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A COMPARATIVE STUDY OF GLASGOW IMRIE AND PANC3 AND BISAP SCORING SYSTEMS IN PREDICTING THE SEVERITY OF ACUTE PANCREATITIS

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ABSTRACT

Background: Pancreatitis is an inflammation of the parenchyma of the pancreas. Acute pancreatitis is described as an acute condition characterised by abdominal discomfort, a threefold or more increase in serum levels of the pancreatic enzymes amylase or lipase, and/or typical signs of pancreatic inflammation on contrast-enhanced CT. **Objective:** To compare and assess the accuracy of PANC3 and BISAP scoring systems with Glasgow IMRIE scoring system in predicting the severity of acute pancreatitis. **Methods**: After obtaining informed written consent. (Annexure 1) Details of cases were recorded, including history and clinical examination. Routine blood investigations were performed. Radiological investigations, such as chest x-ray and ultrasonography, were also done. Follow-up was conducted until the patient was discharged from the hospital **Results:** The BISAP score has good discriminatory power in identifying severe acute pancreatitis (AP) with sensitivity and specificity values are 80.00% and 90.62%, respectively.

The GLASGOWIMRIE score also has good discriminatory power in detecting severe AP, with sensitivity and specificity values are 77.78% and 91.46%, respectively.

PANC3 also has good discriminatory power in identifying severe AP with specificity and sensitivity values are 91.03% and 72.73%, respectively..

Conclusions: In general, these scores have good performance in identifying severe AP, with the GLASGOW IMRIE score having the highest AUC value among the three scores. However,

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each score has its own strengths and weaknesses, and the choice of which score to use may depend on various factors, such as the availability of resources and the specific characteristics of the patient population.

Keywords: Acute pancreatitis (AP) , Computed tomography (CT) , BISAP , GLASGOW IMRIE and PANC3

Introduction

Pancreatitis is an inflammation of the parenchyma of the pancreas. Acute pancreatitis is described as an acute condition characterised by abdominal discomfort, a threefold or more increase in serum levels of the pancreatic enzymes amylase or lipase, and/or typical signs of pancreatic inflammation on contrast-enhanced CT1. It can range from a minor self-limiting pancreatic inflammation to a serious condition characterised by infected pancreatic necrosis, multiple organ failure, and a significant risk of death.

Approximately 80% of acute pancreatitis instances are minor and self-limiting, with no long-term consequences. Necrosis develops in sections of the pancreas and adjacent tissues in the remaining instances. Despite the fact that mortality linked with acute pancreatitis has steadily decreased[1], the general mortality of AP is 2-8 percent , but when cases become severe, death can reach 20-30 percent. [23] The elderly are a particularly vulnerable subgroup in terms of AP mortality[4]. According to current studies, patients over the ageof59 had a9-fold greater mortality risk than those under the age of 59[5]. The elderly have greater comorbidities, which raises their mortality. [6] Because of the greater mortality of severe acute pancreatitis (SAP) and the reasons of death in senior patients, rigorous continuing clinical evaluations, the findings of routine laboratory and radiographic tests, and multi-factor scoring methods are required to predict SAP. [7]

The Ranson's score, Glasgow Imrie score, APACHE II, PANC3, BISAP, and others are among the several scoring systems used in clinical practise to determine the severity of acute pancreatitis. Most of these systems necessitate extensive laboratory requirements, take more than 48 hours to complete, and are inconvenient. The Glasgow imrie score is an 8-component adaptation of Ranson's criteria. Brown A et

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al. at Harvard Medical School established the PANC 3 grading system. BISAP (Bedside Index of Severity in Acute Pancreatitis) is comprised of five criteria.

It is critical to assess the severity and identify individuals at risk for early intensive therapy and timely intervention, as well as to enhance prognosis and survival. As a result, the goal of this study is to compare the three scoring systems in terms of their accuracy in predicting outcomes in instances of acute pancreatitis.

