Original Research Article

A Comparative Study on Prognostic Relevance of Various Severity Scoring Systems of Acute Pancreatitis in Present Day Surgical Practice

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Abstract

Prior assessment of severity is very important in the management of acute pancreatitis. The purpose of our study is to compare the predictive efficacy of various severity scoring systems for acute pancreatitis. This study was conducted in patients admitted with acute pancreatitis in Medical College Kolkata, between January 2011 to November 2011 by doing a prospective analysis of patients' case notes. There was no significant difference in median APACHE II score on admission and after 48 hours in our study. Ranson's and APACHE II score was found to have similar sensitivity and negative likelihood ratio. Ranson's and CTSI had similar PPV and PLR. Ranson's score proved equal to the APACHE II score for predicting mortality and the development of organ dysfunction. The LR+ of MGMOF score (cut off at ≥2) after 48 hours, MGMOF score (cut off at ≥2) on admission, MGMOF score >0 after 48 hours and on admission and Ranson's were almost comparable. All the scores under study except Goris MOF at a cut off ≥2 on admission had good predictive value in terms of different predictive accuracy parameters. CTSI and Ranson's score can be most useful to identify mild pancreatitis cases but can also be useful in severe pancreatitis patients to some extent. However, Ranson's score can not be applied for prediction of severity after 48 hours.

Keywords: Pancreatitis, severity scoring, prognostic relevance

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Introduction

"Acute pancreatitis stings like a scorpion, drinks like a fish , eats like a wolf , burrows like a rodent and kills like a leopard." "Acute Pancreatitis is the most terrible of all the calamities that occur in connection with the abdominal viscera. The suddenness of its onset, the illimitable agony which accompanies it, and the mortality attendant upon it, all render it most formidable of catastrophies."

(Berkeley Moynihan, 1865-1936)

Acute Pancreatitis refers to pancreatic inflammation which may be followed by clinical and biological restitution of the gland, if the primary cause is eliminated. It may involve the entire gland, may present as vasomotor collapse, hypotension, shock and even death (1). It has various modes of presentation, varied laboratory test result and different forms of treatment, ranging from conservative treatment to surgery and both high mortality and morbidity. Males are generally affected more than females in third world countries (2). Severe acute pancreatitis refers to the presence of organ failure and/or local complications (pancreatic necrosis, abscess or pseudocyst) with unfavorable prognostic signs (Ranson's criteria ≥3 or Acute Physiology and Chronic Health Evaluation [APACHE] II score ≥8) (3). Early severe acute pancreatitis is characterized by development of organ dysfunction within 72 hours of onset and progressive multi organ dysfunction score (MODS) , early hypoxemia, high CT score, increased incidence of necrosis, infection and abdominal compartment syndrome (4, 5).

Prior assessment of severity is very important in the management of acute pancreatitis. It helps us to identify high risk patients and to transfer them to an intensive care unit for closer supervision and early interventions. No single parameter, blood test or clinical recording has been found to be consistently accurate in predicting the severity of acute pancreatitis (6). A variety of predictive systems have been developed to meet this goal, but still there is no such sensitive and specific test or severity scoring system that can accurately measure prognosis at admission . The purpose of our study was to compare the predictive efficacy of various severity scoring systems for acute pancreatitis.

The main aim of the study was to compare association and prognostic relevance of various severity scoring systems - Ranson's criteria, Acute Physiology and Chronic Health Evaluation [APACHE II], Balthazar Computed Tomography Severity Index (BCTSI) and Goris Multi Organ Failure Score (GMOFS) and to determine the most accurate scoring system.

Materials and Methods

The study was conducted with patients admitted with acute pancreatitis in Medical College, Kolkata between January 2011 to November 2011. Fifty consecutive patients admitted with acute pancreatitis were selected and relevant data studied prospectively, as per the study protocol.

