RESEARCH ARTICLE

COMPARISON OF RANSON AND APACHE II SCORING SYSTEM IN PREDICTION OF SEVERITY IN PATIENTS OF ACUTE PANCREATITIS PRESENTING IN RURAL HOSPITAL IN CENTRAL INDIA

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ABSTRACT

Background: Acute pancreatitis is one of the commonest disorder in surgical practice. Numerous advances have been made in diagnosis and treatment of acute pancreatitis. Predicting outcome in these cases still remains difficult. Multiple scoring systems have been developed to predict its severity.

Aim: This study was aimed at comparing the traditional scoring systems: Ranson's and Acute Physiology and Chronic Health Examination (APACHE II) in predicting severity in a prospective cohort of patients with Acute Pancreatitis.

Material and methods: The study comprised of 144 patients of acute pancreatitis. According to the Atlanta classification the patients were classified into having mild or severe acute pancreatitis. Ranson score and APACHE II score were used for predicting the severity of acute pancreatitis. Samples were analysed and data analysed.

Results: Out of the 144 cases of acute pancreatitis, 39 had severe acute pancreatitis, correlating with APACHE II score ≥ 8, 54 had mild acute pancreatitis with score <8. 24 had severe acute pancreatitis, correlating with Ranson score ≥ 3, 70 had mild acute pancreatitis with score <3. AUC curve for 24 hours APACHE II score was larger than AUC curve for RANSON score and the difference was found to be statistically significant (p<0.01).

Conclusion: APACHE-II scoring system seems to have the highest accuracy in assessment of the severity and outcome of Acute Pancreatitis, and appeared to be a more influential tool than Ranson Score, however Ranson score was better in predicting complications of pancreatitis.

INTRODUCTION

Acute pancreatitis is quite commonly encountered in routine surgical practice. The incidence of acute pancreatitis per 100,000 population ranges from 5.4 to 79.8 cases per year (Zheng *et al.,* 2015; Xu *et al.,* 2014). Early severe acute pancreatitis is characterized by a short course, progressive MODS, early hypoxemia, increased incidence of necrosis, infection, and abdominal compartment syndrome (ACS) (AlMofleh, 2008). Clinical biomarkers that predict the development of these life threatening complications are important to help guide patient triage and management. There have been numerous advances in diagnosis and treatment of acute pancreatitis. But ability to predict outcome in these cases remains difficult. Multifactorial scoring systems incorporating clinical and biochemical criteria for severity assessment have been in use for some decades.

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These include the 11 criteria described by Ranson *et al.* in the 1970s, the Glasgow score (eight criteria) (Ranson *et al,* 1977), MOSS score (12 criteria), BISAP score (5 criteria), and the acute physiology and chronic health evaluation (APACHE II) score (14 criteria) (Knaus *et al.,* 1985). The Ranson's score represented a major advance in evaluating the severity of AP and has being used for over three decades to access AP severity. The Ranson's score is moderately accurate in classifying patients in terms of severity, but has the disadvantage of requiring a full 48 hours to be completed, missing a potentially valuable early therapeutic window. The APACHE II score is as accurate as Ranson's score and can be administered on any day. The sensitivity and specificity of these scoring systems for predicting severe acute pancreatitis range between 55% and 90%, depending on the cut-off number and the timing of scoring (Larvin, 1989; Balthazar, 2002). There is a need to find out efficacy of these scoring systems in predicting prognosis and whether one system has any advantage over the other. This study was aimed to compare between the traditional Multifactorial scoring systems: Ranson's and Acute Physiology and Chronic Health Examination (APACHE II) in

predicting severity in a prospective cohort of patients with Acute Pancreatitis.

MATERIALS AND METHODS

This study was conducted in a medical college located in rural central India. The study comprised of 144 patients of acute pancreatitis. All patients reporting within the study period and fulfilling the inclusion criteria and giving consent were enrolled.

Severity grading

According to the clinically based classification of Atlanta the patients were classified as having,

- Mild acute pancreatitis if, it was associated with transient organ failure (<48 hours), no local or systemic complications and an uneventful recovery.
- Severe acute pancreatitis if, it was associated with organ failure (>48 hours) and/or local such as pseudocyst, necrosis, ascitis or systemic complications.

