Original Research Article

Comparative study between BISAP and Ranson's score in predicting severity of acute pancreatitis

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Abstract

Background: Acute pancreatitis is an acute inflammation of the pancreas is an increasingly common abdominal disorder presenting as major surgical challenge to general surgeons worldwide. Early identification of patients at risk of developing a severe attack has great importance for instituting therapeutic interventions and improved outcome. Accurate prediction of severity is important in order to improve survival. There are several assessment criteria in order to predict prognosis and severity of acute pancreatitis, which help in guiding patient triage and management. However, nothing is proven to perform significantly better in clinical settings than good clinical judgment. Ideal predicting criteria should, therefore be simple, non-invasive, accurate and quantitative and assessment tests are easily available.

Aim and objectives: It was a prospective study to assess the accuracy of BISAP scoring system vs Ranson's scoring system in predicting Severity in an attack of acute pancreatitis and to compare predictability of organ failure, necrosis and mortality between BISAP scoring and Ranson's Scoring system.

Materials and methods: All patients admitted to Govt. Stanley Hospital with complaints of pain abdomen diagnosed to have Acute Pancreatitis on clinical examination and further investigations. Sample size consists of 100 patients with acute pancreatitis. BISAP score and Ranson's score is calculated in all such patients based on data obtained within 24 hours of hospitalization and at 48 hours.

Results: In this study, the two different scoring systems (BISAP and Ranson's) were compared and analyzed to assess the severity in patients with acute pancreatitis. An attempt also made to compare this study with previous similar studies done by others. Acute pancreatitis found to be 10 times more

common in males than females in this study. The mean length of hospital stay was 12.03 ± 6.8 days in this study. In this study, increasing BISAP and Ranson's scores was correlated well with the duration of hospital stay. In this study, 86 patients were diagnosed to have mild and moderately severe acute pancreatitis grouped under MAP, and 14 patients found to have severe acute pancreatitis. All the 14 patients were correctly predicted by BISAP score. The scores were assessed by correlating the scores with three factors: organ failure, necrosis and mortality. The analysis for organ failure showed BISAP score has sensitivity of 71.43%, specificity of 95.35%, PPV of 71.43%, NPV of 95.35%, diagnostic accuracy of 92%; whereas Ranson's score has sensitivity of 78.57%, specificity of 74.42%, PPV of 43.33%, NPV of 95.52 %, diagnostic accuracy of 88%. In this study, 7/20 patients with BISAP> 3 and 8/14 patients with Ranson's >3, developed pancreatic necrosis. The statistical analysis for the prediction of necrosis has sensitivity of (81.82%, 90.91%), specificity of (94.35%, 77.53%), PPV of (64.29%, 43.56%), NPV of (97.67%, 98.57%), diagnostic accuracy of (93%, 91%) for BISAP and Ranson's respectively. In this study, 4 patients with severs acute pancreatitis were expired. All 4 deaths were correctly predicted by BISAP score. The statistical analysis for the prediction of necrosis has sensitivity of (100%, 88.57%), specificity of (95.83%, 64.42%), PPV of (50%, 31.33%), NPV of (100%, 96.52%), diagnostic accuracy of (96%, 93%) for BISAP and Ranson's respectively. In this study, patients developed pancreatic necrosis, acute renal failure, MODS, septicemia. These complications were more likely seen in patients with BISAP ≥ 3, and Ranson's > 3, hence concluded that these are the patients in high risk group, who requires intensive monitoring and probably early intervention if necessary.

Conclusion: From this study, alcohol (59%) was found to be the most common etiological factor for acute pancreatitis. Males were more commonly affected than females with a ratio of 10:1. The most common age groups of patients affected were in 4th decade of life. The overall mortality in patients with severe acute pancreatitis was 4% BISAP score is equally effective in finding out the frequency of severity and predicting mortality in patients with acute pancreatitis as Ranson's score. Moreover, its components are easily available and it does not require 48 hours for completion of assessment as compared to Ranson's score. It is an accurate tool to classify patients into mild and severe disease; it is easy to perform and can be done on the bedside of patients with acute pancreatitis in every setup.

Key words

Acute pancreatitis, BISAP scoring system, Ranson's scoring system, Pancreatic necrosis, Acute renal failure, MODS, Septicemia.

Introduction

Acute pancreatitis is an acute inflammation of the pancreas is an increasingly common abdominal disorder presenting as major surgical challenge to general surgeons worldwide. It is a complex process which varies from mild self limiting inflammation to rapidly deteriorating condition which poses a serious threat to life. Acute pancreatitis has incidence of around 2.29%. Based on severity, acute pancreatitis can be acute edematous; acute persistent; or acute hemorrhagic necrotizing. Early identification of patients at risk of developing a severe attack has great importance for instituting therapeutic interventions and improved outcome.

