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Validation of Bedside Index for severity in acute pancreatitis (BISAP) score in the severity and prognosis of acute pancreatitis

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Abstract
Introduction: Acute Pancreatitis (AP) is one of most common cause of acute pain abdomen which we encounter in our daily surgical practice. It will be important if we stratify patients with acute pancreatitis according to their risk. Many staging systems for acute pancreatitis have been proposed, each with advantages and disadvantages. **Objective**: To evaluate the accuracy of bedside index for severity in acute pancreatitis (BISAP) in predicting the severity and prognoses of acute pancreatitis (AP). **Material and Methods:** Prospective obervational study that included all patients presented with acute pancreatitis and getting admitted in Department of Surgery, HIMS, Hassan from June 2020 to November 2020. The variables needed to calculate BISAP and complications were obtained and recorded in standard proforma. Clinical data for 80 patients with AP were analyzed prospectively to compare BISAP with Atlanta scoring system in predicting the severity of AP and the occurrence of mortality, and organ failure in patients with severe AP. **Results:** Of the 80 patients, 67 had mild AP, 16 had moderate AP and 20 had severe AP. There were significant correlations between the scores of two systems. BISAP performed similarly to other scoring systems in predicting SAP, as well as mortality, and organ failure in SAP patients. **Conclusion:** BISAP can be used as a tool to triage patients for streaming health care facilities, as it is a simple system that does not increase the cost of hospitalization and also identifies persons at risk of severe pancreatitis in the first 24 hours of admission.
Keywords: Acute pancreatitis, Scoring system, BISAP, Severity, Prognosis

Introduction

Acute pancreatitis has a myriad of causes with numerous epidemiological factors depending on geographical location. Though the disease is mostly mild, may be fatal due to late recognition or the disease severity itself. Predicting an attack of acute pancreatitis as mild or severe depends on various clinical and biochemical parameters and needs multiple investigations to arrive at the diagnosis. Several scoring systems have been developed with an aim of predicting the development of severe acute pancreatitis, each having its own pros and cons. Efforts to identify factors involved in patho-physiology of an attack of pancreatitis which are simple yet can predict the severity of an attack is going on. There are numerous ways to predict the severity and outcome of acute pancreatitis, which includes the Ranson's criteria[1], Acute Physiology and Chronic Health Evaluation (APACHE) II[2], Computed Tom Severity Index (CTSI)[3], Glasgow scoring systems[4]. There are several advantages and disadvantages are there for each and till today none is currently recognized as a criterion standard. In our study, we used the same criteria of BISAP[5] scoring system prospectively and compared the score with Atlanta classification[6] in predicting development of severe AP. Since the treatment of the disease needs to be tailored for each individual patient, we hope that by using the simple BISAP (Bedside Index for Severity in Acute Pancreatitis) scoring we can triage acute pancreatitis and can find the treatment most suitable for a patient.

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Aim of the study

1. To study the epidemiological profile of acute pancreatitis.
2. To establish prospectively the utility and diagnostic accuracy of BISAP (Bedside Index for Severity in Acute Pancreatitis) in acute pancreatitis.

Materials and Methods

We performed a prospective study in the Department of Surgery, HIMS, Hassan, Karnataka from June 2020 to November 2020. .The study population consisted of patients admitted in Surgery wards with acute pancreatitis.

Acute pancreatitis was defined as two or more of the following: characteristic abdominal pain; serum amylase and / or lipase levels 3 × the upper limit of normal; and / or a contrast-enhanced computed tomography (CT) of the abdomen within the first 7days of hospitalization demonstrating changes consistent with AP.

Presence / absence of pleural effusion: Determined by X ray, USG, CT findings, radiological, or in the absence of both clinical findings consistent with pleural effusion (dullness to percussion, decreased breath sounds on auscultation).

Morbidity: Local complications and / or systemic that originated as a result of acute pancreatitis, which were not present or not detected at admission to hospital. The patients presenting with acute pancreatitis admitted during the study period were studied and analyzed. Patient who had chronic pancreatitis, who refused to participate in the study were excluded. The study was carried out after obtaining approval from institutional ethics committee (IEC), HIMS, Hassan. A written valid informed consent from subjects was taken.

