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Original Research

A comparative study between BISAP score and HAPS score as predictors of severity in acute pancreatitis.

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Abstract

Introduction: Acute pancreatitis (AP) is a potentially life-threatening condition, with early prediction of severity being crucial for better management and outcomes. Various scoring systems exist to assess the severity of AP. The Bedside Index for Severity in Acute Pancreatitis (BISAP) and Harmless Acute Pancreatitis Score (HAPS) are two commonly used tools. This study aims to compare the accuracy of BISAP and HAPS scores in predicting the severity of AP.

Methodology: A hospital-based comparative study was conducted on 60 patients diagnosed with acute pancreatitis at a tertiary care center. Patients were evaluated using both BISAP and HAPS scoring systems within 24 hours of admission. The scores were then compared with clinical outcomes, including the development of organ failure, necrosis, intensive care unit (ICU) admission, and mortality rates. Data analysis was performed to determine the predictive value of each scoring system in relation to severity indicators.

Results: The BISAP score showed a higher sensitivity and specificity in predicting severe acute pancreatitis compared to the HAPS score. BISAP score >3 was significantly associated with complications like organ failure and ICU admission, while HAPS score had a lower predictive accuracy. Mortality was better predicted by BISAP, while HAPS was more effective in ruling out severe cases in mild presentations.

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Conclusion: The BISAP score is more effective than the HAPS score in predicting the severity of acute pancreatitis, especially in high-risk patients. Early use of BISAP can aid in better management and improved outcomes.

Keywords: Acute pancreatitis, BISAP score, HAPS score, severity prediction, organ failure, mortality

Background

Acute pancreatitis (AP) is a sudden inflammation of the pancreas that can range from mild, self-limiting disease to severe, life-threatening conditions with multi-organ failure. The global incidence of acute pancreatitis has been steadily rising, with rates ranging from 13 to 45 cases per 100,000 people annually. Mortality rates for mild cases of AP are typically less than 1%, but in cases with severe complications, particularly necrotizing pancreatitis or persistent organ failure, mortality can rise to 20-30%. Studies have shown that early identification and appropriate intervention in high-risk cases are critical in reducing mortality and improving outcomes. In India, the incidence of AP is also increasing, with gallstones and chronic alcohol consumption being the leading causes. A study from southern India showed that gallstones were responsible for 40-70% of acute pancreatitis cases, while alcohol was a contributing factor in 25-35% of cases. Odisha, a state with a high prevalence of alcohol-related liver diseases, also reports an increasing incidence of acute pancreatitis, although specific statewide data on AP is limited. Worldwide, the incidence of acute pancreatitis is increasing, with an estimated 275,000 hospitalizations in the United States annually. Mortality rates range from less than 5% in mild cases to as high as 30% in severe cases with organ failure or infected pancreatic necrosis. In Europe, the incidence varies between 4.9 and 73.4 per 100,000 population, depending on the country. Alcohol consumption and gallstone disease remain the most common etiologies.

In India, the incidence of acute pancreatitis is estimated at 10–50 cases per 100,000 population, though regional variations exist. Gallstones and alcohol are the predominant causes, with gallstone disease accounting for 30-50% of cases and alcohol-related pancreatitis responsible for up to 40% of cases, especially in southern and eastern states. A study conducted at the Postgraduate Institute of Medical Education and Research (PGIMER) in Chandigarh found that the mortality rate for patients with acute pancreatitis was 16.7%, with severe pancreatitis accounting for most of the deaths. The ability to predict the severity of acute pancreatitis early in its course is crucial for determining patient management strategies. While some patients may have mild disease and require only supportive care, others may develop severe pancreatitis that necessitates intensive monitoring and intervention. Accurate and early prediction allows for the timely allocation of medical resources and can significantly impact clinical outcomes.