About 10 to 20% of patients experience a severe attack of acute pancreatitis (SAP); the rate of mortality in SAP is about 20% of all cases of acute pancreatitis. Accurate prediction of severity is important in order to improve survival. There are several assessment criteria in order to predict prognosis and severity of acute pancreatitis, which help in guiding patient triage and management. However, nothing is proven to perform significantly better in clinical settings than good clinical judgment. Ideal predicting

criteria should, therefore be simple, non-invasive, accurate and quantitative and assessment tests are easily available.

Materials and methods

Sources of data
All patients admitted to Govt. Stanley hospital with complaints of pain abdomen diagnosed to have Acute Pancreatitis on clinical examination and further investigations.

Research design
Prospective Study

Sample size
Sample size consists of 100 patients of acute pancreatitis.

Criteria for sample collection
Inclusion criteria
Patients with history and clinical findings suggestive of acute pancreatitis with evidence of bulky edematous pancreas on USG/ CT abdomen.

Exclusion criteria
Chronic pancreatitis

Patient data collection and evaluation
All patients who present at Govt. Stanley Hospital diagnosed as acute pancreatitis from February 2015 to September 2015. Acute pancreatitis is defined as 2 or more of the following

- Characteristic abdominal pain.
- Increased levels of Serum amylase and/or lipase 3 times the normal value.
- Ultrasonography of the abdomen within first 7days of hospitalization demonstrating changes consistent with acute pancreatitis.

BISAP score and Ranson's score was calculated in all such patients based on data obtained within 24 hours of hospitalization and at 48 hours.

BISAP SCORE
Bedside index of severity in acute pancreatitis (BISAP) score
- BUN >25 mg/dl (8.9 mmol/L)

- Abnormal mental status with a Glasgow coma score <15
- Evidence of SIRS (systemic inflammatory response syndrome)
- Patient age >60 years old
- Imaging study reveals pleural effusion

Systemic inflammatory response syndrome was defined as two or more of the following: temperature of $<36°C$ or $>38°C$, PaCO2 <32 mmHg or respiratory rate >20 breaths/min, pulse >90 beats/min, and white blood cell count <4000 or $>12\,000$ cells/mm3 or $>10\%$ immature bands.

Ranson's criteria
For **non-gallstone pancreatitis**, the parameters are:
At admission:
1. Age in years > 55 years
2. White blood cell count > 16000 cells/mm3
3. Blood glucose > 11 mmol/L (> 200 mg/dL)
4. Serum AST > 250 IU/L
5. Serum LDH > 350 IU/L

Within 48 hours:
1. Serum calcium < 2.0 mmol/L (< 8.0 mg/dL)
2. Hematocrit fall > 10%
3. Oxygen (hypoxemia PaO2 < 60 mmHg)
4. BUN increased by 1.8 or more mmol/L (5 or more mg/dL) after IV fluid hydration
5. Base deficit (negative base excess) > 4 mEq/L
6. Sequestration of fluids > 6 L

For **gallstone pancreatitis**, the parameters are:
At admission:
1. Age in years > 70 years
2. White blood cell count > 18000 cells/mm3
3. Blood glucose > 12.2 mmol/L (> 220 mg/dL)
4. Serum AST > 250 IU/L
5. Serum LDH > 400 IU/L

Within 48 hours:
1. Serum calcium < 2.0 mmol/L (< 8.0 mg/dL)
2. Hematocrit fall > 10%
3. Oxygen (hypoxemia PaO2 < 60 mmHg)
4. BUN increased by 0.7 or more mmol/L (2 or more mg/dL) after IV fluid hydration
5. Base deficit (negative base excess) > 5 mEq/L
6. Sequestration of fluids > 4 L

Interpretation of scores:
- If the score ≥ 3, severe pancreatitis likely.
- If the score < 3, severe pancreatitis is unlikely
- Score 0 to 2: 2% mortality
- Score 3 to 4: 15% mortality
- Score 5 to 6: 40% mortality
- Score 7 to 8: 100% mortality

Criteria for organ failure based on Marshall scoring system was as per **Table – 1**.

Organ failure is defined as a score of ≥ 2 in one or more of the three (respiratory, renal, and cardiovascular) out of the five organ systems.

Table – 1: Criteria for organ failure based on Marshall scoring system.