Detailed history and physical examination will form the basis of the study; findings are recorded using standard proforma. The baseline investigation (Complete haemogram, Chest x-ray, Kidney function test, Random blood Sugar, Total leukocyte count) and special investigations (Serum amylase, Serum Lipase) was done for every

case. Ultrasonography of abdomen was performed on admission in all the patients. CT-scan of Abdomen was done during the hospital stay in selective cases that developed severe pancreatitis.

BISAP score had parameters of Blood Urea Nitrogen (>25 gm/dl), Impaired mental status, Systemic Inflammatory Response Syndrome, Age >65 years, Pleural effusion. Each was assigned one point and minimum score being 0 and maximum 5. BISAP cut-off of >3 was taken to stratify the AP.

Patients are divided into mild, moderate and severe acute pancreatitis and compared with BISAP score. Ultimate outcome of the disease i.e. recovered, expired were noted. Based on clinical parameters and BISAP scores, we tried to find out some prognostic indicators for the disease. All the data thus collected was systematically analysed and statistic significance calculated by using SPSS software 16.0. Student t test, Mann-Whitney test, Pearson Chi square test, mean were calculated. P <0.05 was considered statistically significant.

Results

Patients presenting with features of acute pancreatitis namely, pain upper abdomen with elevated Serum Amylase and Serum Lipase levels and abnormal imaging findings were studied, out of which 80 patients satisfied the inclusion criteria were included in the study. Among the patients studied, 52(65%) cases had mild, 12(15%) cases had moderate and 16 (20%) had severe acute pancreatitis. The severity assessment was done using the definition from modified Atlanta classification.

Majority of the patients belonged to the age group of 21-30 years with 26 of 80 patients (32.5%), followed by 31-40 years 19 patients (23.75%). Only 8 cases (10%) were more than 60 years of age. Mean age of the patients with mild AP was 36.03 yrs while it was 40.39 years for those with moderate and severe AP. But the overall mean age of the patients was 38.60 years. The range of the patient's age was between 15-81 years with a standard deviation of 12.09 years. On application of standard T test and Independent Samples test for the age distribution of mild AP as one group and moderate and severe AP as another, no statistical significance of age distribution was found between two groups (p - 0.144). In other words, age could not predict severity of the disease.

Among 80 patients 64 (80%) were male and 16 (20%) were female, 14 of 16 patients who developed acute severe pancreatitis were male. No statistically significant difference was observed when gender was taken to compare for severity. Pearson Chi-square test was used which showed a p value of 0.254

Patients presented to our hospital with a mean delay of around 2.4 days after the onset of symptoms. There was no significant difference between severe AP and mild AP in terms of patients'presentation to hospital. Mann-Whitney test was used showing p value of >0.05

Forty four (55%) cases among 80 had only alcohol as aetiology, 29 (36.25%) cases had gall stones only, while five (6.25%) were alcoholics and with gall stones. In the remaining 2 (2.5%) patients, the cause was not ascertained. Six patients (37.5%) among 16 severe cases were alcoholic, 5 (31.25%) were of gall stone aetiology and remaining 5 (31.25%) patients had both alcohol and gall stones as the precipitating cause. When compared these results with those of mild attack, there was no significant statistical difference between severe and mild types in terms of aetiology of an attack. Value of p for alcohol and gall stone disease in severe acute pancreatitis was insignificant (p>0.05). (Pearsons-Chi square test)

Thirty five (79.5%) patients among the alcoholic pancreatitis group had a binge of alcohol intake in the past 24 hours before admission and only 1(1.6%) patient developed pancreatitis after 4 days of alcohol intake. Analysis of alcohol pancreatitis patients based on the history of intake of last alcohol intake showed that 21 of the 23 moderate and severe pancreatitis patients had alcohol intake within last 24 hours before the attack of pancreatitis. The value was statistically significant (P=0.001)

Out of 80 patients who underwent X- ray chest PA view, 27 (33.75%) patients had abnormal x ray findings. All the patients with severe AP and 10 (83.3%) of the 12 moderate AP patients showed abnormal x ray findings suggestive of pleural effusion. In contrast only 1(1.9%) patient among 52 patients with mild attack had pleural effusion. Chi-square test showed p value of <0.001.

BISAP Score in predicting severity:

Bedside index for severity in acute pancreatitis has 5 parameters namely blood urea nitrogen >25, impaired mental status, SIRS, age >60 years and pleural effusion on imaging. The parameters are recorded at the time of admission are here being analysed.