Only those patients were included, in whom all details were available according to the study protocol and in whom acute pancreatitis was proven by CECT of abdomen. Patients in whom details available were incomplete according to the study protocol or acute pancreatitis was not proven by CECT abdomen were excluded. In some patients at admission amylase was not raised but there was clinically strong suspicion of acute pancreatitis. They were subjected to serial amylase, lipase estimation along with CECT abdomen to confirm the diagnosis.

Prediction of severe pancreatitis has been made in this study if:

1. Ranson's Score ≥3 after 48 hours
2. APACHE II Score of ≥8 on admission or after 48 hours
3. CT severity index (CTSI) score of ≥6 in the first CECT abdomen
4. Goris Multi organ failure (MOF) score >0 i.e. any organ dysfunction failure on admission or after 48 hours
5. Persistent or progressive organ failure during the first week of admission. (calculated by daily calculation of Goris score)

Prediction of a mild pancreatitis has been made if:

1. Ranson's Score <3 after 48 hours
2. APACHE II Score of <8 on admission and after 48 hours
3. CT severity index(CTSI) score of <6 in the first CECT abdomen
4. Goris MOF score= 0 i.e. no organ dysfunction/failure at admission and after 48 hours
5. Any transient organ failure which is resolved within 48 hours of its development (calculated by daily calculation of Goris score during the first week of admission)

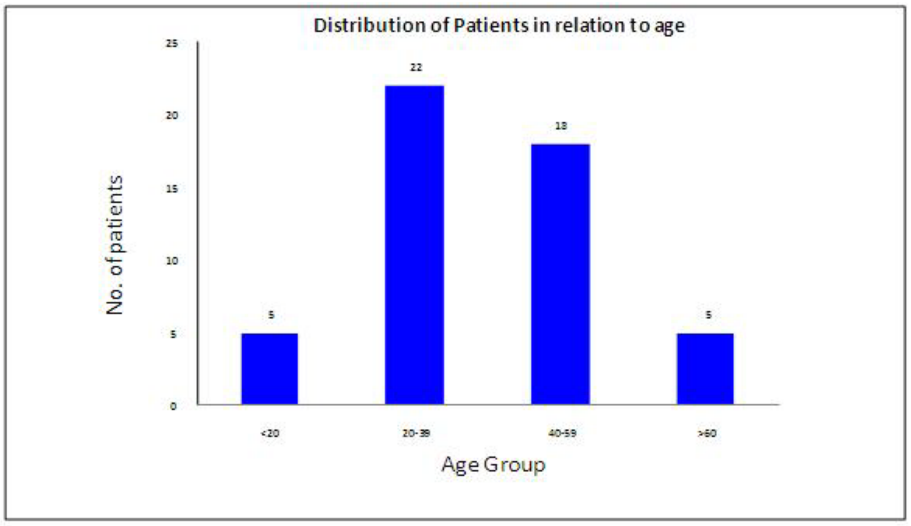
Criteria for severe pancreatitis were:

1. Duration of hospital stay >3 weeks
2. Treatment in ICU for >48 hours
3. Requirement of Inotropic support
4. Requirement of ventilator support
5. Requirement of dialysis (peritoneal/ hemodialysis)
6. Local complication like pancreatic necrosis (more than 30% of the parenchyma or more than 3 cm), pseudocyst or pancreatic abscess
7. Systemic complication like SIRS, sepsis or MODS
8. Multi organ failure
9. Requirement of percutaneous aspiration
10. Requirement of necrosectomy
11. Death

Patients with the following criteria were shifted to ICU:

1. Age >55 years with any co morbidity
2. History suggestive of less (<30 ml/hr) urine output
3. Tachycardia >120/min
4. Hypotension <90 mm of Hg refractory to bolus IV fluid
5. Respiratory rate >35 /min
6. Temperature >38°C
7. SPO_2 <90% or PaO_2<60 mm of Hg in spite of moist O_2 inhalation
8. Evidence of organ failure on admission

Patients who were stable initially but later on developed features suggestive of sepsis , MODS or early organ failure, or were detected to have Ranson's ≥3/APACHE II ≥8/ CTSI score≥6 were also transferred to ICU.