Several clinical scoring systems have been developed to predict the severity of AP, including the Ranson's criteria, the Acute Physiology and Chronic Health Evaluation (APACHE II), and the Glasgow-Imrie score. However, these traditional scoring systems have limitations. They require multiple data points over several days and depend on laboratory parameters that may not be readily available in all healthcare settings. Consequently, simpler, bedside scoring systems such as the Bedside Index for Severity in Acute Pancreatitis (BISAP) and the Harmless

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Acute Pancreatitis Score (HAPS) have gained popularity for their ease of use and ability to quickly predict disease severity.

The Bedside Index for Severity in Acute Pancreatitis (BISAP) score is a simple scoring system introduced to predict mortality in patients with acute pancreatitis. The score is based on five parameters, each given one point:

- Blood urea nitrogen (BUN) > 25 mg/dL,
- Impaired mental status,
- Systemic inflammatory response syndrome (SIRS),
- Age > 60 years, and
- Presence of pleural effusion.

The BISAP score has been validated in multiple studies and shown to be a reliable predictor of severe pancreatitis and mortality. Patients with a BISAP score of 3 or more are at high risk of developing severe complications. It can be applied within the first 24 hours of admission, making it a useful tool in emergency settings. A 2010 study by Wu et al. found that the BISAP score had a similar accuracy in predicting mortality as the APACHE II score, but was much simpler to calculate. In resource-limited settings such as those found in many parts of India, the BISAP score offers a valuable tool for early risk stratification.

The Harmless Acute Pancreatitis Score (HAPS) is another simple scoring system developed to predict the likelihood of a mild disease course. The HAPS score is based on three criteria:

- The absence of rebound tenderness or guarding,
- Hematocrit < 43% in men or < 39.6% in women, and
- Serum creatinine < 2 mg/dL.

If all three criteria are met, the patient is considered to have a harmless disease course, meaning that they are unlikely to develop complications or require intensive care. The HAPS score is particularly useful in identifying low-risk patients who can be safely managed without aggressive intervention or prolonged hospital stays. Studies have demonstrated that the HAPS score has a high negative predictive value, meaning it is highly effective in ruling out severe disease. However, it is less effective at identifying patients who will go on to develop severe complications, making it a useful complement to more predictive scoring systems like BISAP.

Despite the availability of scoring systems like BISAP and HAPS, there is a need for comparative studies to evaluate their performance in different clinical settings, particularly in resource-limited environments. Both scoring systems offer significant advantages: BISAP is effective in predicting severe cases early on, while HAPS is useful in ruling out complications and identifying mild cases. However, limited research compares the two scores head-to-head, particularly in the Indian context.

In a setting like Odisha, where healthcare resources are often constrained, choosing an effective and easy-to-use scoring system can have significant implications for patient management. Given the growing incidence of acute pancreatitis in India and Odisha, a comparative study of BISAP and HAPS scores can help identify which system is more suitable for predicting disease severity in local populations. This would enable clinicians to allocate resources better, improve patient outcomes, and reduce unnecessary ICU admissions. Therefore, this study aims to compare the efficacy of these two scoring systems in predicting the severity with objectives to

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evaluate and compare the predictive accuracy of the BISAP (Bedside Index for Severity in Acute Pancreatitis) score and HAPS (Harmless Acute Pancreatitis Score) score in determining the severity of acute pancreatitis and to assess the sensitivity, specificity, positive predictive value, and negative predictive value of BISAP and HAPS scores as predictors of severity of acute pancreatitis and identify the most reliable predictor for clinical practice.

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Material and Methods

This prospective observational study was conducted in the Department of General Surgery, MKCG Medical College and Hospital over two years (June 2022 to June 2024). It includes 60 adult patients diagnosed with acute pancreatitis based on clinical presentation, serum amylase/lipase levels, and imaging findings. Patients with chronic pancreatitis, incomplete medical records, or other confounding factors affecting severity assessment are excluded. Convenience sampling is employed, and all eligible patients are assessed within the first 24 hours of admission using both BISAP (Bedside Index for Severity in Acute Pancreatitis) and HAPS (Harmless Acute Pancreatitis Score). BISAP evaluates five factors: blood urea nitrogen >25 mg/dL, impaired mental status, systemic inflammatory response syndrome (SIRS), age >60 years, and pleural effusion, while HAPS uses the absence of rebound tenderness, hematocrit <43% in men or <39.6% in women, and serum creatinine <2 mg/dL. The severity