Table 1: BISAP score among AP based on severity

Diagnosis	BISAP <3	BISAP >3	Total
Mild	52	0	52
Moderate, severe	03	25	28
Total	55	25	80

BISAP score results were tabulated as either score of >3 or <3. Sensitivity of BISAP score in predicting severe acute pancreatitis was 100 % and specificity of 94.4 % with positive predictive value of 0.88 and negative predictive value of 1.00 .

CT scan of abdomen was performed only on patients with severe AP only (n=16). Findings of pancreatic morphology, necrosis and fluid collection were scored based on CT severity index given by Balthazar and colleagues. The highest possible score is 10. Mean score of 16 patients with severe AP was 6.3/10.

Table 2: Pattern of organ failure and its course

Organ Failure	Number	Resolved @48 hrs
Nil	52 (65.1%)	-
Respiratory	09 (11.25%)	04 (44.4%)
Renal	11 (13.75%)	08 (72.7%)
Multi-organ	08 (10%)	0 (0.0%)
Total	80 (100%)	12

Organ failure was present in 28 of the 80 patients at admission; respiratory failure was seen in 09 patients, renal failure in 11 patients and multiple organ failure in 08 patients. However, organ failure resolved in 12 patients (04 of the 09 patients in patients with respiratory failure, 08 of the 11 patients in patients with renal failure) and resolved in none of the patients when multiple organs were involved.

Table 3: Correlation between outcome and BISAP score

Outcome	Number of patients	mean BISAP
Recovered	76	1.77($\pm$1.25)
Expired	4	4($\pm$0.5)
	80	P=0.006

The mean BISAP score among the patients who recovered was 1.77($\pm$1.25), in contrast it was 4($\pm$0.5) in patients who succumbed to illness. The difference was statistically significant (p=0.006).

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Table 4: Correlation of outcome and organ failure

Type of organ failure	Recovered	Expired	Total
Respiratory	08	01	09
Renal	11	0	11
Multiple	5	3	8
Total	24	4	28

Thirty patients in the study group had organ failure. One patient among the 8 patients with respiratory failure (n=8) expired, none in the renal failure (n=11) expired but 37.5% with multi-organ failure (n=8) expired. Presence of organ failure had an impact on the Outcome of the patients and was statistically significant (P= 0.01).

Table 5: Correlation of BISAP components and complication/ outcome of AP

BISAP Components	Presence of pseudocyst[10]	Presence of Complications [30]	Death[4]
BUN >25 (n=27)	6 (p=0.025)	16 (p=0.002)	4 (p=0.001)
IMS [31]	5 (p=0.235)	17 (p=0.009)	3 (p=0.053)
SIRS [54]	9 (p=0.038)	27 (p=0.000)	4(p=0.108)
Age >60 [8]	1 (p=0.793)	5 (p=0.111)	2 (p=0.019)
Pleural effusion [29]	6 (p=0.039)	19 (p=0.000)	3 (p=0.035)

The components of BISAP were analysed individually to assess predictability of occurrence of pseudocyst, complication and death. Presence of BUN >25 and pleural effusion had a significant impact (p<0.05) on the occurrence of pseudocyst, complications and death. Presence of IMS had a significant impact (p<0.05) only on the occurrence of complications and not on pseudocyst and death. SIRS had a significant impact (p<0.05) only on the occurrence of pseudocyst and complications; not on death. However, age was a significant factor only with respect to mortality.

Discussion
Our study showed that the characteristics of the population with acute pancreatitis was hospitalized during the time period, is similar in demographic but varied BISAP compared to that reported by other authors. An attempt was made to evaluate these patients in relation to their age, sex, aetiology, and clinical prognostic indicators have been used to assess severity of the disease.

Table 6: Age distribution in comparison with other studies

Literature	No. Of patients	Range	Mean (years)
Ozkan et al[7].	43	24-86	57.03
Uhl et al[8].	302	18-93	50
Garg et al[9].	169	15-80	41.3
Nippon R et al[10].	1688	13-79	62
Papachirstou et al[11].	185	15-90	52
Peter J et al[12].	242	20-83	47
Present Study	80	15-81	38.60

The age of the patients in the present study ranged from 15-81 years with a mean age of 38.6 years. Garg et al[3], has documented a mean 41.3 years as against other studies from abroad having a range between 47 to 64 years. We may attribute it to rising gall stones with increasing age and also increased life expectancy among the western population.
SEX: In the present study male preponderance was seen with M: F ratio 4:1. Male patients constituted 80% of the study population. In contrast, as mentioned below, other studies have only slight male predominance may be as alcohol is factor causing pancreatitis even in female gender which is not so in our study.