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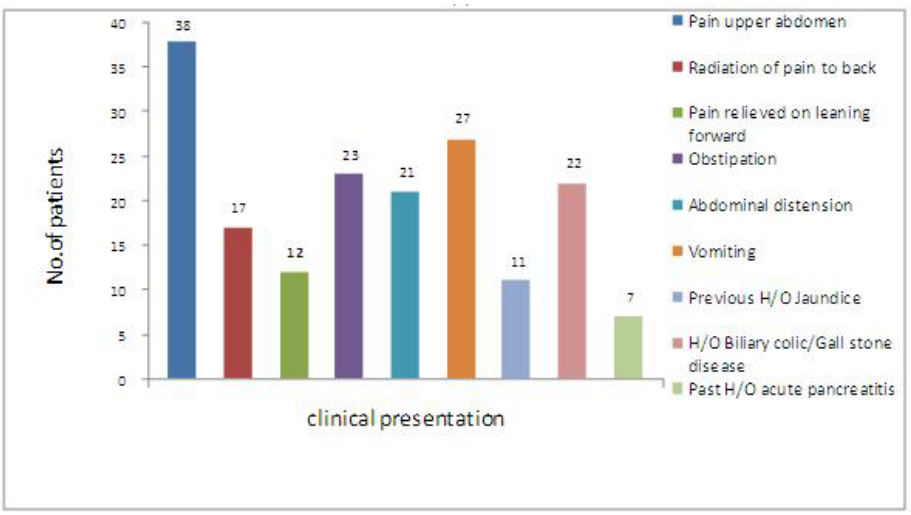

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Figure 1: a) Distribution of patients in relation to age b) Diverse clinical presentations of acute pancreatitis

In each patient APACHE II and Goris MOF score was obtained on admission. Calculation of Ranson's score was completed after 48 hours of each admission. Balthazar's CTSI was calculated as soon as the CECT scan was available. APACHE II and Goris MOF score were calculated once again after 48 hours of admission.

Results

The distribution of patients in relation to age is shown in Fig.1a. Among 50 patients 33 (66%) were male and 17 (34%) were female showing male preponderance. The diversity of clinical presentations are depicted in Fig.1b. The mean duration of pain abdomen at presentation and after admission are depicted in Fig.2a.

Aetiology: Alcohol was the commonest etiological factor in 58% patients , gall stones in 24% patients and 18% patients had mixed or miscellaneous etiologies.

USG abdomen revealed morphological changes associated with pancreatitis in 32(64%) patients and was absent in 18 (36%) patients.

Various outcome parameters were observed (Table 1). Types of organ failure caused by acute pancreatitis was noted (Fig.2b)

Correlation of Ranson's score and the final outcome (Table 2):

A total of 27(54%) patients had Ranson's Score ≥3(severe pancreatitis) and rest 23(46%) had Ranson's Score < 3 (mild pancreatitis).

Correlation of APACHE II score and final outcome were tabulated (Table 2). A total of 22(44%) patients both on admission and at 48 hours had APACHE II score ≥8 (severe pancreatitis) and 28(56%) patients both on admission and at 48 hours had APACHE II score <8 (mild pancreatitis).

Correlation of CTSI score and final outcome were tabulated (Table 3). A total of 27(54%) patients had CTSI score ≥6 (severe pancreatitis) and 23(46%) patients had CTSI score <6 (mild pancreatitis).