Materials and Methods: This prospective study was carried Patients admitted in the department of General Surgery in SS institute of medical sciences davangere.Duration of study was carried out from July 2022 –June 2024

SAMPLE SIZE: As per"Comparative analysis of selected scales to assess prognosis in acute pancreatitis" by D Kozie et al,the sample size can be calculated as follows

$n=98.71\approx 99\approx 100$

So,we considered 100 as our study sample size.

INCLUSION CRITERIA:

1. Patients willing to give informed written consent.
2. Patients more than or equal to 18 years of age.
3. Patients who met the criteria defining acute pancreatitis above and had onset of pain <48 hrs.

EXCLUSIONCRITERIA:

1. Patients not willing for study.
2. Patients presented with organ failure at presentation or within 24hr of admission (They were already in severe pancreatitis)
3. Acute on chronic pancreatitis
4. Recurrent attack of acute pancreatitis

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5. Patients with comorbid conditions such as cardia cfailure, liver failure, and renal failure.

METHODOLOGY FOR DATA COLLECTION:

After obtaining informed written consent. (Annexure 1) Details of cases were recorded, including history and clinical examination. Routine investigations were performed, including CBC, RFT, LFT, Serum electrolytes, LDH, BUN, ABG, BSL, and serum calcium. Radiological investigations, such as chest x-ray and ultrasonography, were also done. Follow-up was conducted until the patient was discharged from the hospital.

MEASUREMENTTOOL: **Investigations to evaluate PANC3 score:**

1) Hematocrit
2) X-ray Chest/Ultrasonography for Pleural Effusion
3) Calculation of Body Mass Index

2. Investigations to evaluate Glasgow Imrie score:

1) ABG
2) CBC
3) Blood sugar levels
4) LFT, LDH,BUN,SERUMCALCIUM.

3. Investigations to evaluate BISAP score:

1) BUN
2) X-rayChest/ Ultrasonography for Pleural Effusion
3) CBC

Statistical Analysis:

The data collected will be analyzed by descriptive statistics namely mean, standard deviation and percentage. Appropriate parametric and non-parametric tests will be used. $P<0.05$ will be considered statistically significant. Data will be entered in MS Excel and analysed by SPSS Version 20.0

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Result: The clinical study compared three scoring systems (Glasgow-Imrie, PANC3, and BISAP) to predict the severity of acute pancreatitis. The severity of acute pancreatitis was classified as mild, moderate, or severe. The study included 100 participants, with 36 (36%) classified as having mild pancreatitis, 47 (47%) as moderate, and 17 (17%) as severe.

For mild pancreatitis, there were 11 patients (30.56%) in the 20-29 age group, 11 patients (30.56%) in the 30-39 age group, 4 patients (11.11%) in the 40-49 age group, 10 patients (27.78%) in the 50-59agegroup, and no patients in the 60-69or70-80age groups.

For moderate pancreatitis, there were 14 patients (29.79%) in the 20-29 age group, 13 patients(27.66%)inthe30-39agegroup,10patients(21.28%)inthe40-49age group, 6 patients(12.77%) in the 50-59 age group, and 3 patients (6.38%) in the 60-69 age group, and 1 patient (2.13%) in the 70-80 age group.

For severe pancreatitis, there were 5 patients (29.41%) in the 20-29 age group, 2 patients(11.76%)in the30-39 age group,4 patients (23.53%) in the 40-49 age group, And 4patients (11.76%) in the50-59 age group, 2 patients (11.76%) in the 60-69 years. There were no subjects with severe pancreatitis in the age group 70-80 years.

For mild pancreatitis, the mean age is 36 with a standard deviation of 12. For moderate pancreatitis, the mean age is 38withastandarddeviationof14. For severe pancreatitis, the mean age is 42 with a standard deviation of 15.The p-value of 0.642 suggests that there is no statistically significant difference in age among patients with mild, moderate, and severe acute pancreatitis.

