

A Comparative Evaluation of Clinical And Radiological Scoring Systems in The Early Prediction of Severity in Acute Pancreatitis

*Dr.P.Murugadasan¹, Dr.R.Ravi²,Dr.A.Nirmala³, Dr.Sujith M.Jose⁴

¹(Assistant Professor, Department of General Surgery, Government Medical College Hospital, Coimbatore, Tamilnadu, India)

²(Assistant Professor, Department of General Surgery, Government Medical College Hospital, Coimbatore, Tamilnadu, India)

³(Professor, Department of General Surgery, Government Medical College Hospital, Coimbatore, Tamilnadu, India)

⁴(Post Graduate in General Surgery, Department of General Surgery, Government Medical College Hospital, Coimbatore, Tamilnadu, India)

*Corresponding author: Dr.R.Ravi

Abstract : Acute pancreatitis is an acute inflammatory process involving pancreas and peri-pancreatic tissue, with a range of severity as well as various local and systemic complications. It is a common disorder causing substantial burden to the health care system. The process involved in acute pancreatitis is complex in which pancreatic damage is caused by pancreatic enzyme activation, which results in an acute inflammatory response. BISAP score is a 5 point bedside score. It is inexpensive to perform and easy to obtain. BISAP uses 5 points: Blood Urea Nitrogen (BUN) > 25mg/dl, impaired mental status evidenced by disorientation or disturbance in mental status, presence of SIRS, age > 60 years and Pleural Effusion . BISAP score has been shown to be accurate in predicting the severity of acute pancreatitis in western population.

Keywords: Pancreatitis, BISAP Score, Pleural effusion

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I. Introduction

Acute pancreatitis is an acute inflammatory process involving pancreas and peri-pancreatic tissue, with a range of severity as well as various local and systemic complications. It is a common disorder causing substantial burden to the health care system. The process involved in acute pancreatitis is complex in which pancreatic damage is caused by pancreatic enzyme activation, which results in an acute inflammatory response. Severe acute pancreatitis is defined by revised Atlanta classification of 2012 by the presence of organ failure that persist more than 48 hours . Organ failure is determined by assessing Cardiovascular, Respiratory and Renal systems. Different scoring system are being used to predict the severity of pancreatitis which includes APACHE II score, with 14 criteria and the RANSON'S score with 11 criteria. MOSS score with 12 criteria and BISAP score with 5 criteria are the newer scoring system. Balthazar described CT severity index which was modified into MCTSI (Modified CT Severity Index) by Silverman et al in 2004. CTSI is calculated using CT scan features of acute pancreatitis and pancreatic necrosis. BISAP score is a 5 point bedside score. It is inexpensive to perform and easy to obtain. BISAP uses 5 points: Blood Urea Nitrogen (BUN) > 25mg/dl, impaired mental status evidenced by disorientation or disturbance in mental status, presence of SIRS, age > 60 years and Pleural Effusion . BISAP score has been shown to be accurate in predicting the severity of acute pancreatitis in western population.

II. Aims And Objectives

To compare BISAP (Blood Urea Nitrogen >25mg/dl, Impaired Mental Status, Systemic Inflammatory Response Syndrome, Age >60 and Pleural Effusion) score with modified computed tomography severity index(MCTSI) in predicting: Severity, Pancreatic Necrosis and Mortality in patients with Acute Pancreatitis.

III. Materials And Methods

All patients with Acute Pancreatitis presenting to the Department of General Surgery who fit the inclusion criteria were included in the study after obtaining informed consent. Extensive demographic, radiographic and laboratory data which includes complete haemogram, serum electrolytes, renal function test, liver function test, serum amylase, lipid profile, chest X-ray, USG abdomen etc were collected. BISAP score

was calculated using data from the first 24 hours from admission. A score of 1 is given for each criteria for a maximum score of 5.