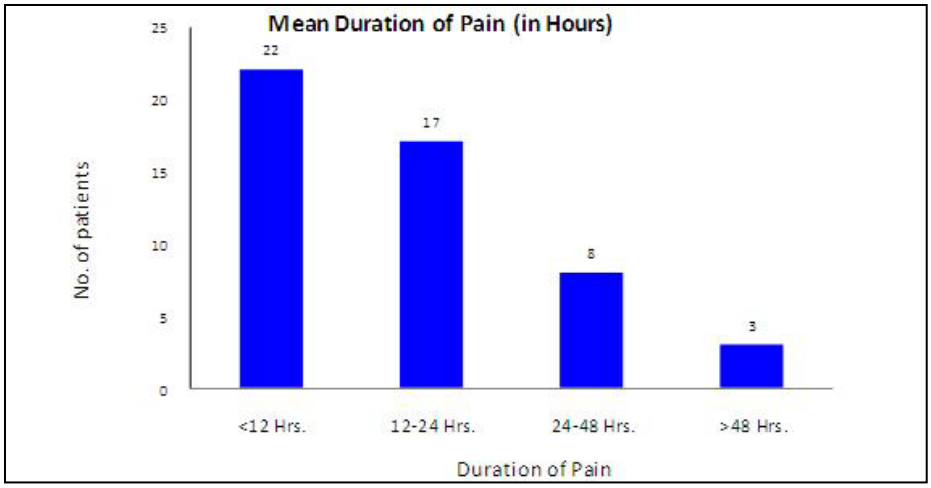
Correlation of Modified Goris MOF (MGMOF) score and final outcome were tabulated (Table 3).

On admission MGMOF Score was 0,1-2 and >2 in 30% ,66% and 4% patients respectively whereas after 48 hours it was found in 36% ,62% and 2% patients. This score was evaluated at a cut off of 0 and 2 on admission and at 48 hours.

Persistent/progressive organ failure during first week and final outcome was noted. Organ failure was present during 1st week in 12 severe pancreatitis and 5 mild pancreatitis patients.

Discussion

Acute pancreatitis (AP) can vary from self-limiting inflammation of pancreatic tissue to destruction of the entire pancreatic tissue leading to a fatal outcome. Most of the victims have a mild form of the disease which responds to supportive treatment, but many of



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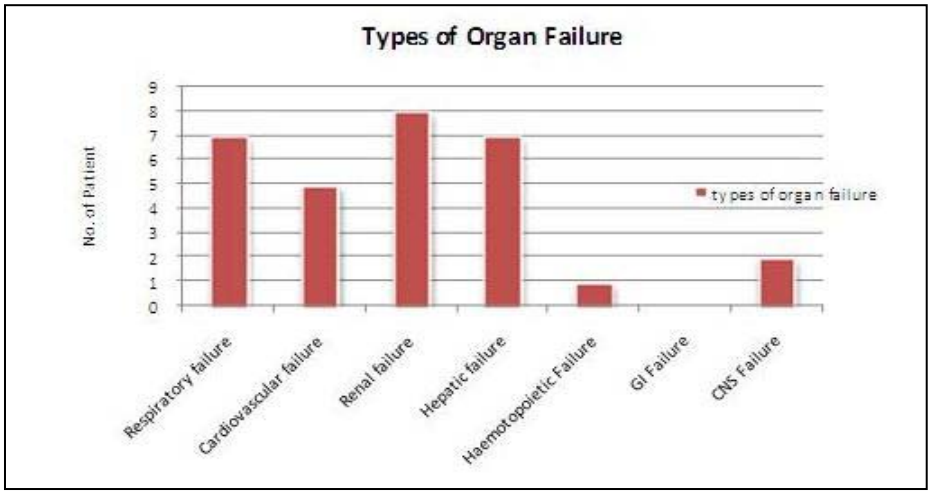

(b)

Figure 2: a) Mean duration of pain. b) Types of organ failure associated with acute pancreatitis.