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of acute pancreatitis is classified according to the Revised Atlanta Classification into mild, moderate, or severe. Demographic and clinical data are collected, and outcomes such as ICU admission, complications, length of stay, and mortality are recorded. Statistical analysis includes sensitivity, specificity, and ROC curves to compare the predictive accuracy of the BISAP and HAPS scores. Ethical approval is obtained from the Institutional Ethics Committee vide no. , and written informed consent is collected from all participants, ensuring confidentiality and adherence to the ethical guidelines. The results were compared with existing literature, aiming to enhance understanding and improve clinical management of intestinal obstruction in Southern Odisha. Statistical tools like JAMOVI version 2.3.18 were used to analyze and interpret the data.

Results

In this study of 60 patients with acute pancreatitis, the majority, 38 (63.3%), were aged 21-45, followed by 17 (28.3%) in the 46-60 age group, and 5 (8.4%) aged 61-81. There were 35 males (58.3%) and 25 females (41.7%). Abdominal pain was present in 100% of cases, with vomiting in 42 (70%), abdominal rigidity in 39 (65%), and back pain radiation in 36 (60%). A past history of pancreatitis was reported by 22 (36.67%), while only 4 (6.67%) had a family history. Smoking was common in 43 (71.7%), alcohol consumption in 38 (63.3%), and tobacco chewing in 31 (51.7%). Imaging was positive in 51 cases on USG and 40 on CT. Additionally, 32 patients (53.33%) had SIRS, 49 had pleural effusion, and 56 (93.33%) exhibited signs of peritonitis.

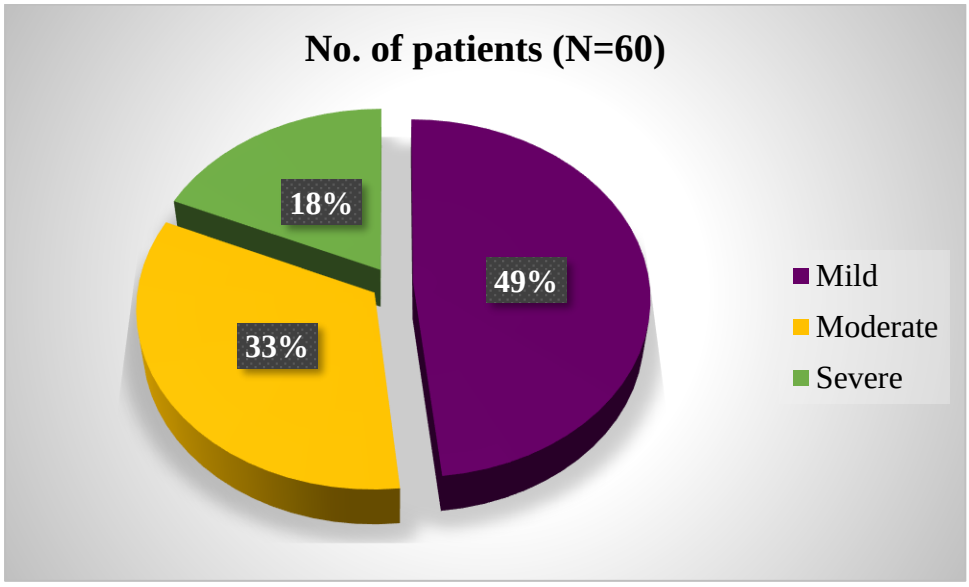

Figure 1: Severity of acute pancreatitis according to revised Atlanta classification of severity of acute pancreatitis (N=60)

Figure 1 shows maximum 29(48.4%) patients presented with mild disease while 20(33.3%) patients presented with moderate disease and only 11 (18.3%) cases have severe Acute Pancreatitis.