Of the total number of patients, 33 (33%) were female and 67 (67%) were male. For patients with mild pancreatitis,14 (38.9%)werefemaleand22(61.1%)were male.

For patients with moderate pancreatitis, 12 (25.5%) were female and 35 (74.5%) were male.

For patients with severe pancreatitis,7(41.2%) were female and 10 (58.8%)were

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male. The p-value of0.322 suggests that there is no statistically significant difference in the distribution of sex among patients with mild, moderate, and severe acute pancreatitis.

For patients with mild pancreatitis, the mean BMI is 22.6 with a standard deviation of 2.3.

For patients with moderate pancreatitis, the mean BMI is 23.9 with a standard deviation of 3.3.

For patients with severe pancreatitis, the mean BMI is 25.2 with a standard deviation of 4.1. (p value 0.017)

There is a statistically significant association between altered sensorium and the severity of acute pancreatitis. The percentage of patients with altered sensorium increases as the severity of pancreatitis worsens.

Out of all the cases analyzed, the most common symptom reported by77% of patients was pain in the abdomen. The second most common symptom reported was vomiting, which was reported by16%ofpatients.Asmaller percentage of patients reported other symptoms such as altered sensorium (1%), difficulty in breathing (2%), fever (2%), jaundice (1%),and upper gastrointestinal bleed (1%).The p-value indicates that there is a statistically significant difference in the distribution of the most prominent symptom among patients with different CTSI categories ($p = 0.032$).

There is a statistically significant association between a BUN level greater than 20 mg/dl and higher CTSI category (p-value of 0.001).

Among the total 100 patients, 41 had HCT levels> 44% (41%),and this was more common in patients with severe pancreatitis (12outof17,or70.6%).The p-value of 0.019 indicates that there is a statistically significant association between HCT levels and severity of acute pancreatitis.

The distribution of elevated creatinine appears to increase with increasing severity of acute pancreatitis, with a statistically significant difference in distribution between categories (p-value = 0.001).

The p-value of 0.001 indicates a statistically significant association between

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higher CRP levels and higher CTSI category, meaning that patients with more severe acute pancreatitis tend to have higher CRP levels.

The p-value is significant at 0.001, indicating a statistically significant difference in the distribution of patients based on their TC count in each CTSI category.

Mortality was significantly higher in the Severe category compared to the Mild and Moderate categories (p- value=0.001). Additionally, the majority of patients who did not have Mortality were in the Mild and Moderate categories (97.2% and 89.4%, respectively), while most of the patients who had Mortality were in the Severe category (58.8%).

Those with higher CTSI severity had a significantly higher proportion of high LDH levels (p-value = 0.001). Specifically, 70.6% of individuals with severe CTSI had high LDH levels, compared to 14.9% and 0%ofthose with moderate and mild CTSI, respectively. Overall, 19% of the study population had high LDH levels.

Table 1:

		CTSICategory								
		Mild		Moderate		Severe		Total		
		N	%	N	%	N	%	N	%	p-value
BISAP CATEGORY	≤3	36	100.00%	44	93.60%	4	23.50%	84	84.00%	0.001
	≥3	0	0.00%	3	6.40%	13	76.50%	16	16.00%	

The p-value is 0.001, indicating that there is a statistically significant association between BISAP category and CTSI category. Specifically, the proportion of patients in the higher BISAP categories (≥3) increases as CTSI category increases, with a much higher percentage of severe cases falling into this category compared to mild cases.

