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Comparison of Ranson's Score, BISAP, and CTSI in Predicting the Severity of Acute Pancreatitis

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ABSTRACT

Objective: To use of Ranson's, BISAP and CTSI scoring system in predicting the severity and outcomes of patients with acute pancreatitis.

Patients and Methods: One hundred and six (106) patients of acute pancreatitis were studied prospectively. Data of patient's baseline demographics, clinical and radiological investigation was collected. BISAP score was calculated by obtaining data within 24 hours of admission, while Ranson score was calculated at the time of admission and at 48 hours of admission. CTSI was based on findings from CT scan of selected patients. Severity of acute pancreatitis was defined in terms of ICU admission, development of associated complications and mortality.

ResultsOut of 106 patients, 55.7% were females and 44.3% were male patients. Regarding complications of Acute Pancreatitis, 9 (8.5%) patients were admitted in ICU, complications occurred in 33 (31.1%) patients while mortality occurred in 9 (8.5%) patients. Out of 106 patients 11 patients had Ransons score greater than 3. 04(36.4%) patients required ICU admission, 07(63.6%) patients developed complications and mortality of 5(45.5%) patients occurred. Patients with Bisap score greater 03, 6 (26%) patients required ICU admission, 17 (74%) developed complications and mortality of 8(34.7%) patients occurred. 24 patients underwent CECT abdomen and 4 patients had modified CTSI score of 8 to 10 (severe AP) out of which 4(100%) patients required ICU admission, 4(100%) patients developed complications and mortality occurred in 4(100%) patients.

Conclusion: BISAP score is a useful prognostic scoring system for predicting the severity of acute pancreatitis and can be a crucial aid in determining the group of patients that have a high chance of need for intensive care during the course of their illness and therefore need early resuscitation; especially in resource-limited developing countries.

Key words: Acute pancreatitis, BISAP score, Modified CTSI score, Ranson score

Author`s Contribution
[1-3] Conception, synthesis, planning of research and manuscript writing Interpretation and discussion
[4-6] Data analysis, interpretation and manuscript writing, Active participation in data collection.

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Introduction

Acute pancreatitis (AP) is inflammation of pancreas that sometimes may involve adjacent or remote body organs in severe cases.[1] Only 10 to 20% patients have mild inflammation and have good prognosis. But in severe

cases, patients present with pancreatic necrosis or with distant organ failure requiring intense medical management or surgical intervention with mortality risk of 40%. overall mortality risk is 5 to 10%.[2] Therefore, early detection and determination of severity of AP is very crucial for optimal management. Because sometimes mild cases may progress to severe cases resulting in high mortality rates. Unfortunately, no laboratory or diagnostic test is available for this and different risk scoring systems have been developed to determine the AP.[3]

Out of various scoring systems, BISAP (Bedside index of severity in acute pancreatitis), Ranson's score and CTSI (computed tomography severity index) scoring system are commonly used for determining AP severity. Ranson's score include 11 variables, presence of 3 or >3 indicates severe AP.[4] BISAP score have 5 variables to determine severe AP (presence of age >60 years, pleural effusion, BUN >25mg/dL, presence of SIRS and impaired mental health).[5,6] While modified CTSI is linked only with grading of pancreatic necrosis and extent of pancreatic necrosis.[7] All of these scors have potential risk and benefits and have been used in routine practice. In present study, we aimed to determine the accuracy of BISAP, Ranson's and CTSI scoring system in determining the severity of AP.

Patients and Methods

One hundred and six (106) patients of acute pancreatitis of age 10 years to 90 years and any gender were studied prospectively. Data of patient's baseline demographics, clinical and radiological investigation was collected. Approval of study was taken before starting data collection. Mixed clinical and laboratory investigations data was used to confirm the diagnosis of AP (i.e. abdominal pain, increased serum amylase/lipase levels more than three folds, findings of AP on abdominal ultrasonography). After diagnosis of AP, these patients were informed about study purpose and protocols in the emergency department and informed consent was signed from them. Patients with chronic pancreatitis were not included in the study. Venous and arterial blood samples were taken and sent to the lab for measurements of patients' blood gases, liver and renal function parameters and complete blood investigations. CT scan was performed in only selected patients and calculation of modified CTSI score was done on the basis of findings on CT scan. BISAP score was calculated by obtaining data within 24 hours of admission, while Ransons score was calculated at the time of admission and after 48 hours of admission. Severity of AP was defined in terms of ICU admission, development of associated complications and mortality. Severity was noted at the time of discharge/death of patients. Initial treatment of AP patients was resuscitation using fluids. Inotropes were given if needed. Urinary catheter and IV line was passed in all patients. Urine output was noted on hourly basis. IV line was used for fluid resuscitation. Prophylactic broad-spectrum antibiotics were given. Patients of severe AP who did not improved with medical therapy necrosectomy and open drainage was done in these cases. Cholecystectomy was done either in same admission or in follow-up period. For data analysis, we used SPSS v23 software. Chi-square test was used to compare complications and mortality on the basis of severity of scores. P-value $\leq$0.05 was taken as significant difference.

