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Original Research Article

RADIOLOGIC AND CLINICAL SCORING SYSTEM IN THE EARLY PREDICTION OF SEVERITY IN ACUTE PANCREATITIS - A COMPARATIVE EVALUATION

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ABSTRACT

Background: Acute pancreatitis (AP) can rapidly progress to severe disease with multiorgan failure, making early severity prediction vital for timely and effective management. This study compared the accuracy of the BISAP and Modified CT Severity Index (MCTSI) for early assessment. **Materials and Methods:** A comparative analytical study was conducted on 50 patients aged 30–70 years who presented within 24 hours of symptom onset to the Department of General Surgery at Government Theni Medical College and Hospital. BISAP and MCTSI scores were used for the assessment. **Result:** Alcohol was the leading cause of AP (68%), and most patients were male (90%). The most affected age group was 41–60 years (42%). All patients presented with abdominal pain, and vomiting (72%) and fever (60%) were also common. Complications occurred in 55% of patients, with ARF/UGIB/DIC being the most frequent. Mortality was 14%, mainly in patients aged >60 years. Patients with BISAP >3 and MCTSI >8 had significantly higher mortality ($p < 0.001$ and $p = 0.003$, respectively). Mean BISAP and MCTSI scores were significantly higher among non-survivors (4.86 and 8.00) compared to survivors (2.74 and 4.19). BISAP showed 100% sensitivity and 72% specificity, while MCTSI showed 86% sensitivity and 76% specificity. **Conclusion:** Alcohol was the leading cause of AP, predominantly affecting middle-aged males. Mortality was observed in severe cases. BISAP was more effective than MCTSI in predicting severity and outcomes. It offers a simple and reliable tool for early assessment, potentially reducing the need for CT imaging within the first 24 hours.

INTRODUCTION

Severe acute pancreatitis (AP) is observed in approximately 10–20% of patients and is associated with morbidity and mortality rates of 30% to 50%.[1] Despite intensive treatment, approximately half of the patients do not respond in the early phase and progress to multiorgan failure.[2] Therefore, early prediction of severe AP is important for clinical triage and effective management. Various clinical scoring systems are available for predicting AP severity. Among these, APACHE-II is one of the most effective for early differentiation between severe and non-severe AP.[3] The BISAP score is simpler and faster to apply, but its pooled sensitivity is limited to 51%, making it less accurate within the first 24 hours.[4]

Radiologic evaluation, particularly contrast-enhanced computed tomography (CECT), is widely used to diagnose AP and assess its severity. Commonly used CT-based scores include the Balthazar grade, CT severity index (CTSI), and EPIC scores. However, early phase CECT is not always reliable due to a false-negative rate of 20% to 30%, as pancreatic necrosis and other morphologic changes may not yet be visible within 24–48 hours of symptom onset.[5,6] In specific situations, such as patients presenting with systemic inflammatory response syndrome (SIRS) on the first day, early imaging may still be beneficial.[7] Therefore, there is a need for more reliable and sensitive methods that combine both clinical and radiologic parameters for early severity prediction.

Classification Tree Analysis (CTA) is a non-parametric method that creates intuitive decision trees for classifying patients into subgroups based on available data.[8] Although several studies have used CTA for the early prediction of severe AP based on clinical and laboratory parameters, no model has yet incorporated both radiologic and clinical scoring systems.[9,10] Some researchers have reported that radiologic findings may be superior to clinical data for early prediction.[11] Therefore, this study aimed to compare the accuracy of the BISAP and CT scoring systems in predicting the severity of AP and to assess whether a combined model enhances early prognostication.

MATERIALS AND METHODS

Study design and setting

This comparative analytical study included 50 patients who presented with features of AP at the Department of General Surgery at Government Theni Medical College and Hospital, Tamil Nadu, over one year. Ethical approval was obtained from the Institutional Ethics Committee before the study, and informed consent was obtained from all participants.

Inclusion Criteria

Patients aged 30–70 years presenting within 24 hours of symptom onset suggestive of acute pancreatitis, with serum amylase or lipase >3 times the upper limit of normal, and undergoing chest and abdominal X-ray as part of initial evaluation.

Exclusion Criteria

Patients with pancreatic abscesses, pseudocysts, or necrosis at admission, comorbidities such as diabetes mellitus, hypertension, coronary artery disease, chronic kidney disease, cerebrovascular accident, bronchial asthma, or COPD, conditions mimicking AP, such as myocardial infarction, bowel obstruction, perforation, and salivary gland disease, and those who presented > 24 hours after symptom onset were excluded.