Organ system	Score				
	0	1	2	3	4
Respiratory (PaO2/ FiO2)	>400	301-400	201-300	101-200	<101
Renal (serum creatinine, mg/dl)	<1.5	>1.5 to <1.9	>1.9 to <3.5	>3.5 to <5	>5
Cardiovascular (SBP in mm Hg)	>90	<90, fluid responsive	<90, fluid unresponsive	<90, ph<7.3	<90, ph<7.2

Results

This study was conducted in the department of general surgery, Govt. Stanley Medical College and Hospital, Chennai from February 2015 to September 2015. The 100 persons with features of acute pancreatitis who fulfilled the inclusion criteria were enrolled in this study after obtaining an informed consent.

The age group of patients enrolled in the study ranges from 20 to 80 years. The peak incidence of the disease was noted in the 4th decade of life. The length of the hospital stay ranges from 1 day to 32 days. The mean length of hospital stay was 12.03 ± 6.8 days.

On clinical presentation, 95 % of patients were presented with abdominal pain as chief complaint. Rest of 5 % who didn't have abdominal pain had vomiting and fever as presenting symptoms.

History of consumption of alcohol and the possibility of it being the etiological factor were found on 59 patients, gall stone disease was attributed in 23 patients. Hyperlipidemia and drugs as causative factor presented in 3 and 2 patients, respectively. There was clear cut history of blunt trauma with CT scan showing isolated pancreatic injury presented in two cases. No cause could be attributed in the rest of 11 patients.

Out of 100 patients, 86 patients presented with mild and moderately severe acute pancreatitis. Out of 14 with severe attack, 4 were expired. In mild group the BISAP score ranges from 0 to 2 and in severe group, it ranges from 3 to 5. In

mild group the RANSON'S score ranges from 0 to 3 and in severe group it is greater than 3.

Age distribution of patients was as per **Table – 2**. Gender distribution was as per **Table – 3**. Duration of Hospital stay was as per **Table – 4**. Clinical features were as per **Table – 5**. Etiology was as per **Table – 6**. Outcome was as per **Table – 7**. Correlation of BISAP and Ranson with severity was as per **Table – 8**. Analysis of BISAP score in predicting organ failure was as per **Table – 9**. Analysis of Ranson's score in predicting organ failure was as per **Table – 10**. Statistical analysis of BISAP score in predicting necrosis was as per **Table – 11**. Statistical analysis of Ranson's score in predicting necrosis was as per **Table – 12**. Statistical analysis of BISAP score in predicting mortality was as per **Table – 13**. Statistical analysis of Ranson's score in predicting mortality was as per **Table – 14**. Complications were as per **Table – 15**.

Table – 2: Age distribution.

Age range (years)	No. of patients	%
21 – 30	22	22
31 – 40	25	25
41 – 50	37	37
51 – 60	14	14
>60	02	02
Total	100	100

Table – 3: Gender distribution.

Sex	No. of patients	%
Male	91	91
Female	9	9
Total	100	100

Table – 4: Hospital stay.

Days in hospital	No. of patients	%
1 -7	33	33
8 – 14	37	37
15 – 21	20	20
22 – 28	8	8
>28	2	2
Total	100	100

Table – 5: Clinical features.

Symptoms	No. of patients	%
Pain abdomen	95	95
Fever	31	31
Vomiting	25	25
Jaundice	14	14
Abdominal distension	13	13

Table – 6: Etiology.

Etiology	No. of patients	%
Alcohol	59	59
Gall stone disease	23	23
Drug induced	02	02
Hypertriglyceridemia	03	03
Trauma	02	02
Idiopathic	11	11

Table – 7: Outcome.

	BISAP		Ranson	
	≤2	≥3	≤3	>3
Number of patients	86	14	80	20
Organ failure	04	10	O2	12
Pancreatic necrosis	01	08	02	07
Mortality	00	04	01	03

Management

Among 100 patients four patients expired, in the remaining 96 patient, all except four patients managed conservatively. Two patients had traumatic injury to the pancreas which was initially managed conservatively, later they developed severe pancreatitis with intra-abdominal abscess that required laparotomy and drainage procedure. One patient with severe disease have developed pseudocyst, underwent and internal drainage. Another patient who had severe pancreatitis underwent necrosectomy initially and has developed pancreatic fistula later, which was managed by pancreatic duct stenting**.**

Discussion

Acute pancreatitis is a common disorder with wide spectrum of illness. Severe acute

pancreatitis having high morbidity and mortality rate, multiple interventions have been tried to prevent this. Early hospitalization may be beneficial to identify those who require aggressive interventions to prevent the severe attack of pancreatitis.

Table – 8: Correlation of BISAP and Ranson with severity.