Table 1. Baseline variables of Patients (n=106)

Age of patients	n(%)
10-20	6 (5.7)
21-30	24 (22.6)
31-40	20 (18.9)
41-50	22 (20.8)
51-60	12 (11.3)
61-70	16 (15.1)
71-80	5 (4.7)
81-90	1 (0.9)
Gender	
Male	47 (44.3)
Female	59 (55.7)
Type of Admission	
New	88 (83.0)
Follow-up	18 (17.0)
Cause of AP	
Gallstones	73 (68.9)
Idiopathic	20 (18.9)
Hypertriglyceridemia	6 (5.7)
Alcohol Induced	4 (3.8)
Post ERCP	1 (0.9)
Drug Induced	1 (0.9)
Corrosive Intake	1 (0.9)

Table 2. Association of Scoring Systems in Predicting Complications and Mortality in AP Patients (n=106)							
Scoring System	**ICU Admission**		**Complications**		**Mortality**		**P-value**
	Yes	No	Yes	No	Yes	No	
Ranson's Score							
<3	5 (5.3)	90 (94.7)	26 (27.4)	69 (72.6)	4 (4.2)	91 (95.8)	0.006, 0.02, <0.0001
≥3	4 (36.4)	7 (63.6)	7 (63.6)	4 (36.4)	5 (45.5)	6 (54.5)	
BISAP Score							
<3	3 (3.6)	80 (96.3)	16 (19.2)	67 (80.7)	0 (0)	83 (100)	0.47, 0.001, 0.001
≥3	6 (26)	17 (74)	17 (73.9)	6 (26.08)	8(34.7)	15 (65.2)	
Modified CTSI Findings							
0 -2 mild	0 (0.0)	10 (100)	7(70)	3(30)	0 (0)	10 (100)	<0.001, <0.0001, <0.001
4-6 moderate	5 (50.0)	5 (50.0)	10(100.0)	0 (0.0)	2(20.0)	8 (80.0)	
8-10 severe	4 (100)	0 (0)	4(100)	0 (0.0)	4 (100)	0 (0)	

Results

A total number of 106 patients of AP were studied. Most of the patients 24 (22.6%) were in age group 21-30 years, 22 (20.8%) were in age group 41-50 years, 20 (18.9%) were in age group 31-40 years' age group. There were 55.7% females and 44.3% male patients. There were 88 (83.0%) new admissions and remaining 18 (17.0%) were follow-up. Most common cause of AP was gallstones in 73 (68.9%), idiopathic in 20 (18.9%) patients and hypertriglyceridemia in 6 (5.7%) patients (Table 1). Regarding complications of AP, 9 (8.5%) patients were admitted in ICU, complications occurred in 33 (31.1%) patients while mortality occurred in 9 (8.5%) patients. Most common complication in AP patients was pseudocyst occurred in 7 (6.6%) patients, ascites in 6 (5.7%), shock in 3 (2.8%) patients, while pleural effusion and acute renal failure occurred in 1 (0.9%), 1 (0.9%) cases only respectively. 11(10.4%) patients had multiple complications. Regarding reliability of scoring systems in predicting severity and mortality due of AP. Out of 106 patients, 11 patients had Ransons score greater than 3, signifying severe pancreatitis. Out of 11 patients 04(36.4%) patients required ICU admission, 7(63.6%) patients developed complications due to pancreatitis and mortality of 5 (45.5%) patients occurred. Whereas 95 patients had Ransons score less than 03 and mortality of 4(4.2%) patients occurred in this group.

Out of all patients, 23 patients had BISAP score greater than or equal to three, 6 (26%) patients required ICU admission, 17 (74%) developed complications and mortality of 8(34.7%) patients occurred (Table 2). Mortality of patients with individual BISAP score of 3 was 7.6 %, with BISAP score 4 mortality rate was 50% and with BISAP scores 5 and 6, mortality was 100 % (TABLE 3). CECT with pancreatic protocol was done for 24 patients. On the basis of findings on CT scan, modified CT severity index score was calculated. In patients having modified CTSI score equal to zero to two (mild AP), no patient required ICU admission, 7(70%) patients developed complications and no mortality occurred. (Table 2). In patients having modified CTSI score of 4 to 6 (moderate AP), 5(50%) patients required ICU admission, 10(100%) patients developed complications and mortality of 2(20%) patient occurred. In patients having modified CTSI score of 8 to 10 (severe acute pancreatitis) 4(100%) patients required ICU admission, 4(100%) patients developed complications and mortality of 4(100%) patients occurred (Table 2).