Scoring system

Ranson score and APACHE II score were calculated and used for predicting the severity of acute pancreatitis.

RESULTS

As shown in figure 1, 113 (78.47%) of the patients had mild while 31 (21.53%) had severe acute pancreatitis.
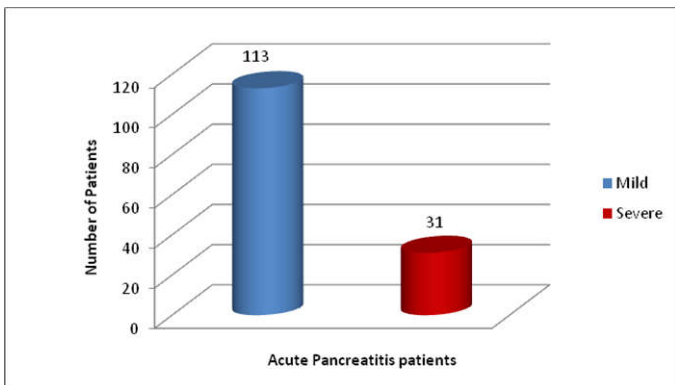

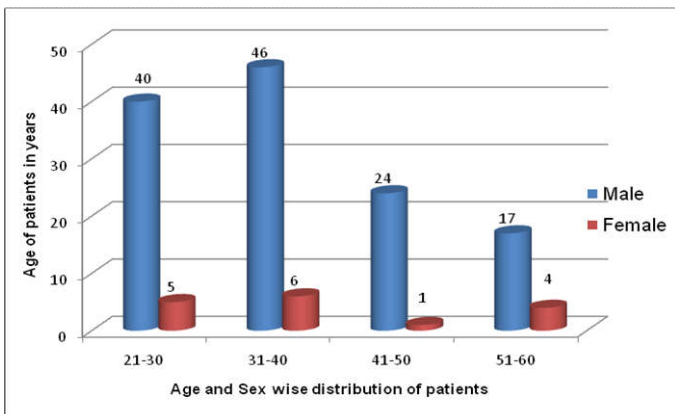**Figure 1. Severity of acute pancreatitis**

Figure 2. Age and Sex wise distribution of patients of acute pancreatitis

There was statistical significant difference between severe and mild acute pancreatitis patients with p value of (p=0.010 for serum amylase and p=0.023 for serum lipase), and the levels of amylase (909.00 IU/L) and lipase (811.23 IU/L) were higher in severe acute pancreatitis cases as compared to mild acute pancreatitis.

Figure 3. Mean amylase and lipase levels in patients of acute pancreatitis

The mean Ranson score (3.58) and the mean 24 hours APACHE II score (10.03) of patients with severe acute pancreatitis were higher and statistically significant as compared to those in mild acute pancreatitis patients.

Figure 4. Mean scores of the RANSON and APACHE II scoring systems in patients with mild and severe acute pancreatitis

Figure 5. ROC curves of RANSON and APACHE II scoring system in predicting severity of acute pancreatitis

Table 1. Mortality in patients of acute pancreatitis

Mortality in acute pancreatitis	Simoes *et al.,* (2011)	Khanna *et al.,* (2013)	Barreto *et al.,* (2007)	Chatzicostas *et al.,* (2002)	Present study
	5.7%	12.5%	12%	3.2%	0.69%

Table 2. Sensitivity, Specificity, PPV, NPV in RANSON scoring system in predicting severity of acute pancreatitis

	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)
Yang *et al.,* (2016)	46	84	54	-
Cho *et al.,* (2015)	85.7	44.3	18.8	95.3
Forsmark *et al.,* (2007)	75	77	49	91
Simoes *et al.,* (2011)	91.2	74.4	57.4	95.7
Present Study	39.34	84.34	64.86	65.42

Table 3. Sensitivity, specificity, PPV, NPV in APACHE II scoring system in predicting severity of acute pancreatitis

	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)
Yang *et al.,* (2016)	57	89	67	-
Cho *et al*(2015)	81	65.7	26.2	95.8
Barreto *et al.,* (2007)	56	98	95	82
Simoes *et al.,* (2011)	83.3	68.9	51.7	91.2
Papachristou *et al.,* (2010)	70.3	71.9	-	-
Present Study	44.32	96.43	95.12	52.43

In assessment of severity, the sensitivity (44.32%), specificity (96.43%), positive predictive value (95.12%), positive likelihood ratio (12.41) and area under curve (0.717) with a 95% confidence interval (CI) of 0.603- 0.831 of APACHE II were higher as compared to that of RANSON scoring system. The ROC curves for 24 hours APACHE II score and ROC curve for RANSON score are shown in figure 5. AUC curve for 24 hours APACHE II score was larger than AUC curve for RANSON score and the difference was found to be statistically significant (p<0.01). Out of 144 patients, 119 patients cured, Morbidity was seen in 24 patients and 1 patient died due to septicemia with ARDS.