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BISAP SCORE	VALUE	95% CI
SENSITIVITY	100	82.78-99.92
SPECIFICITY	93.10	82.78-99.92
POSITIVE LIKELIHOOD RATIO	14.50	4.22-199.44
NEGATIVE LIKELIHOOD RATIO	0.03	0.01-0.24
POSITIVE PREDICTIVE VALUE	93.94	80.83-99.50
NEGATIVE PREDICTIVE VALUE	100	80.83-99.50
ACCURACY	96.67	88.47-99.59

Table 1: Diagnostic accuracy of BISAP scoring (N=60)

The sensitivity and specificity of the BISAP score are both notably high at 100% & 93.10% respectively, with confidence intervals indicating precise estimates. This implies that the BISAP score effectively identifies individuals with and without severe acute pancreatitis. The positive likelihood ratio of 14.50 indicates strong evidence favouring a positive BISAP score in severe cases, while the low negative likelihood ratio of 0.03 suggests that a negative BISAP score reliably rules out severe pancreatitis. The positive and negative predictive values of 93.94% & 100%, further validate the accuracy of the BISAP score in predicting disease severity. The overall accuracy of 96.67% underscores the reliability of the BISAP score in clinical practice. However, the kappa statistic of 0.045 suggests only slight agreement beyond what would be expected by chance alone, indicating potential limitations in the BISAP score's ability to differentiate between severity levels. Nevertheless, the statistically significant p-value (<0.001) emphasizes the robustness of the BISAP score as a predictive tool for acute pancreatitis severity.

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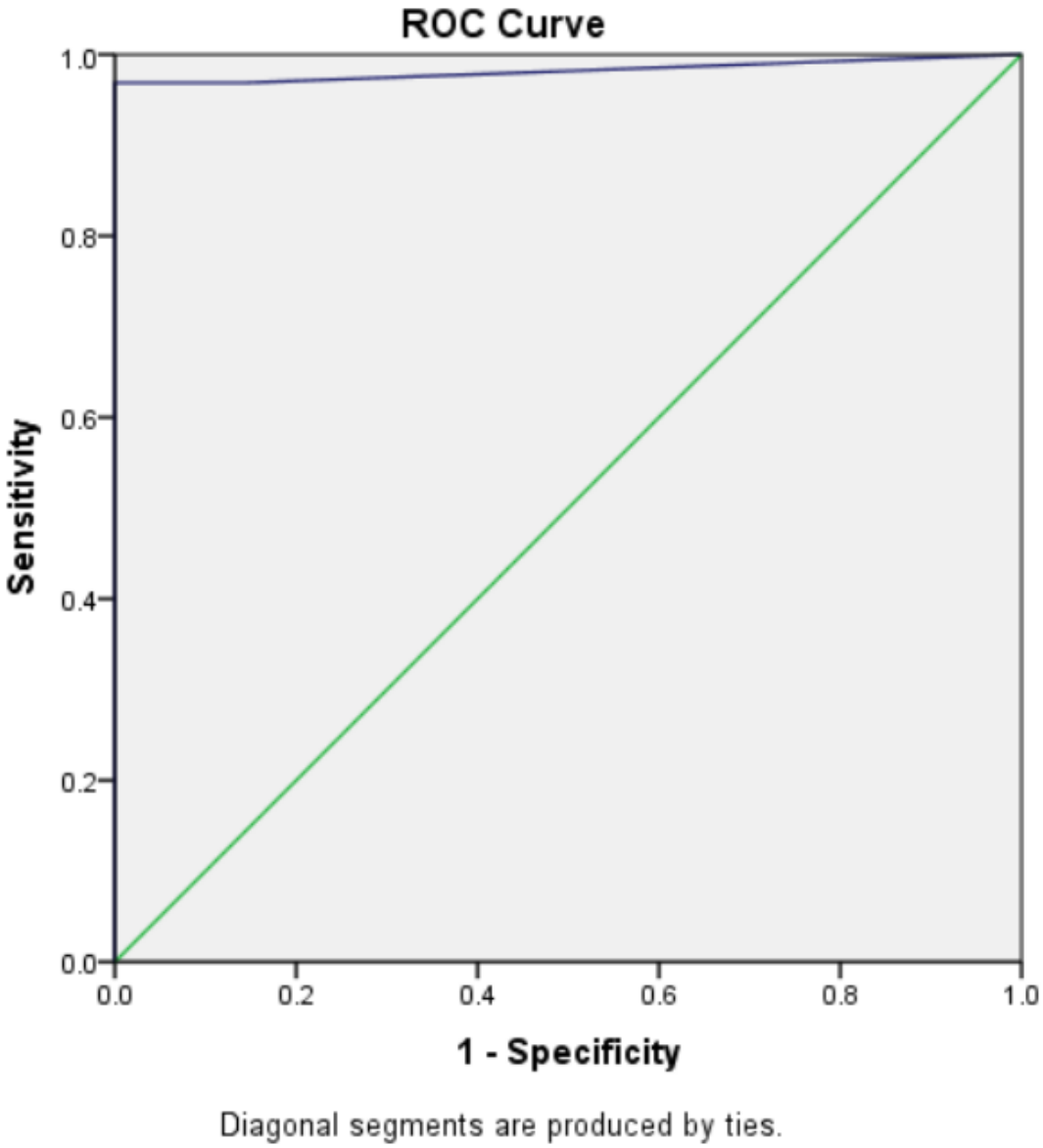