3.1 Criteria ForBisap Score

BUN more than 25mg/dl,Abnormal mental status with GCS < 15,Evidence of SIRS,Age> 60 years, Presence of Pleural Effusion on X Rays.One point is given for each score.SIRS is defined by the presence of >2 of the following criteria: Pulse rate > 90/min,Respiratory rate > 20/min or PaCO₂ < 32mm Hg,Temperature> 100.4⁰F or <96.8 ⁰F ,WBC count > 12,000 or < 4,000 cells/ mm³ or >10% immature neutrophils. MCTSI was calculated from CECT within 48 hours.Modified CT Severity Score is calculated as follows: Normal Pancreas-Point 0,Intrinsic Pancreatic Abnormality with Peripancreatic fat stranding-Point 2,Peripancreatic fluid collection-Point 4,Pancreatic Necrosis – Absent-Point 0,< 30 percent-Point 2, ≥ 30 percent-Point 2,Extra Pancreatic Complications- Point 2.Total point is calculated. Patients were closely monitored during the entire stay in hospital and evidence of organ failure documented. Patients were classified as mild acute pancreatitis and severe acute pancreatitis based on the presence of organ failure that persist for more than 48 hours . Oxygen failure is defined by-Shock (Systolic BP < 90 mm Hg),Pulmonary Insufficiency (PO₂< 60mm Hg at room air or need of mechanical ventilator),Renal Failure (serum creatinine> 2mg/dl after rehydration or hemodialysis).Pancreatic necrosis was assessed from CECT. Pancreatic necrosis is defined as lack of enhancement of pancreatic parenchyma with contrast. Comparison of prediction of severity of acute pancreatitis by BISAP and MCTSI score is the primary outcome of interest and comparison of prediction of mortality and pancreatic necrosis by both scores is the secondary outcome of interest.

3.2 Statistical Analysis

The data collected were entered in Microsoft Excel. The categorical data were expressed as percentage. The continuous data was expressed in Mean ± Standard Deviation. For the comparison of two groups Unpaired t test was used. When more than two groups were compared ANOVA was used as the statistical tool. Categorical data and influence of the factors on severity were assessed using chi square test. For all analytical purpose SPSS Software version 21.0 was used ,value less than 0.05 was considered significant.

IV. Results

The specificity,sensitivity,positive predictive value and negative Predictive value of both BISAP and MCTSI in predicting the severity, pancreatic necrosis, and mortality of acute pancreatitis was calculated and results as follows. The Specificity and Positive Predictive Value of BISAP score was higher than the MCTSI in predicting the severity. Comparable Negative Predictive Values were seen for both BISAP score and MCTSI. The ROC analysis for severity showed BISAP score had AUC of 0.917 which was more than MCTSI score which had AUC of 0.853. Hence the accuracy of BISAP score in predicting severity of acute pancreatitis is more when compared with MCTSI. In predicting pancreatic necrosis, MCTSI was found to have higher sensitivity and positive predictive value. MCTSI also had a negative predictive value of 100% .Patients with MCTSI ≥ 4 had 23 times chance of having pancreatic necrosis than MCTSI < 4. Hence MCTSI is more accurate in predicting necrosis compared to BISAP score.In predicting Mortality of acute pancreatitis, among the 8 expired patients in the study all of them had a MCTSI score ≥ 4. 23 out of 92 discharged patients also had a MCTSI score ≥ 4. P value was calculated to be 0.001 which was statistically significant. Odds ratio was calculate to be 24. Based on MCTSI score patient who have score ≥ 4 has Twenty Four fold higher chance of ending up in mortality which is statistically significant. Comparing BISAP and MCTSI, BISAP having high odds ratio predicts mortality more accurately.

V. Figures And Tables

Table no: 1 age distribution

A g e	N o O f P a t i e n t s	P e r c e n t a g e
< 3 0 Y e a r s	2 4	2 4 %
3 1 - 4 0 Y e a r s	4 1	4 1 %
4 1 - 5 0 Y e a r s	2 0	2 0 %
5 1 - 6 0 Y e a r s	6	6 %
> 6 0 Y e a r s	9	9 %