DISCUSSION

Acute Pancreatitis is a disease with variable severity and an evolving process that may involve multiple organ systems. Mortality rate ranges from less than 1 % in mild cases to 20-50% in severe cases (Zheng *et al.,* 2015; Xu *et al.,* 2014). Identification of patients at risk for severe disease early in the course of acute pancreatitis is an important step to guiding management and thereby improves the outcome. The age of the patient ranged from 21 to 60 years, with a mean age of 37.1 years. The maximum number of patients were present in the age group of 31-40. Similar findings were also observed in the studies conducted by Agarwal *et al.,* (2013), Ranson *et al.,* (1997) and others. Although approximately 80% of patients have mild disease that resolves spontaneously with little morbidity, the remaining 20% suffer from severe attack with mortality rates as high as 30%. Predicting severity is an essential step while evaluating a patient with AP as it allows physicians to stratify disease severity and management strategies (Simoes *et al.,* 2011). Findings of Chatzicostas *et al.,* (2002) were similar to our study. This is also supported by the findings of Barreto *et al.,* (2007). Severe Acute Pancreatitis is usually observed at the initial stage of AP and slow progression from mild to severe disease is uncommon. Therefore, early evaluation of its severity is considered to be a critical concern in the prognosis and management of AP. An ideal prognostic scoring system should be simple, noninvasive, accurate, and quantitative, and the assessment methods should be easily applicable at the time of diagnosis (Papachristou *et al.,* 2010; Bollen *et al.,* 2012).

Mortality for acute pancreatitis was low (0.69%) in our study as compared to other studies (As shown in table I). Serum amylase or lipase elevated >3 times the upper limit of normal (ULN). The levels of serum amylase (909.00 IU/L) and serum lipase (811.23 IU/L) were higher in severe acute pancreatitis patients as compare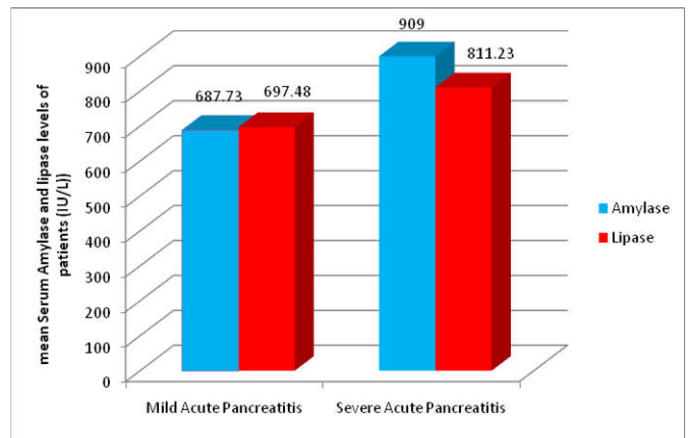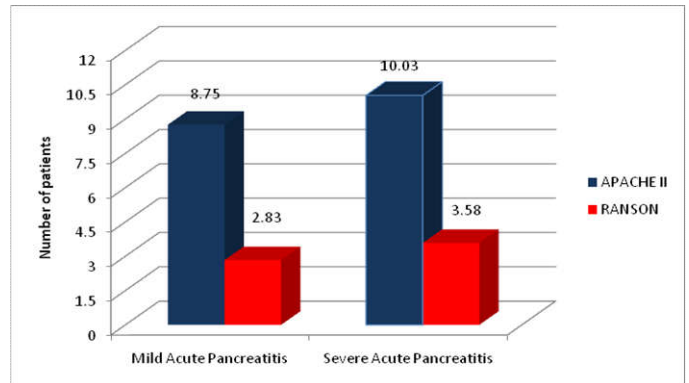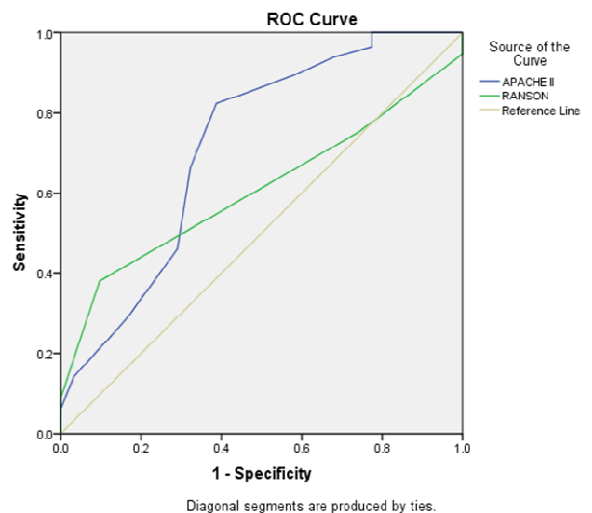d to that in mild acute pancreatitis. In Cho *et al.,* 2015 the levels of amylase and lipase were more than 3 times than the normal for patients of acute pancreatitis. The levels of serum amylase levels correlate with severity of attack in our study. The mean Ranson score (3.58) and the mean 24 hours APACHE II score (10.03) of patients with severe acute pancreatitis was higher and statistically significant as compared to those in mild acute pancreatitis patients with a Ranson score of 2.83 and APACHE II score of 8.75 . The score in severe cases were found to be above the cut off limits in both the scoring system. By the Ranson scoring system, 37 attacks were predicted severe based on the highest Ranson score (≥3) of which 24 patients actually had a severe outcome. By the APACHE II scoring system, 41 attacks were predicted severe based on the highest APACHE II score (≥8) of which 39 patients actually had a severe outcome.