Figure 2: ROC Curve of BISAP score

The AUC for the BISAP SCORE variable is 0.982, indicating excellent discriminatory ability in distinguishing between positive and negative cases of acute pancreatitis severity. A perfect test would have an AUC of 1.0, indicating perfect discrimination, while a value of 0.5 suggests no discrimination beyond chance. The sensitivity and specificity values at different cutoff points provide further insights into the test performance. At a cutoff point of 1.50, the sensitivity is high (0.969) while the specificity is relatively low (0.143), suggesting that the test correctly identifies most true positive cases but also produces false positives. As the cutoff point increases, the sensitivity decreases while the specificity increases, reflecting a trade-off between sensitivity and specificity. Overall, the high AUC and varying sensitivity/specificity values indicate that the BISAP SCORE variable is a strong predictor of acute pancreatitis severity, providing valuable diagnostic information for clinical decision-making.

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PREDICTIVE TOOLS	VALUES
SENSITIVITY	48.3
SPECIFICITY	51.6
POSITIVE LIKELIHOOD RATIO	0.99
NEGATIVE LIKELIHOOD RATIO	1.001
POSITIVE PREDICTIVE VALUE	65.9
NEGATIVE PREDICTIVE VALUE	34.0
ACCURACY	49.5

Table 2: Diagnostic accuracy of HAPS scoring (N=60)

The HAPS score parameters reveal several noteworthy findings. The sensitivity of the HAPS score is moderate at 50%, indicating its ability to correctly identify half of the patients with severe acute pancreatitis, with a confidence interval that provides a reasonable estimate of this measure. However, the specificity is relatively low at 25%, suggesting a higher rate of false positives. The positive likelihood ratio of 0.67 implies weak evidence in favor of a positive HAPS score in severe cases, while the negative likelihood ratio of 2 indicates limited value in ruling out severe pancreatitis with a negative HAPS score. The positive predictive value of 43.24% suggests that only around 43% of patients with a positive HAPS score truly have severe pancreatitis, while the negative predictive value of 30.43% indicates that approximately 30% of patients with a negative HAPS score are correctly classified as not having severe pancreatitis. The overall accuracy of the HAPS score is 38.33%, demonstrating its limited performance in correctly predicting disease severity. The kappa statistic of 0.045 suggests slight agreement beyond chance, while the statistically significant pvalue (<0.001) highlights the significant association between the HAPS score and acute pancreatitis severity. These findings underscore the modest predictive ability of the HAPS score.