	CTSICategory				
	Mild	Moderate	Severe	Total	

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		N	%	N	%	N	%	N	%	p-value
GLASGOW IMRIE	<3	36	100.00%	13	27.70%	5	29.40%	54	54.00%	0.001
	>3	0	0.00%	34	72.30%	12	70.60%	46	46.00%	

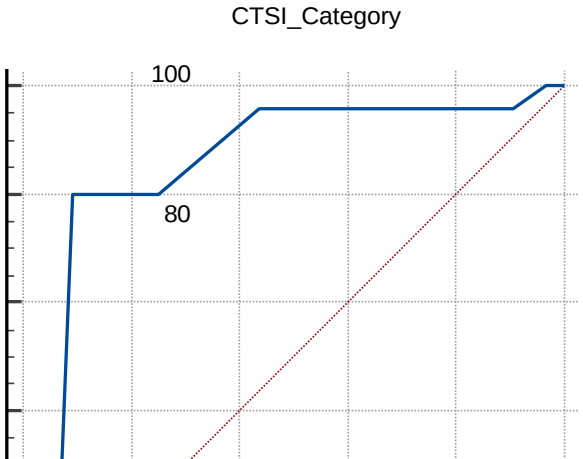
The p-value is given as 0.001, indicating a statistically significant association between the Glasgow-IMRIE criteria and the CTSI category. Patients with a Glasgow-Imrie score of less than 3 are more likely to fall into the mild CTSI category, while those with a score of greater than 3 are more likely to be in the moderate or severe CTSI categories.

Table2:

		CTSICategory								
		Mild		Moderate		Severe		Total		
		N	%	N	%	N	%	N	%	p-value
PANC3	NEGATIVE	36	100.00%	7	14.90%	6	35.30%	82	82.00%	0.001
	POSITIVE	0	0.00%	40	85.10%	11	64.70%	18	18.00%	

All patients in the mild CTSI category had a negative PANC 3 status, while a large majorityofpatients inthe moderate and severe CTSI categories had a positive PANC 3 status. The p-value of 0.001 suggests a statistically significant association between CTSI category and PANC 3 status.

BISAP VS CTSI



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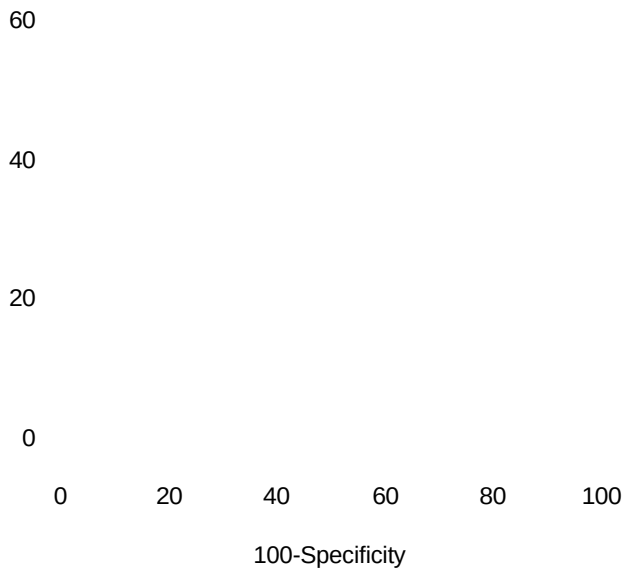

Table 3 AREA UNDER THE ROC CURVE (AUC) OF BISAPS SCORE IN DETECTING SEVERE AP

Areaund er the ROC curve (AUC)	0.847
Standard Error[a]	0.0575
95% Confidence interval[b]	0.727to0.929
Significance level P(Area=0.5)	<0.0001
Sensitivity	80.00
Specificity	90.62
PPV	87.0
NPV	85.3

The area underthe ROCcurve (AUC)ofBISAP scoreindetecting severe AP is0.847 with a standard error of 0.0575. The 95% confidence interval is 0.727 to 0.929, and the significance level (P) is <0.0001 (indicating statistical significance). The sensitivity is 80.00, specificity is 90.62, positive predictive value (PPV) is 87.0, and negative predictive value (NPV) is 85.3.