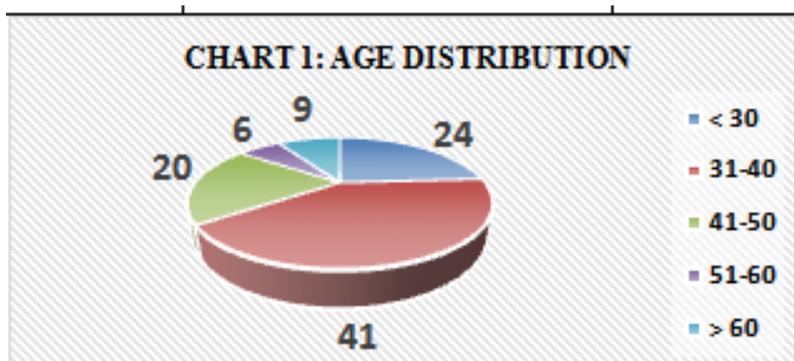


Table No: 2 Sex Distribution

Sex	F r e q u e n c y	Percentage
M a l e	9	7 %
F e m a l e	3	3 %

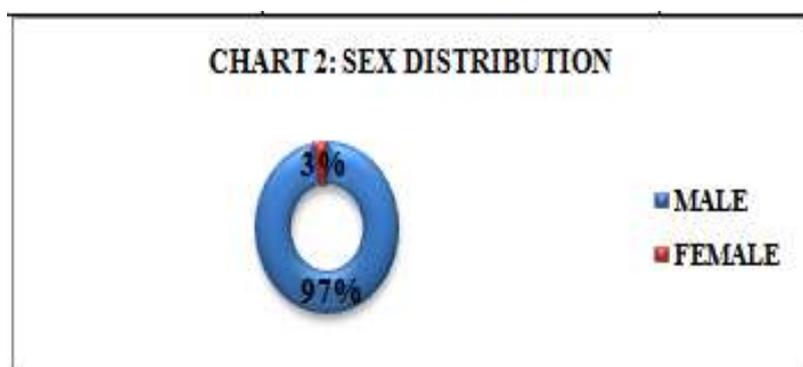


Table No: 3 Sensitivity, Specificity, Ppv, Npv Comparison Of Bisap And Mctsi In Predicting Severity.

Scoring System	B i s a p	M c t s i
S e n s i t i v i t y	6 5 . 5 2 %	6 8 . 9 7 %
S p e c i f i c i t y	9 2 . 9 6 %	8 4 . 5 1 %
Positive Predictive Value	7 9 . 1 7 %	6 4 . 5 2 %
Negative Predictive Value	8 6 . 8 4 %	8 6 . 9 6 %

Table No: 4 sensitivity, specificity, ppv, npv comparison of bisap and mctsi in predicting pancreatic necrosis.

SCORING SYSTEM	B I S A P	M C T S I
S e n s i t i v i t y	8 5 . 7 1 %	1 0 0 . 0 0 %
S p e c i f i c i t y	7 5 . 0 0 %	7 5 . 0 0 %
Positive predictive value	6 6 . 6 7 %	8 3 . 7 5 %
Negative predictive value	9 0 . 0 0 %	1 0 0 . 0 0 %
O d d s r a t i o	3 . 9 6	2

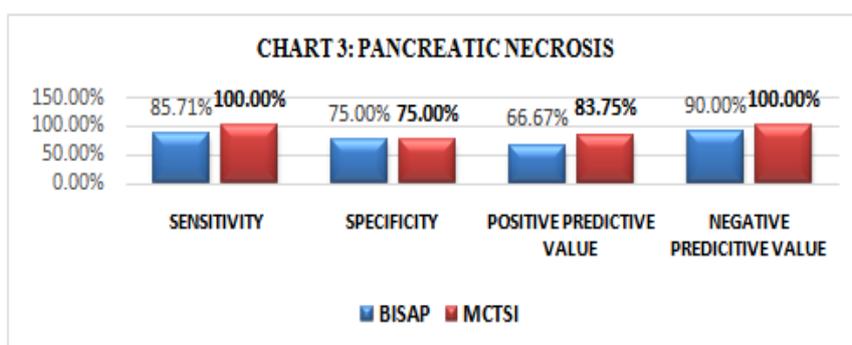
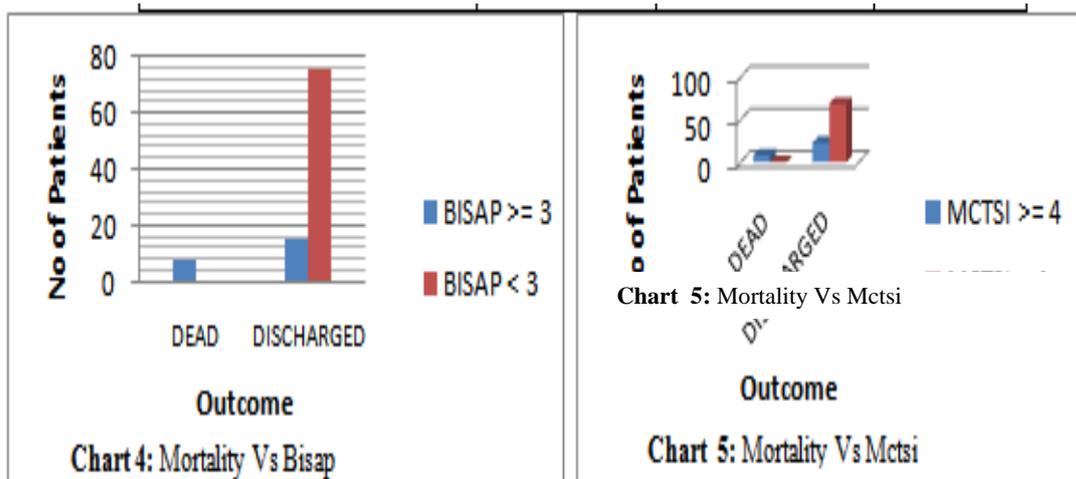