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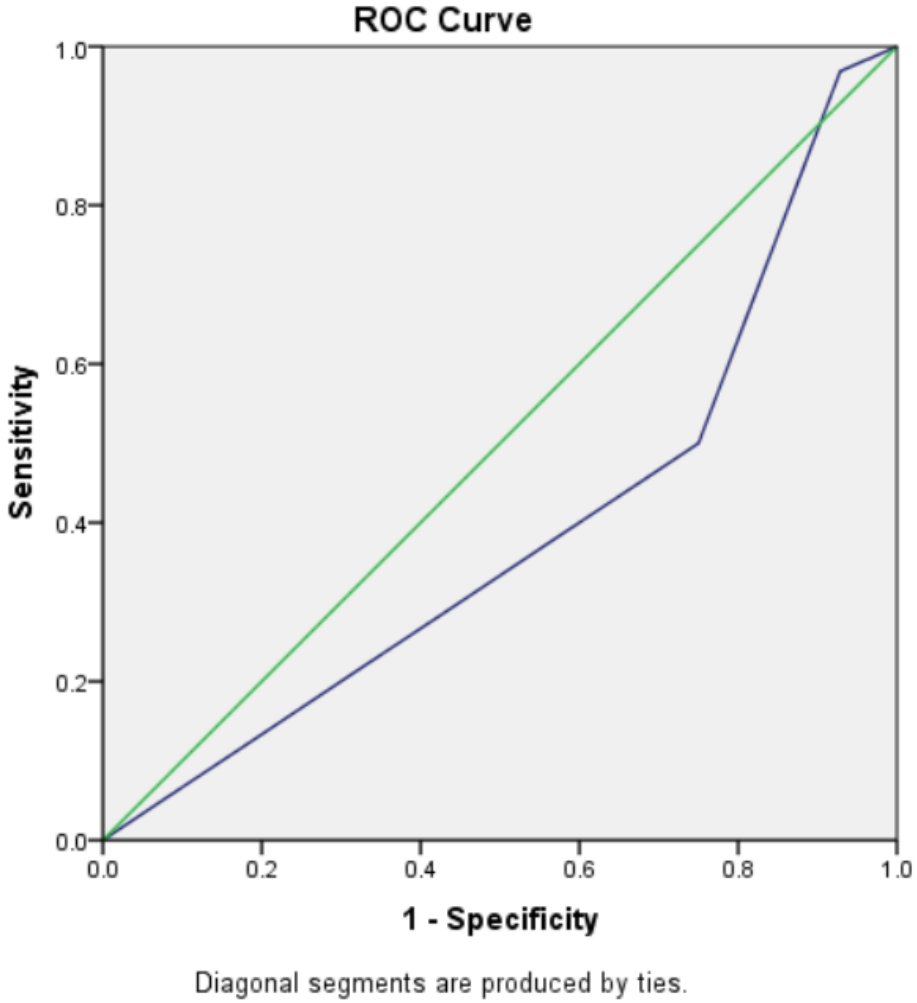

Figure 3: ROC Curve of HAPS score (N=60)

The Area Under the Curve (AUC) for the HAPS SCORE variable is 0.377, with a standard error of 0.073 and an asymptotic significance of 0.101. The 95% confidence interval for the AUC ranges from 0.233 to 0.520. These results suggest that the discriminatory power of the HAPSSCORE variable in distinguishing between positive and negative cases of acute pancreatitis severity is limited. The coordinates of the curve demonstrate the sensitivity and specificity at different cutoff points. At a cutoff point of 1.5, the sensitivity is relatively high (0.968), indicating that the test correctly identifies most true positive cases, while the specificity is also reasonably high (0.931), suggesting a low rate of false positives. However, as the cutoff point increases, both sensitivity and specificity decrease, indicating a less reliable performance of the test. Overall, the AUC value, coupled with the sensitivity/specificity trade-offs, suggests that the HAPSSCORE variable may not be a reliable predictor of acute pancreatitis severity and may have limited diagnostic utility in clinical settings.