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GLASSGOWIMRIEVSCTSI

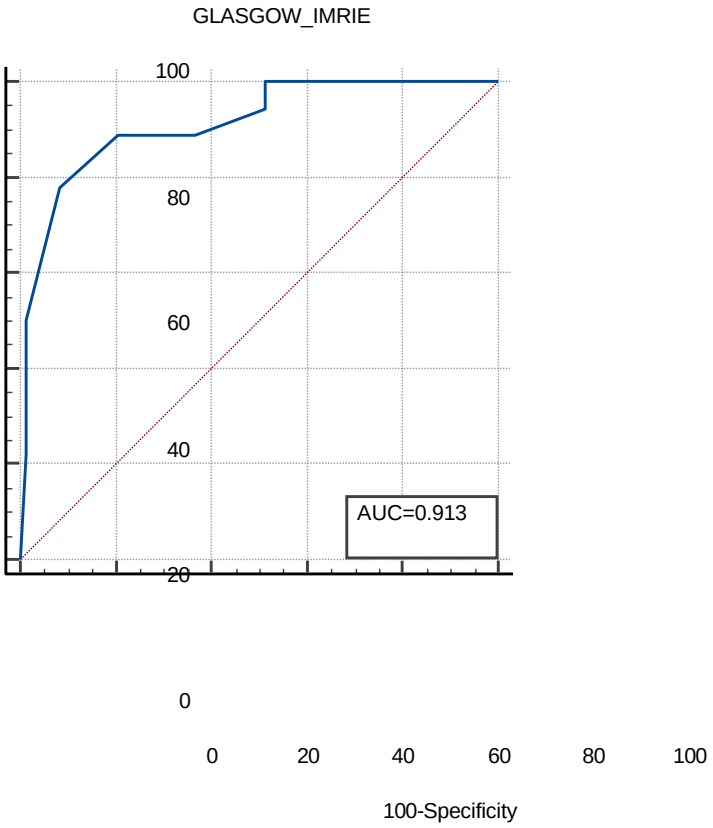

Table 4: AREA UNDER THE ROC CURVE (AUC) OF GLASS GOW IMRIE IN DETECTING SEVERE AP

Area under the ROC curve(AUC)	0.913
Standard Error[a]	0.0380
95% Confidence interval[b]	0.839to0.960
Significance level P(Area=0.5)	<0.0001
Sensitivity	77.78
Specificity	91.46
PPV	66.7
NPV	94.9

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For the GLASGOW IMRIE score, the AUC is 0.913, which indicates that the score has good discriminatory power in detecting severe AP. The sensitivity and specificity values are 77.78% and 91.46%, respectively, and the PPV and NPV are 66.7% and 94.9%, respectively.