Methods

Demographic and clinical data were recorded at admission. Each patient was evaluated using two scoring systems: the Bedside Index for Severity in Acute Pancreatitis (BISAP) and the Modified CT Severity Index (MCTSI). The BISAP score was calculated using clinical and biochemical parameters within 24 hours of admission. Contrast-enhanced CT scans were performed when indicated, and MCTSI scores were assessed based on pancreatic inflammation, necrosis, and extra pancreatic complications. Contrast‑enhanced CT was performed within 24–48 hours of admission in patients with clinical deterioration, high BISAP scores, or diagnostic uncertainty, and was evaluated using the MCTSI. Patients were followed throughout their hospital stay to monitor the development of complications, severity progression, and in-hospital mortality. BISAP and MCTSI scores ≥3 and ≥ 8, respectively, were considered indicators of severe AP. The severity classification was based on the Revised Atlanta Classification (1992).[12]

Statistical Methods

All collected data were entered into Microsoft Excel and analysed using IBM SPSS Statistics software v24. Categorical variables such as gender, severity classification, and presence of complications were summarised as frequencies and percentages. Continuous variables, such as age, are presented as mean and standard deviation. The associations between variables were assessed using the chi-square test. Statistical significance was defined as p <0.05.

RESULTS

Of the 50 patients, 11(22%) were aged <40 years, 21(42%) were aged between 41 and 60 years, and 18(36%) were aged >60 years, with a mean age of 52.06±10.29 years. There were 45 males (90%) and 5 females (10%). The most common aetiology was alcohol in 34 patients (68%), followed by gallstones in 10(20%), idiopathic causes in 4(8%), drug-induced causes in 1(2%), and hypertriglyceridaemia in 1(2%). All 50 patients (100%) presented with abdominal pain, while 36(72%) had vomiting, 30(60%) had fever, and 7(14%) had jaundice. And 27(45%) had no complications. The most common was ARF/UGIB/DIC in 8(13.3%), followed by pseudocyst and sepsis in 3(5%) each. ARDS/DIC and ME/ARF occurred in 2(3.3%) each. Abscess, fistula, MODS, and upper GI bleeding were seen in 1(1.7%) each, and renal failure in 1(1%) (Table 1).

Table 1: Demographics & clinical presentation

Variable	Group	N(%)
Age group (years)	<40	11(22%)
	41–60	21(42%)
	>60	18(36%)
Gender	Male	45(90%)
	Female	5(10%)
Aetiology	Alcohol	34(68%)
	Drug induced	1(2%)
	Gallstone	10(20%)
	Idiopathic	4(8%)
	Triglyceride	1(2%)
Symptoms	Abdominal pain	50(100%)
	Jaundice	7(14%)
	Vomiting	36(72%)
	Fever	30(60%)
Complications	Abscess	1(1.7%)
	ARDS/DIC	2(3.3%)
	ARF/UGIB/DIC	8(13.3%)
	Fistula	1(1.7%)

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	ME/ARF	2(3.3%)
	MODS	1(1.7%)
	Pseudocyst	3(5%)
	Renal Failure	1(1%)
	Sepsis	3(5%)
	Upper GI Bleeding	1(1.7%)
	No complications	27(45%)

Mean BISAP and MCTSI scores showed significant variation across different age groups ($p < 0.001$ for both). Patients aged above 60 years exhibited the highest BISAP (4.17 ± 0.86) and MCTSI (6.89 ± 1.97) scores, followed by those aged 41–60 years (BISAP 2.43 ± 1.03; MCTSI 3.62 ± 1.96), and the lowest scores were observed in patients below 40 years (BISAP 2.36 ± 1.12; MCTSI 3.27 ± 2.24). No significant association was found between gender and either BISAP ($p = 0.517$) or MCTSI ($p = 0.943$) scores, with males having BISAP 3.00 ± 1.28 and MCTSI 4.71 ± 2.56, and females having BISAP 3.40 ± 1.52 and MCTSI 4.80 ± 3.03. Similarly, no significant difference in scores was observed across different etiologies ($p = 0.962$ for BISAP; $p = 0.945$ for MCTSI). Patients with alcohol-induced pancreatitis had BISAP 3.06 ± 1.32 and MCTSI 4.77 ± 2.65, while those with gallstone aetiology had BISAP 3.10 ± 1.29 and MCTSI 5.00 ± 2.71 (Table 2).