Table 7: Age distribution in comparison with other published studies

Studies	Total cases	Males	Females	M:F
Ozkan et al[7].	43	14(32%)	29(68%)	0.5:1
Uhl et al[8].	302	198(65.6%)	104(34.4%)	1.9:1
Garg et al[9].	169	116(68.6%)	53(31.4%)	2.1:1
Nippon R et al[10].	1688	1047(62%)	641 (48%)	1.6:1
Papachirstou et al[11].	185	94(51%)	91(49%)	1.1:1
Peter J et al[12].	242	159(65%)	83(35%)	1.8:1
Present Study	80	64 (80%)	16 (20%)	4:1

AETIOLOGY: In the present study, the most common aetiology of acute pancreatitis was alcohol abuse (55%) followed by gall stones (36.25%). 6.25% of patients had both history of alcohol abuse and gall stones. In 2.5% of the cases no cause could be determined. The study from the West has gall stone as commonest aetiology and the idiopathic cause is also significant to wide range of investigations. Also though alcohol is consumed everywhere, abuse is mostly in India.

Table 8: Aetiology distribution in comparison with other studies

Studies	Total cases	Alcohol	Gall stones	Idiopathic
Uhl et al[8].	302	42%	37%	--
Papachirstou et al[11].	185	14%	36%	27%
Peter J et al[12].	242	22%	38%	38.3%
Present Study	80	55%	36.25%	2.5%

A total of 27 patients had pleural effusion on Chest X ray at the time of presentation. All the patients in severe AP had presence of pleural effusion. Heller et al[13], have noted pleural effusion in 84.2% as the study population was mostly moderate to severe AP. From above findings, usefulness of the simple test like X-ray can be highlighted.

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Table 9: BISAP score in predicting severity

Studies	Cut off score	Sensitivity	Specificity	PPV	NPV
Mounzer et al[14]	2	61%	84%	0.54	0.87
Papachristou et al[11]	--	37.5%	92.4	0.57	0.84
T. Bollen et al[15].	≥3	48%	82%	0.38	0.81
Present study	≥3	100%	94.4%	0.88	1.00

BISAP score has been utilised in AP and has variable results as can be observed the table. Based on AOC, cut-off has been 2 or 3, in our study we considered ≥3 and compared with Atlanta classification. The varied results in other studies are difficult to comment due to different population, the timing of recording BISAP parameters was just told before 24 hours of admission. In our study, we have recorded BISAP score at zero hour followed by resuscitation to know the exact biology of the disease.

Table 10: BISAP score and mortality pattern

Mortality %		BISAP Score					
		0	1	2	3	4	5
Wu et al[16]. (mortality)	Total pts	4912	7722	3941	1349	292	40
	%	0.1%	0.5%	1.9%	5.3%	12.7%	22.5%
Present Study (Mortality)	Total pts 80	13	20	22	16	4	4
	%	0	0	0	6.25%	25%	50%
Singh VK et al[17]. (mortality)	Total pts 230	52	89	44	34	8	3
	%	0%	4%	0%	12%	38%	33%

Wu et al[16] in their study on BISAP in pancreatitis have documented mortality risk with BISAP score. Our study though similar is difficult to compare owing to small sample size.

Our study had 16 patients with severe AP and 4 patients expired (25%). Our results are in agreement with other studies published[11,18].

Limitation of the study: small sample size, non comparison with other scoring systems

Conclusion

It is important to identify the risk for mortality early in all cases of acute pancreatitis especially in the severe cases. Majority of our patients were Males with alcohol as the commonest aetiology. Pleural effusion was seen in all patients with severe pancreatitis. BUN >25 and pleural effusion were good predictors of both complications and death. Given its high specificity and NPV, we propose that BISAP can be used as a tool to triage patients for streaming health care facilities, as it is a simple system that does not increase the cost of hospitalization and also identifies persons at risk of severe pancreatitis in the first 24 hours of admission.

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