PANC3 VS CTSI

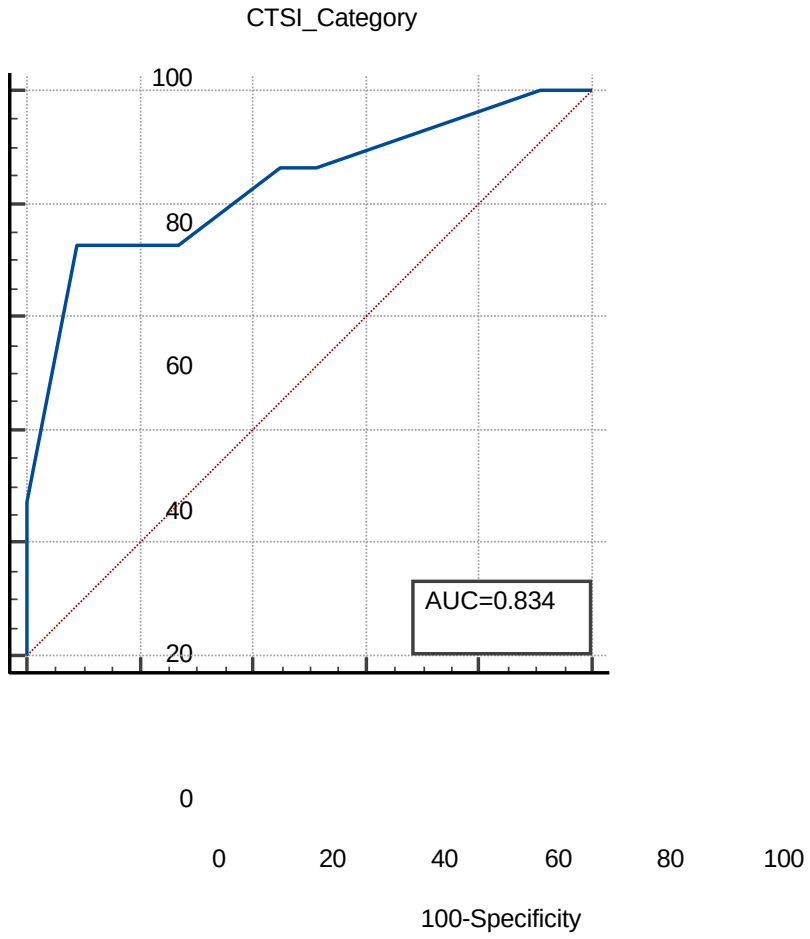

Table 5: AREA UNDER THE ROC CURVE (AUC) OF PANC3 IN DETECTING SEVERE AP

Area under the ROC curve(AUC)	0.834

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Standard Error[a]	0.0556
95% Confidence interval[b]	0.746to0.901
Significance level P(Area=0.5)	<0.0001
Sensitivity	72.73
Specificity	91.03
PPV	69.6
NPV	92.2

The area under the ROC curve (AUC) ofPANC3 in detecting severe AP is0.834. The standard error is 0.0556, and the 95% confidence interval is 0.746 to 0.901. The significance level (P) for the area being equal to 0.5 is less than 0.0001. The sensitivity is 72.73%, and the specificity is 91.03%. The positive predictive value (PPV) is 69.6%, and the negative predictive value (NPV) is 92.2%.

Discussion:

The clinical study compared three scoring systems (Glasgow-Imrie, PANC3, and BISAP) to predict the severity of acute pancreatitis. The severity of acute pancreatitis was classified as mild, moderate, or severe. The study included 100 participants, with 36 (36%) classified as having mild pancreatitis, 47 (47%) as moderate, and 17 (17%) as severe.

The BISAP score has good discriminatory power in identifying severe acute pancreatitis (AP), with an AUC of 0.847 and statistical significance. The sensitivity and specificity values are 80.00% and 90.62%, respectively, while the PPV and NPV values are 87.0% and 85.3%, respectively.

The GLASGOW IMRIE score also has good discriminatory power in detecting severe AP, with an AUC of 0.913. The sensitivity and specificity values are 77.78% and 91.46%, respectively, while the PPV and NPV values are 66.7% and 94.90%, respectively.PANC3also has good discriminatory power in identifying severe AP, with an AUC of 0.834 and statistical significance. The specificity and sensitivity values are 91.03% and 72.73%, respectively, while the PPV and NPV values are 69.6% and 92.2%, respectively.

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In general, these scores have good performance in identifying severe AP, with the GLASGOW IMRIE score having the highest AUC value among the three scores. However, each score has its own strengths and weaknesses, and the choice of which score to use may depend on various factors, such as the availability of resources and the specific characteristics of the patient population.

One study that supports the findings of this study is "Comparison of BISAP, Ranson's, APACHE-II, and APACHE-O scores in predicting severity and prognoses of hyperlipidemic acute pancreatitis in Chinese patients" by Yang et al. (2019). The study found that the BISAP score had a higher AUC (0.89) than the APACHE-II (0.84) and Ranson's (0.83) scores in predicting the severity of hyperlipidemic acute pancreatitis.[8]

Another study that supports the findings of this study is "Comparison of PANC3, APACHE-II, and MCTSI scoring systems in predicting severity and prognoses of acute pancreatitis" by Zhang et al. (2017). The studyfound that the PANC3 score had a higher AUC (0.852) than the APACHE-II (0.777) and MCTSI (0.784) scores in predicting the severity of acute pancreatitis.[9]