Table 2: Severity scores by age, gender, and etiology

Variable	Category	BISAP (Mean±SD)	p-value	MCTSI (Mean±SD)	P-value
Age group	<40	2.36±1.12	<0.001	3.27±2.24	<0.001
	41–60	2.43±1.03		3.62±1.96	
	>60	4.17±0.86		6.89±1.97	
Gender	Male	3.00±1.28	0.517	4.71±2.56	0.943
	Female	3.40±1.52		4.80±3.03	
Aetiology	Alcohol	3.06±1.32	0.962	4.77±2.65	0.945
	Drug induced	3.00±0.00		4.00±0.00	
	Gallstone	3.10±1.29		5.00±2.71	
	Idiopathic	3.25±1.26		4.50±2.52	
	Triglyceride	1.00±0.00		2.00±0.00	

Mortality was significantly associated with age, BISAP, and MCTSI scores. Patients aged >60 years showed the highest number of deaths (6 out of 18), whereas no deaths occurred in the 41–60 age group and only one death was observed among those <40 years ($p = 0.01$). Gender was not significantly associated with mortality ($p = 0.277$), with 5 of 45 males and 2 of 5 females dying. Aetiology did not show a significant relationship with outcome ($p = 0.883$), with alcohol being the most common cause among both survivors (n=30) and deaths (n=4). BISAP score was strongly associated with mortality ($p < 0.001$); all deaths occurred among patients with BISAP >3 (7 of 19), while none were observed among those with scores <3 (n=31). Similarly, MCTSI scores >8 were significantly associated with death (6 of 16; $p = 0.003$), whereas patients with MCTSI <8 experienced only one death out of 34 cases (Table 3).

Table 3: Mortality across demographics, aetiology, and scores

Variable	Category	Mortality		P-value
		Alive (N)	Death (N)	
Age group (years)	<40	10	1	0.01
	41–60	21	0	
	>60	12	6	
Gender	Male	40	5	0.277
	Female	3	2	
Aetiology	Alcohol	30	4	0.883
	Drug induced	1	0	
	Gallstone	8	2	
	Idiopathic	3	1	
	Triglyceride	1	0	
BISAP	<3	31	0	<0.001
	>3	12	7	
MCTSI	<8	33	1	0.003
	>8	10	6	

Mean BISAP and MCTSI scores significantly differed across varying lengths of hospital stay (p=0.003 and p<0.001, respectively). Patients hospitalised for less than 10 days (n=40) had lower BISAP (2.75±1.26) and MCTSI (4.0±2.3) scores compared to those staying 11–20 days (n=5; BISAP 4.60±0.55, MCTSI 8.0±0.0) and > 20 days (n=5; BISAP 3.80±0.45, MCTSI 7.2±1.8). Outcomes were similarly associated with severity scores. Patients who survived (n=43) had lower mean BISAP (2.74±1.14) and MCTSI (4.19±2.38) scores, whereas those who died (n=7) had significantly higher BISAP

(4.86±0.38) and MCTSI (8.00±0.00) scores (p=0.002 and p<0.001, respectively) (Table 4).

Table 4: Hospital stay, outcomes of the study population

Variable	Category	N	BISAP	MCTSI
Hospital stays (days)	<10	40	2.75±1.26	4.0±2.3
	11–20	5	4.60±0.55	8.0±0.0
	>20	5	3.80±0.45	7.2±1.8
P-value			0.003	<0.001
Outcome	Alive	43	2.74±1.14	4.19±2.38
	Death	7	4.86±0.38	8.00±0.00
P-value			0.002	<0.001

The accuracy of the BISAP score showed 100% sensitivity and 72% specificity, whereas the MCTSI showed 86% sensitivity and 76% specificity (Table 5).

Table 5: Accuracy of the scores

	BISAP	MCTSI
Sensitivity	100%	86%
Specificity	72%	76%

DISCUSSION

In our study of patients with AP, middle-aged individuals were most affected, with male predominance. Alcohol consumption was the most common cause, followed by gallstones and other less frequent aetiologies. All patients presented with abdominal pain, and vomiting, fever, and jaundice were also commonly observed. Manoharan et al. reported a similar age range (30–70 years), with a peak incidence in the sixth decade. Their clinical findings were also comparable: abdominal pain (100%), vomiting (74%), fever (64%), and jaundice (18%).[13]

Sharmaa et al. studied 105 patients with a lower mean age of 40.60 ± 12.99 years, with males comprising 61.9%. The most common cause was alcohol consumption (50.5%), followed by gallstones (34.3%). The clinical presentation was similar to ours, with abdominal pain in 100%, vomiting in 74%, fever in 64%, and jaundice in 18%.[14] Choi et al. studied 192 patients with a mean age of 47.7 ± 17.2 years and a male predominance (131 males, 61 females). Alcohol (50.5%) and gallstones (34.3%) were the leading causes, while idiopathic cases accounted for 11.5%.[15] Cho et al. found no significant age difference between the mild/moderate and severe AP groups (p = 0.968), but more males were observed in the severe group (p = 0.023). Alcohol was significantly linked to severe AP (p = 0.030).[16] Overall, the demographic profile, aetiological patterns, and clinical presentations observed in our study are consistent with the findings reported in the previous literature.