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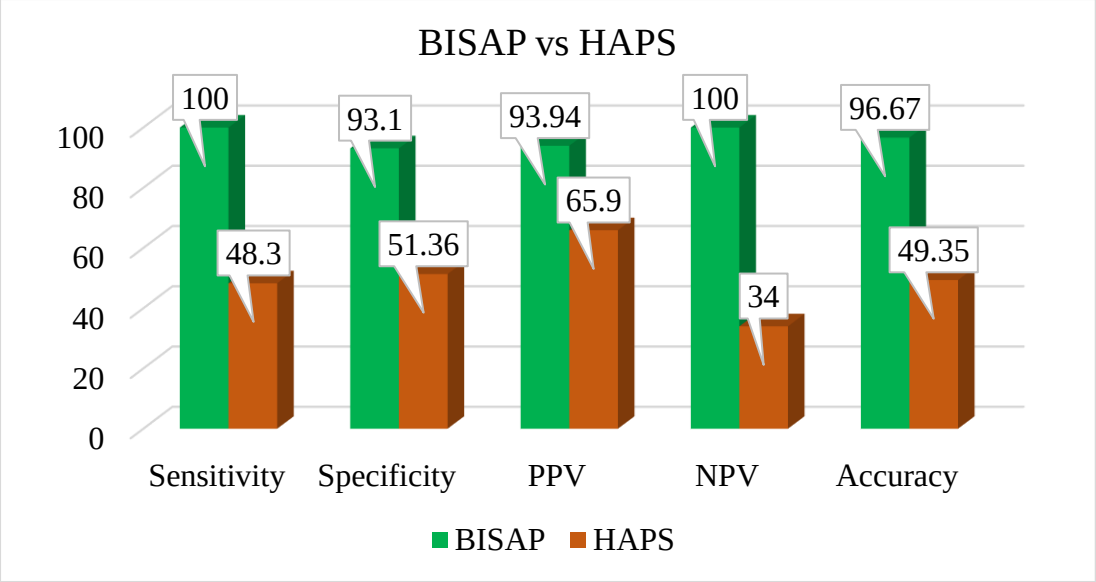

Figure 4: Bar graph depicting BISAP vs HAPS score (N=60)

The bar graph compares the BISAP and HAPS scores in terms of sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and accuracy. BISAP outperforms HAPS in all parameters, showing a sensitivity of 100% compared to HAPS's 48.3%, and a specificity of 93.1% versus HAPS's 51.36%. BISAP also demonstrates a higher PPV of 93.94% compared to HAPS's 65.9%, and an NPV of 100%, while HAPS has an NPV of 34%. Lastly, BISAP's accuracy is 96.67%, almost double that of HAPS, which stands at 49.35%. This suggests that BISAP is a superior predictor for severity in acute pancreatitis.

Discussion

The study compared the performance of BISAP (Bedside Index for Severity in Acute Pancreatitis) and HAPS (Harmless Acute Pancreatitis Score) in predicting the severity of acute pancreatitis (AP) in 60 patients. The findings show that BISAP is superior to HAPS in all diagnostic parameters, including sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and accuracy. This aligns with previous studies on the utility of these scoring systems, underscoring the significance of early risk stratification in acute pancreatitis.

BISAP demonstrated 100% sensitivity, indicating its ability to correctly identify all patients with severe acute pancreatitis, and a specificity of 93.1%, showing that it can also effectively rule out non-severe cases. The high PPV of 93.94% and NPV of 100% validate BISAP's robust predictive capacity. The overall accuracy of 96.67% further highlights its clinical reliability. HAPS, on the other hand, showed significantly lower diagnostic performance. Its sensitivity was 48.3%, meaning it missed nearly half of the severe pancreatitis cases, and its specificity was 51.36%. The HAPS score's low PPV of 65.9% and NPV of 34% suggest limited utility in both confirming and ruling out severe acute pancreatitis. Overall, HAPS's accuracy of 49.35% indicates that it is not a dependable tool for determining disease severity. The BISAP score has been extensively validated in previous research as an accurate predictor of acute pancreatitis severity. A study by Papachristou et al. (2010) reported similar high diagnostic performance, with BISAP showing a sensitivity of 85% and specificity of 91%, which are comparable to the current study's findings. BISAP's ease of use, requiring only five parameters (BUN >25 mg/dL,

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impaired mental status, SIRS, age >60 years, and pleural effusion), makes it a practical tool for clinicians to predict severe pancreatitis early, often within the first 24 hours of hospitalization.