Table No: 5 Mortality Vs Bisap Score

Bisap Score	D e a d	Discharged	Odds Ratio
B i s a p \geq 3	8	1 6	3 8
B i s a p $<$ 3	0	7 6	

Table No: 6 Mortality Vs Mctsi Score

Bisap Score	D e a d	Discharged	Odds Ratio
M c t s i \geq 4	8	2 3	2 4
M c t s i $<$ 4	0	6 9	



VI. Discussion

Acute pancreatitis is a condition with high incidence and is associated with significant mortality rates. Therefore determining the severity in patients with acute pancreatitis is important in triaging patients to either wards or intensive care units to provide best outcome. Present study compares BISAP score which is a clinical scoring system with MCTSI, which is a radiological score in predicting severity, mortality and necrosis in 100 patients with acute pancreatitis. The median age for acute pancreatitis in the study done by Cornfield et al on 418 patients was 61 years. Nordestgaard et al did a study on 51 patients with acute pancreatitis with mean age of 44 years. In the present study mean age of patients presenting with acute pancreatitis is 39 years. In this study males were 97% and females were 3%. Alcohol and gallstone are the most common etiological factors of acute pancreatitis. In the original BISAP study by Wu et al, gall stone contributed 23.8% cases and alcohol was responsible in 21.1% cases. In the present study alcohol is the most common etiological agent contributing 46% followed by gall stones contributing 27%. Other Indian studies also showed similar distribution in etiological agents. This may be attributed to the difference in dietary, social, genetic and cultural factors between Indian population and Western population. In our study 29 out of 100 patients (29%) developed severe acute pancreatitis. The AUC for prediction of severity by BISAP and MCTSI score are 0.917 (95% CI 0.864 – 0.970) and 0.853 (95% CI 0.777 – 0.928) respectively. The in-hospital mortality rate is 8%. Present study also had high specificity and negative predictive value compared with that of MCTSI \geq 4 in predicting severity in acute pancreatitis. Singh and colleagues from Harvard Medical School studied 397 cases of acute pancreatitis. They observed that cases with BISAP score \geq 3 were 4 times more likely to develop pancreatic necrosis than those with score $<$ 3. Case with MCTSI \geq 4 were 18 times more likely to develop pancreatic necrosis compared with cases with score $<$ 4. In our study also cases with BISAP score \geq 3 had a 4 times more chance to develop pancreatic necrosis than those with score $<$ 3. Also patients with MCTSI \geq 4 has 23 times more chance to develop pancreatic necrosis than those with score $<$ 4. Study by Yadhav et al concluded that MCTSI predicts pancreatic necrosis more accurately than BISAP score. Present study also derived at the same conclusion. Wu et al showed in their study that 18% of patients with BISAP \geq 3 died and only 1% of those with score $<$ 3 died in the study. In the present study 50% of patients with BISAP score \geq 3 died and no patients with BISAP $<$ 3 expired. In the present study patients with BISAP \geq 3 had thirty eight times more chance of ending up in death compared to those with BISAP $<$ 3. These results are comparable to other similar studies.

VII. Conclusion

To classify patients with acute pancreatitis into mild and severe groups, BISAP is a reliable prognostic tool. The components of BISAP are clinically relevant and easy to obtain. The sensitivity of BISAP score ≥ 3 in predicting severe acute pancreatitis was found to be 65.52%. But the negative predictive value is much higher at 86.84%. If only BISAP score of 0 or 1 were considered, only 3 out of 60 patients (5%) had severe pancreatitis. Hence it is safe to consider that patients with BISAP score 0 or 1 will be having mild pancreatitis.

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