	BISAP ≤2	Ranson ≤ 3	X^2	P value
Organ failure	4	2	O.2275	0.6334
Pancreatic necrosis	1	2	O.1204	0.7286
Mortality	0	1	0.9629	0.3265

	BISAP ≥ 3	Ranson >3	X2	P value
Organ failure	10	12	5.5336	0.0187
Pancreatic necrosis	08	07	5.9744	0.0145
Mortality	04	03	3.9822	0.0460

Table – 9: Analysis of BISAP score in predicting organ failure.

		Organ failure		Total
		Yes	No	
BISAP score	≥ 3	10	04	14
	≤ 2	04	82	86
Total		14	86	100

Parameter	Estimate	Lower – Upper 95% CIs
Sensitivity	71.43%	45.35, 88.28
Specificity	95.35%	88.64, 98.18
Positive predictive value	71.43%	45.35, 88.28
Negative predictive value	95.35%	88.64, 98.18
Diagnostic accuracy	92.00%	85.00, 95.89

Table – 10: Analysis of Ranson's score in predicting organ failure.

		Organ failure		Total
		Yes	No	
Ranson's score	> 3	12	08	20
	≤ 3	02	78	80
Total		14	86	100

Parameter	Estimate	Lower – Upper 95% CIs
Sensitivity	78.57%	52.41, 92.43
Specificity	74.42%	64.29, 82.46
Positive predictive value	43.33%	29.75, 50.39
Negative predictive value	95.52%	87.64, 98.47
Diagnostic accuracy	88%	65.7O, 82.45

Table – 11: Statistical analysis of BISAP score in predicting necrosis.

		Necrosis		Total
		Yes	No	
BISAP score	≥ 3	08	O6	14
	≤ 2	01	85	86
Total		09	91	100

Parameter	Estimate	Lower – Upper 95% CIs
Sensitivity	81.82%	52.30, 94.86
Specificity	94.38%	87.51,97.58
Positive predictive value	64.29%	38.76, 83.66
Negative predicitive value	97.67%	91.91,99.36
Diagnostic accuarcy	93.00%	86.25, 96.57

Table – 12: Statistical analysis of Ranson's score in predicting necrosis.

		Necrosis		Total
		Yes	No	
Ranson's score	≥ 3	07	13	20
	≤ 2	02	78	80
Total		09	91	100

Parameter	Estimate	Lower – Upper 95% CIs
Sensitivity	90.91%	62.26, 98.38
Specificity	77.53%	67.82, 84.96
Positive predictive value	43.56%	29.23, 61.22
Negative predictive value	98.57%	92.34,99.75
Diagnostic accuracy	91.00%	85.7O, 95.45

Table – 13: Statistical analysis of BISAP score in predicting mortality.

		Mortality		Total
		Yes	No	
BISAP score	> 3	04	10	14
	≤ 3	00	86	86
Total		04	96	100

Parameter	Estimate	Lower – Upper 95% CIs
Sensitivity	100.00%	51.01,100.00
Specificity	95.83%	89.77, 98.37
Positive predictive value	50.00%	21.52, 78.48
Negative predictive value	100.00%	95.99, 100.00
Diagnostic accuracy	96%	90.16, 98.43

Table – 14: Statistical analysis of Ranson's score in predicting mortality.

		Mortality		Total
		Yes	No	
Ranson's score	≥ 3	03	17	20
	≤ 2	01	79	80
Total		04	96	100

Parameter	Estimate	Lower – Upper 95% CIs
Sensitivity	88.57%	62.41, 96.43
Specificity	64.42%	54.29, 72.46
Positive predictive value	31.33%	22.75, 70.39
Negative predictive value	96.52%	87.64, 98.48
Diagnostic accuracy	93.01%	85.7O, 95.45

In this study, the two different scoring systems (BISAP and Ranson's) were compared and analyzed to assess the severity in patients with acute pancreatitis. An attempt also made to compare this study with previous similar studies done by others.

Table – 15: Complications.

Complication	No. of patients	%
Acute renal failure	5	35.7
Respiratory failure	2	14.28
Pancreatic necrosis	9	
Intra abdominal abscess	1	7.14
UGI bleeding	1	7.14
MODS	3	21.4
Septicemia	3	21.4
Encephalopathy	1	1.74
Portal vein thrombosis	1	1.74
DIC	1	1.74
Pancreatic fistula	1	1.74
Pseudocyst	1	1.74
Hypocalcemia	1	1.74

Acute pancreatitis found to be 10 times more common in males than females in this study. This result didn't match with previous study results, Vikesh K Singh, et al. [34] (6:1), Papachristou, et al. (5.1:1) [33]. This could be explained by the fact that, in this study alcohol has found to be most common etiological factor and it's more common in males.