A study by Wu et al. (2008) first proposed BISAP as a simple bedside scoring tool, and since then, it has gained widespread use due to its efficiency and accuracy. Several subsequent studies have confirmed its strong predictive ability for severe acute pancreatitis. For instance, a study by Jang et al. (2011) also demonstrated that BISAP had a high predictive value for mortality in acute pancreatitis, with an area under the curve (AUC) of 0.82, further confirming the efficacy of BISAP as observed in this study's ROC curve analysis. The current study's ROC analysis of the BISAP score showed an AUC of 0.982, indicating excellent discriminatory power in distinguishing between mild and severe acute pancreatitis. This is consistent with the findings of Cho et al. (2015), who reported an AUC of 0.86 for BISAP, reinforcing its status as a reliable tool in clinical settings.

HAPS was initially introduced as a scoring system to identify patients with mild, non-severe acute pancreatitis and allow for outpatient management. However, its limited utility in predicting severe cases has been consistently demonstrated. In this study, HAPS had a sensitivity of 48.3%, meaning it failed to identify more than half of the severe cases. This is in line with other studies that reported low sensitivity and specificity for HAPS in severe pancreatitis cases. For instance, a study by Cota et al. (2013) found that HAPS had an AUC of only 0.58, which reflects its moderate ability to rule out severe cases but not to confirm them. The current study's findings also corroborate a systematic review by Gulen et al. (2014), which concluded that HAPS is not suitable for use as a comprehensive severity prediction tool in acute pancreatitis, particularly for identifying severe cases. The low positive predictive value and poor agreement (kappa = 0.045) suggest that HAPS may result in frequent misclassification of severity, limiting its clinical utility.

While the study focuses on BISAP and HAPS, other scoring systems like the Ranson criteria, the Acute Physiology and Chronic Health Evaluation (APACHE-II), and the Glasgow-Imrie scoring system are also commonly used to assess severity in acute pancreatitis. Studies have shown that although these scoring systems are highly accurate, they are more complex and less user-friendly compared to BISAP. For example, the APACHE-II score, although accurate, requires multiple variables such as arterial blood gas measurements and lab results, making it less practical for immediate bedside assessment. In contrast, the simplicity and comparable accuracy of BISAP make it more suitable for early prediction of severity, especially in resource-limited settings. For instance, a study by DeMadaria et al. (2014) found that the BISAP score performed nearly as well as APACHE-II but required fewer clinical inputs.

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Conclusion

The results of this study underscore the need for an effective, simple scoring tool like BISAP in the early prediction of severe acute pancreatitis. Early identification of high-risk patients allows for more aggressive management, which can significantly improve outcomes. BISAP's high sensitivity, specificity, and overall accuracy make it a preferred tool for clinicians in both emergency and inpatient settings. However, there are limitations to relying solely on scoring systems like BISAP. While it effectively predicts severity, other factors such as comorbid conditions, patient age, and timely intervention also play critical roles in patient outcomes. Future research could focus on integrating BISAP with other predictive tools and biomarkers to create a comprehensive severity assessment framework. In contrast, the HAPS score's limited predictive ability, as demonstrated by its low sensitivity and accuracy, suggests that it may have minimal utility in modern clinical practice. Although it was initially designed to identify low-risk patients for outpatient management, its high rate of false negatives and low NPV indicates that it may misclassify patients, leading to inadequate treatment of severe cases.

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In conclusion, the findings of this study demonstrate that BISAP is a superior scoring system compared to HAPS in predicting the severity of acute pancreatitis. BISAP's high sensitivity, specificity, and AUC make it a reliable tool for early diagnosis and management, improving patient outcomes. HAPS, on the other hand, may be best suited for low-risk outpatient management rather than as a comprehensive severity predictor. Further studies should focus on improving existing scoring systems or developing novel biomarkers for more precise prediction of severe acute pancreatitis.

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Conflict of Interest

The author declares no conflict of interest.

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