Based on this result, there was a high sensitivity and specificity of severe AP with APACHE II score as compared to Ranson score sensitivity and specificity respectively. Studies conducted by Yang *et al*, Cho *et al* and Barreto *et al* supports the findings of our study, while Simoes *et al* and Papachristou *et al* are in contrast with our findings, where they found Ranson scoring system better. In our study, since AUC of APACHE II score was larger than AUC of Ranson score, thus APACHE II scoring system proves to be powerful prognostic model in predicting the severity of acute pancreatitis. Ranson scoring system was better predictor of complications as compared to APACHE II in our study. Current practice guidelines have suggested that APACHE- II score was the most helpful test at admission in distinguishing severe from mild AP, and, according to recommendation, it should be generated during the first three days of hospitalization. Although the process of calculating APACHE-II score was complex, it might be easier in the era of computerized calculation systems (Simoes *et al.,* 2014). Critics of the Ranson scoring system have voiced other complaints. (Eachempati *et al* 2002) Authors contend that even if the

Ranson score were accurate as a predictor, a 48 hour period is required before the total score can be tabulated. Some studies have quoted that Ranson scoring system has not been properly assessed in recent years. In a study by Foitzik *et al.,* (1995), he commented that, the presence of 3 or more criteria was associated with a 62% mortality in the original study. Because of improvement in resuscitations, antibiotics, critical care; mortality has decreased in patients with acute pancreatitis since 1974 (Choudhuri *et al.,* 2006). Patients are surviving routinely with more than 6 positive Ranson score. Other changes in management trends may also be influencing therapy.

Conclusion

Results of this study demonstrate that the APACHE-II scoring system seems to have the highest accuracy in assessment of the severity and outcome of Acute Pancreatitis. It appeared to be a more influential tool than Ranson Score. But APACHE-II score had shortcoming in predicting local complications which was better by Ranson scoring system. However, taking into consideration the other parameters APACHE II scoring system is still better in predicting severity of acute pancreatitis. There were some limitations in this study. Although the data used in this study were collected prospectively, the number of cases of severe Acute Pancreatitis and mortalities was lower compared to other large scale clinical studies. This study has objectively demonstrated that the tests we have been using for scoring patients in most surgical centres in our country are indeed very useful and effective, and can continue to be used till such time as a simplistic and much more accurate system of scoring is devised.

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Conflict of Interest: None declared

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