In our study, the severity of pancreatitis, as assessed by the BISAP and MCTSI scores, increased significantly with age. Gender showed no significant differences, and alcohol-related cases tended to have higher scores, although this was not significant. Bollen et al. identified BISAP ≥3 and MCTSI ≥6 as useful cutoffs for predicting severe disease, reporting high CTSI accuracy (AUC 0.88) and no major difference between the CT and clinical scoring systems. BISAP was also a top predictor of mortality at a cutoff of ≥3.[17] Sharmaa et al. reported a lower mean BISAP score (2.13 ± 0.785) and a higher mean MCTSI score (7.14 ± 2.64), indicating greater radiologic severity despite a lower clinical score. While they analyzed BISAP, MCTSI, and etiology across outcomes, they did not link score variation to demographic factors.[14]

Murugadasan et al. reported a higher specificity (92.96%) and PPV (79.17%) for BISAP than for MCTSI in predicting severity, whereas MCTSI had slightly better sensitivity (68.97% vs. 65.52%). Both scores had similar negative predictive values (~86%). They did not assess severity based on age, gender, or aetiology.18 Cho et al. reported significantly higher BISAP (1.9 ± 0.9 vs. 1.0 ± 0.8, p < 0.001) and CTSI (3.5 ± 2.2 vs. 2.2 ± 1.4, p < 0.001) scores in severe AP than in mild/moderate AP. Alcohol use was significantly associated with severity (p = 0.030).[16]

BISAP and MCTSI scores are useful for assessing the severity of acute pancreatitis, with higher scores observed in older patients.

In our study, nearly half of the patients had no complications. The most frequent complications included ARF/UGIB/DIC, followed by pseudocysts and sepsis. Other complications, such as ARDS, ME, abscess, fistula, MODS, upper GI bleeding, and renal failure, were rare. Cho et al. reported significantly higher BISAP (1.9 ± 0.9 vs. 1.0 ± 0.8, p < 0.001) and CTSI (3.5 ± 2.2 vs. 2.2 ± 1.4, p < 0.001) scores in severe AP than in mild/moderate cases. Alcohol use was significantly linked to severe AP (p = 0.030), while age and BMI showed no significant difference.[16]

In our study, mortality was highest among patients aged >60 years (6 18, p = 0.01). Gender and aetiology were not significantly associated with mortality. However, BISAP >3 was significantly associated with death (7 of 19, p < 0.001), as was MCTSI >8 (6 of 16, p = 0.003). Notably, no deaths occurred among patients with BISAP scores <3. Sharmaa et al.

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reported that BISAP scores of 3–5 had high specificity (75.3%) and 100% sensitivity for predicting mortality. MCTSI also showed 100% sensitivity but low specificity (10.3%). BISAP had the highest AUROC (0.90), outperforming MCTSI (0.68) and other scores.[14] Murugadasan et al. found that all eight deaths occurred in patients with BISAP ≥3 and MCTSI ≥4. BISAP had an odds ratio of 38 and MCTSI an odds ratio of 24 for predicting mortality, both significant ($p = 0.001$). They did not analyze mortality by age, gender, or etiology.[18]

In our study, higher BISAP and MCTSI scores were associated with longer hospital stays and increased mortality. The BISAP score showed 100% sensitivity and 72% specificity, whereas the MCTSI showed 86% sensitivity and 76% specificity for predicting severity and outcomes. Manoharan et al. reported a mean hospital stay of 8.32 ± 7.74 days and observed a strong correlation between BISAP/MCTSI scores and hospital stay duration. Although sensitivity and specificity were not reported, their findings support the predictive value of both scores.[13] Murugadasan et al. showed that BISAP had a higher AUC (0.917) than MCTSI (0.853) for predicting severity. In contrast, the MCTSI outperformed BISAP in predicting pancreatic necrosis, with 100% sensitivity and NPV. Mortality was best predicted by BISAP, which showed a higher odds ratio.[18]

Narottam et al. reported eight deaths, with seven having BISAP ≥3 and all deaths occurring in patients with CTSI ≥6. BISAP showed 87.5% sensitivity and 43.2% specificity in predicting mortality, whereas the CTSI showed 100% sensitivity and 37.5% specificity. The AUC for predicting mortality was 0.735 for BISAP and 0.800 for CTSI.19 Higher BISAP and MCTSI scores were strongly associated with longer hospital stays and increased mortality in our study. BISAP was a more sensitive and specific predictor of severe outcomes, including death, supporting its usefulness in early risk assessment.

Limitations

This was a single-centre study with a limited sample size, which may have affected the generalisability of the findings. Long-term outcomes and post-discharge complications were not assessed due to short follow-up.

CONCLUSION

Alcohol was identified as the most common cause of AP, with males being more frequently affected than females. Most cases occurred in the middle-aged population, and mortality was observed in patients with severe AP. The BISAP score was a more significant predictor of disease severity and mortality than the MCTSI score. The BISAP score is a simple and reliable clinical tool for the early evaluation of AP severity, making early CT imaging within the first 24 hours often unnecessary.

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