Table 1: Outcome parameters of 50 pancreatitis patients

Outcome parameters	n (%)	
	out of total 50 cases	Out of 17 severe pancreatitis cases
Length of hospital stay>3 weeks	9(18%)	9(53%)
ICU Stay >48 Hours	12(24%)	12(70.6%)
Pancreatic necrosis >30%	11(22%)	11(64.7%)
Pancreatic pseudocysts	3(6%)	3(17.6%)
Pancreatic abscess	2(4%)	2(11.8%)
Pancreatic fistula	3(6%)	3(17.6%)
Multi organ failure	7(14%)	7(41%)
Requirement of Inotropic support	4(8%)	4(23.5%)
Requirement of ventilator support	13(26%)	13(76.5%)
ARDS	3(6%)	3(17.6%)
Sepsis	7(14%)	7(41%)
Requirement of percutaneous needle aspiration	2(4%)	2(11.8%)
Necrosectomy	1(2%)	1(6%)
Death	3(6%)	3(17.6%)

Table 2: Correlation of Ranson's score and APACHE II score with final outcome

	Final outcome		Total
	Severe pancreatitis	Mild pancreatitis	
Ranson's Score			
Severe(Ranson's ≥3)	20	7	27
Mild(Ranson's <3)	8	15	23
Total	28	22	50
APACHE II Score on admission			
Severe(APACHE ≥8)	20	2	22
Mild(APACHE <8)	8	20	28
Total	28	22	50
APACHE II Score after 48 hours			
Severe(APACHE ≥8)	18	4	22
Mild(APACHE <8)	6	22	28
Total	24	26	50

them develop a severe disease with high morbidity and mortality (7).

Different clinical, biochemical and imaging parameters have been used over the years to predict the severity and prognosis of acute pancreatitis but due to inadequate prognostication by these systems many other systems (e.g. multi-organ failure scales, CT severity indices) have evolved over time. However, controversy persists regarding the best predictor of severity and prognosis in a case of acute pancreatitis.

In the present study most of the cases were found to be in the age group of 20-39 years, followed by the age group of 40-59 years. Most of the patients (90%) were male (66%) and 34% were females. This tallied with studies which mention that males are affected more than females in third world countries (8). In the present study, alcohol consumption and gall stone disease were found as aetiological factors in 58% and 24% patients respectively, which were similar to other studies (9).

Studies indicate that about 20% cases run a severe course associated with high risk of mortality and require appropriate management in an intensive care unit (10). In the present study, 34% patients developed severe pancreatitis whereas 66% developed mild pancreatitis. 12 patients had to be treated in ICU for more than 48 hours. Incidence of multi organ failure was found to be 14%. Renal failure was found to be the most common

Table 3: Correlation of CTSI score and Modified Goris MOF score with final outcome

	Final outcome		Total
	severe pancreatitis	Mild pancreatitis	
Predictive severity by CTSI Score			
Severe(CTSI≥6)	20	7	27
Mild(CTSI <6)	5	18	23
Total	25	25	50
Modified Goris MOF Score			
Goris MOF Score >0	22	13	35
Goris MOF Score =0	4	11	15
Total	26	24	50
Modified Goris MOF Score after 48 hours			
Goris MOF Score >0	22	10	32
Goris MOF Score =0	3	15	18
Total	25	25	50
Modified Goris MOF Score			
Goris MOF Score **≥2**	10	7	17
Goris MOF Score <2	8	25	33
Total	18	32	50
Modified Goris MOF Score after 48 hours			
Goris MOF Score **≥2**	10	6	16
Goris MOF Score <2	8	26	34
Total	18	32	50

Table 4: Comparison of predictive values of different severity scoring systems

Score	Sensitivity	Specificity	PPV	NPV	LR+	LR-
Ranson's	71%	68%	74%	65.2%	2.22	0.43
APACHE II on admission	71%	91%	91%	71%	7.8	0.32
APACHE II after 48 hours	75%	85%	82%	78.5%	5	0.3
CTSI	80%	72%	74%	78	2.85	0.28
Modified Goris MOF >0 on admission	85%	46%	63%	73%	1.57	0.33
Modified Goris MOF>0 after 48 hours	88%	60%	69%	83%	2.2	0.2
Modified Goris MOF ≥2 on admission	56%	78%	59%	76%	2.55	0.56
Modified Goris MOF≥2 after 48 hours	56%	81%	62.5%	75%	2.95	0.54
Persistent/ progressive organ failure during first week	80%	86%	71%	91%	5.71	0.23

