (6%) patients. The other complications included biliary obstruction (4%), respiratory failure (4%), and multiorgan dysfunction (6%). Renal failure was seen in 1 (2%) patient. In our study, complications were seen in 11 (22%) patients. Sonawane *et al.* conducted a study of 53 patients with pancreatitis [17]. In this study, 12 (22.6%) patients developed complications, 3(5.66%) had acute fluid collections, 2(3.77%) had pseudocyst, 8(15.1%) had ascites, 9(16.98%) had pleural effusion, 2 (3.77%) had pancreatic necrosis, 1 (1.89%) had superior mesenteric vein thrombosis, 1 (1.89%) had GI bleed, and 5 (9.43%) had organ failure. The complication rate in this study was found to be comparable to our study.

The analysis of severity of pancreatitis as assessed by Ranson's score as well as APACHE II score showed that the sensitivity of Ranson's and APACHE II score for the diagnosis of severe pancreatitis was 60% and 80%, respectively. APACHE II score was found to be having more sensitivity and positive predictive value for the diagnosis of severe pancreatitis as compared to Ranson's score. There was no significant difference in specificity, negative predictive value, and accuracy as determined by Ranson's and APACHE II score. In a prospective study, Malathy and Sundarapandian enrolled 50 patients with acute pancreatitis [18]. Severity of pancreatitis in these cases was assessed by APACHE II and Ranson's scores. The study found that an APACHE II score of ≥10 on admission predicted a complicated outcome in patients with acute pancreatitis with a sensitivity of 100%, specificity of 80%, positive predictive value of 62%, and negative predictive value of 100%. Scores below 10 predicted an uncomplicated outcome. On the basis of these findings, the authors concluded that APACHE II score was a better

**Table 4: Sensitivity, specificity, positive predictive value, negative predictive value, and accuracy in studied cases**

| Ranson's Vs APACHE II Score | Sensitivity (%) | Specificity (%) | Positive predictive value (%) | Negative predictive value (%) | Accuracy (%) |
|---|---|---|---|---|---|
| Ranson's score | 60.00 | 94.24 | 81.82 | 84.62 | 84 |
| APACHE II score | 80.00 | 97.14 | 92.31 | 91.89 | 92 |
| p-value | 0.003 (significant) | 0.49 (not significant) | 0.049 (significant) | 0.14 (not significant) | 0.12 (not significant) |

predictor of systemic complications (sensitivity 100%) than RANSON score (sensitivity 66.7%). These findings were similar to our study. Similar superiority of APACHE II score in assessment of severity of acute pancreatitis was also reported by the authors such as Kumar and Griwan [19] and Khanna *et al*. [20].

**Limitation of the study**

Relatively small number of cases is one of the important limitations of this study. A large randomized control trial will further substantiate the findings of this study. Moreover, the cases were not followed up for prolonged period of time to assess long-term complications such as pseudocyst formation.

## CONCLUSION

APACHE II is found to be better in assessment of cases with acute pancreatitis as it is found to have a better sensitivity and positive predictive value for the diagnosis of severe pancreatitis as compared to Ranson's score.

## WORK ATTRIBUTED TO

Department of General Surgery, PDU Medical College and Hospital, Rajkot.

## AUTHORS CONTRIBUTION

MK – Concept and design of the study, prepared first draft of manuscript; DG – Interpreted the results, reviewed the literature, and manuscript preparation and revision of the manuscript.

## CONFLICT OF INTEREST

None.

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