In this study, the mean age was 41.18 years which matches Vikesh K. Singh, et al. [34] (49.6 years), Papachristou, et al. (51.7 years) [33].

The mean age of non- survivors in this study was found to be 60 years as compared to survivors being 41.23 years. Taking 60 years of age as cut –off value, increasing age was found to be correlated well with increasing incidence of mortality. Thus age is considered as the significant contributory factor in predicting the outcome of severe acute pancreatitis.

The most common etiological factor in this study was alcohol (59%), which was more than Bidarkundi, et al. [35] (46.67%), and not correlating with results of, Vikesh K Singh, et al. [34] (21.4 %), Papachristou, et al. (14%) [33] wherein gall stone disease found to be most common cause, 27 and 36% respectively.

The mean length of hospital stay was 12.03 ± 6.8 days in this study. In this study, increasing BISAP and Ranson's scores was correlated well with the duration of hospital stay.

The most common presentation was predominantly abdominal pain (95%), followed by fever (31%), vomiting (25%) and other manifestations.

In this study, 86 patients were diagnosed to have mild and moderately severe acute pancreatitis grouped under MAP, and 14 patients found to

have severe acute pancreatitis. All the 14 patients were correctly predicted by BISAP score. The scores were assessed by correlating the scores with three factors: organ failure, necrosis and mortality.

The analysis for organ failure showed BISAP score has sensitivity of 71.43%, specificity of 95.35%, PPV of 71.43%, NPV of 95.35%, diagnostic accuracy of 92%; whereas Ranson's score has sensitivity of 78.57%, specificity of 74.42%, PPV of 43.33%, NPV of 95.52 %, diagnostic accuracy of 88%. This correlates well with the study by Papachristou, et al. [33] where sensitivity of (70.42%, 80.41%), specificity of (92.4%, 71.9%), PPV of (57.7%, 40%), NPV of (84.3%, 90.1%), for BISAP and Ranson's respectively. Thus by using Chi square test, BISAP ≥ 3 has significant correlation with prediction of the occurrence of organ failure (p<0.01), which matches well with study by Vikesh K. Singh, et al. [34] and B U Wu, et al. [26].

In this study, 7/20 patients with BISAP> 3 and 8/14 patients with Ranson's >3, developed pancreatic necrosis. The statistical analysis for the prediction of necrosis has sensitivity of (81.82%, 90.91%), specificity of (94.35%, 77.53%), PPV of (64.29%, 43.56%), NPV of (97.67%, 98.57%), diagnostic accuracy of (93%, 91%) for BISAP and Ranson's respectively. This correlates well with the study by Papachristou, et al. [33] where sensitivity of (80.01%, 87.65%), specificity of (95%, 79.51%), PPV of (56.2%, 38.9%), NPV of (84.9%, 90.1%), for BISAP and Ranson's respectively. Thus by using Chi square test, BISAP ≥ 3 has significant correlation with prediction of the occurrence of organ failure (p<0.01), which matches well with study by Vikesh K. Singh, et al. [34] and B U Wu, et al. [26].

In this study, 4 patients with severs acute pancreatitis were expired. All 4 deaths were correctly predicted by BISAP score. The statistical analysis for the prediction of necrosis has sensitivity of (100%, 88.57%), specificity of

(95.83%, 64.42%), PPV of (50%, 31.33%), NPV of (100%, 96.52%), diagnostic accuracy of (96%, 93%) for BISAP and Ranson's respectively. This correlates well with the study by Papachristou, et al. [33] where sensitivity of (100%, 100%), specificity of (95.8%, 53.1%), PPV of (50%, 28.1%), NPV of (100%, 100%), for BISAP and Ranson's respectively.

In this study, patients developed pancreatic necrosis, acute renal failure, MODS, septicemia. These complications were more likely seen in patients with BISAP ≥ 3, and Ranson's > 3, hence concluded that these are the patients in high risk group, who requires intensive monitoring and probably early intervention if necessary.

Conclusion

From this study, alcohol (59%) was found to be the most common etiological factor for acute pancreatitis. Males were more commonly affected than females with a ratio of 10:1. The most common age groups of patients affected were in 4th decade of life. The overall mortality in patients with severe acute pancreatitis was 4%. BISAP score is equally effective in finding out the frequency of severity and predicting mortality in patients with acute pancreatitis as Ranson's score. Moreover, its components are easily available and it does not require 48 hours for completion of assessment as compared to Ranson's score. It is an accurate tool to classify patients into mild and severe disease; it is easy to perform and can be done on the bedside of patients with acute pancreatitis in every setup.

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