organ failure (16%), followed by respiratory (14%) and cardiovascular (14%) failure. In most studies the incidence of pancreatic necrosis (PN) and infection in AP (IPN) usually did not exceed 20% and 10% (11), respectively**,** similar to our study. Three patients died due to sepsis and multi organ failure during 4th week of hospital admission. Overall mortality rate was found to be 6% whereas, most studies found mortality rates of 5%–15% (11).

In the present study the sensitivity, specificity, Positive Predictive Value (PPV), positive Likelihood Ratio (LR) and negative likelihood ratio of Ranson's score was found almost similar to other studies (12).

There was no significant difference in median APACHE II score on admission and after 48 hours in our study. At 48 hours, the sensitivity of an APACHE II score >7 to predict severe acute pancreatitis by Larvin et al., was 76%, with a specificity of 84%, a PPV of 54% and an NPV of 93% (13).

Studies indicate that even though sensitivity of CTSI score is 83%, specificity of it is only 65% and there has been no relationship between extent of necrosis and outcome (14). In our study, the sensitivity and specificity were found almost similar. The negative predictive value of the score was comparable to Ranson's score.

We modified the Goris score by excluding pancreatic necrosis as one of the criteria for organ failure (confounding factor). The sensitivity was quite high both on admission and after 48 hours.

Ranson's and APACHE II score was found to have similar sensitivity and almost equal negative likelihood ratio. Ranson's and CTSI have similar PPV and PLR. LR+ of CTSI was seen to be much lower than APACHE II score on admission and after 48 hours. Sensitivity of Ranson's score was seen to be similar with APACHE II. The positive predictive value of APACHE II on admission was the highest whereas Ranson's had the maximum negative likelihood ratio. Soumitra R. Eachempati et al. concluded that the Ranson's score still remains a valid predictor of outcomes in patients with severe acute pancreatitis when compared with APACHE II and III score. APACHE II scoring system was found to be more accurate than the Ranson's score scoring system either on admission or at 48 hours for prediction of severity in acute pancreatitis (15). In addition, the APACHEII system can be used at any time during the course of the disease before therapeutic interventions are undertaken and it can also quantify the severity even after 48 hours with equal efficacy.

Modified Goris MOF score at a cut off >0 on admission and after 48 hours was found to have the highest sensitivity followed by CTSI score but comparatively low PPV.

Prior assessment of severity of acute pancreatitis is therefore essential to identify high risk patients who are most likely to suffer from the severest form of the disease (16) . In our study severity assessment was done for every patient on admission and at 48 hours using clinical, hematological, biochemical and radiological parameters and by calculating severity scoring points in respect to all scales. Daily measurement of Goris MOF score till seven days was done to assess persistence or progression of organ failure and after end of one week patients were predicted to have severe pancreatitis if organ failure persisted or progressed. All patients having predicted severe pancreatitis were treated aggressively in intensive care unit. All relevant details of every patient with his predicted scores and actual severity were maintained and comparative statistical analysis was done prior to discharge. All cases were followed up for a period of next six months.

Conclusion

1. All the scores under study except Goris MOF at a cut off≥2 on admission had good predictive value in terms of different predictive accuracy parameters.
2. APACHE II and Goris MOF (at cut off>0) are useful on admission and thereafter at 48 hours for prediction of severe cases.
3. CTSI and Ranson's score can be most useful to identify mild pancreatitis cases. They can also be useful in severe pancreatitis patients to some extent.
4. However, Ranson's score cannot be applied for prediction of severity after 48 hours.
5. Persistent/progressive organ failure during 1st week is very useful as a negative predictor of acute pancreatitis with organ failure.

For further validation of the observations, better prediction models with larger sample size and randomized control trials may be required in future.

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