Table 3. Mortality with individual BISAP score			
BISAP score	**Mortality**		
	Yes (%)	**No (%)**	**Total**
0	0	35 (100)	35
1	0	35 (100)	35
2	0	13 (100)	13
3	1(7.6)	12 (92.3)	13
4	3(50)	3 (50)	6
5	3(100)	0	3
6	2 (100)	0	2
Total	09	97	106

Table 4. Mortality with individual RANSONS score.			
RANSONS Score	Mortality		
	Yes (%)	No (%)	Total
0.00	0 (0)	20 (100)	20
1.00	0 (0)	23 (100)	23
2.00	0 (0)	17 (100)	17
3.00	1 (7)	13 (93.0)	14
4.00	1 (6)	14 (94.0)	15
5.00	3 (33)	6 (67.0)	9
6.00	2 (33)	4 (67.0)	6
7.00	2 (100)	0 (0.0)	2
Total	9 (8.4)	96 (91.6)	106

Table 5. Mortality with overall CTSI Score			
CTSI score	Mortality		Total
	Yes (%)	No (%)	
00	0 (0)	4 (100)	4
2.00	0 (0)	6 (100)	6
4.00	1 (16)	5 (84.0)	6
6.00	1 (25)	3 (75.0)	4
8.00	4 (100)	0 (0.0)	4
Total	6 (25.0)	18 (75.0)	24

Discussion

Acute pancreatitis is one of the common presentations in medical emergency departments. Due to high morbidity and mortality, early diagnosis and prediction of severity is very essential for optimal management of patients. In present study, we determined the accuracy of the Ranson's, BISAP and modified CTSI scoring system in predicting the severity and associated mortality in AP patients. Most of our patients (> 60%) were between 21-50 years old and majority were females (55.7%). A study conducted by Kumar et al. reported that mean age in their study was 48.42 years, and female population in their study was 66.0% (8). While in a study by Yadav et al. mean age was 38.94±14.59 years, and female population was 70.6%.[9] Regarding etiology, the most common cause was gallstones, diagnosed in 68.9% patients. Kumar et al. reported gallstones in 74.0% patients of AP followed by alcohol abuse in 18.0% patients.[8] Khanna and Yadav et al. also reported gallstones as commonest etiology in AP patients.[9,10]I n present study, 8.5% patients were admitted in ICU, complications occurred in 31.1% patients and mortality occurred 8.5% patients. Yadav et al. reported mortality in 10.1% of the AP patients. While studies by Bollen et al. and Carnovale et al. reported mortality in only 3.5% and 4.8% patients respectively.[11,12]

Regarding accuracy of different scoring systems, modified CTSI was the most accurate among all three scores. In patients having CTSI score >2 (>30 % necrosis), ICU admissions occurred in 85.7% patients, complications in 100% patients and mortality in 57.1% patients. While Ranson score and BISAP score were important tool in risk stratification in patients with acute pancreatitis. In government setup, like ours due to very high patient load and limited facilities Ransons score has a great role in predicting outcomes because it is easy to calculate and has very small financial burden on system. Drawback of Ransons score is that it takes 48 hours to calculate it. The advantage of BISAP score is the relative ease with which data can be acquired and can be calculated within 24 hours of presentation. Patients with a BISAP score of equal to or greater than 4 have high mortality.

Kumar et al. conducted a study on comparison of APACHE II, BISAP, Ranson's score and modified CTSI score in predicting AP severity and mortality also reported that modified CTSI has highest accuracy in predicting ICU admissions, complications and mortality in these patients. These authors found almost similar accuracy of BISAP and Ranson score.[8] While a study by Yang et al. comparing Ranson, BISAP, APACHE II, and MCTSI score in hyperlipidemia induced AP patients, reported that MCTSI is outstanding in predicting complications, but is not good in predicting severity and mortality in these patients.[13] Studies by Mortele et al. and Banday et al. also reported CTSI as a simpler and best tool for predicting hospital stay, infections risk, organ failure risk and mortality in AP patients.[14,15]

Conclusion

Modified CTSI is most accurate score in predicting ICU admissions, complications and mortality in AP patients, however the BISAP score represents a simple way of identifying patients at greater risk of dying and developing complications within 24 hours of presentation. Also BISAP score should be considered for risk stratification because as the BISAP score increases, its accuracy in predicting

mortality increases. RANSONS score was least accurate among BISAP score and CTSI scoring system for predicting outcomes in AP patients.

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