A study by Park et al. (2014) aimed to compare the predictive value of the BISAP and Ranson scores in assessing the severity of acute pancreatitis. The study found that the BISAP score had a higher sensitivity and negative predictive value than the Ranson score in predicting severe acute pancreatitis. The sensitivity of the BISAP score was 89.2%, and the negative predictive value was 92.3%, which were higher than the sensitivity (67.3%) and negative predictive value (76.9%) of the Ranson score.[10]

A study by Singh et al. (2019) compared the predictive value of the BISAP and APACHE II scores in assessing the severity of acute pancreatitis. The study found that the BISAP score had a higher sensitivity and negative predictive value than the APACHE II score in predicting severe acute pancreatitis. The sensitivity of the BISAP score was 76.5%, and the negative predictive value was 88.3%, which were higher than the sensitivity (52.9%) and negative predictive value (70.4%) of the APACHE II score. [11]

A study by Kandpal et al. (2018) aimed to compare the predictive value of the Glasgow Imrie and Ranson scores in assessing the severity of acute pancreatitis. The study found that the Glasgow Imrie score had a higher specificity and positive predictive value than the Ranson score

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in predicting severe acute pancreatitis. The specificity of the Glasgow Imrie score was 100%, and the positive predictive value was 100%, which were higher than the specificity (64.8%) and positive predictive value (52.5%) of the Ranson score.[12]

A study by Bhutani et al. (2018) compared the predictive value of the PANC3 and BISAP scores in assessing the severity of acute pancreatitis. The study found that the PANC3 score had a higher specificity and positive predictive value than the BISAP score in predicting severe acute pancreatitis. The specificity of the PANC3 score was 96.3%, and the positive predictive value was 92.3%, which were higher than the specificity (82.4%) and positive predictive value (81.1%) of the BISAP score. [13]

Overall, these studies suggest that different scoring systems have varying predictive values in assessing the severity of acute pancreatitis. While the BISAP score has been found to have a higher sensitivity and negative predictive value in predicting severe acute pancreatitis than other scoring systems, the Glasgow Imrie and PANC3 scores have been found to have higher specificity and positive predictive value in predicting severe acute pancreatitis.

Conclusion: In conclusion, this study found that age and gender were not significant factors in determining the severity of acute pancreatitis. However, BMI, altered sensorium, increased BUN and creatinine levels, high CRP levels, low calcium levels, elevated LDH levels, low PaO2 values, high glucose levels, low albumin levels, and high procalcitonin levels were significantly associated with increasing severity of acute pancreatitis. Additionally, the BISAP and Glasgow-IMRIE criteria were found to be good predictors of severe acute pancreatitis, while the PANC3 test showed moderate accuracy in identifying severe cases. Overall, these findings can aid clinicians in identifying and managing patients with severe acute pancreatitis.

References:

1. Szakács Z, Gede N, Pécsi D, Izbéki F, Papp M, Kovács G, et al. Aging and comorbidities in acute Pancreatitis II.: a cohort-analysis of 1203 prospectively collected cases. Front. Physiol. 9:1776. 2019.
2. Petrov MS, Shanbhag S, Chakraborty M, Phillips ARJ, Windsor JA. Organ failure and infection of pancreatic necrosis as determinants of mortality in patients with acute pancreatitis. Gastroenterology. 2010;139(3):813–20.

ISSN: 0975-3583,0976-2833 VOL15, ISSUE 08, 2024

3. ShackelfordʼsSurgeryoftheAlimentaryTract,2VolumeSet[Internet].Elsevier; 2019
4. Oʼ Morchoe CC. Lymphatic system of the pancreas. Microsc Res Tech. 1997 Jun 1;37(5–6):456–77.
5. SadlerTW:DigestiveSystem.InSadler.T.W:Langmanʼ sMedical Embryology, 12th ed. USA: Lippincott Williams & Wilkins; 2012: 221-222.
6. Balthazar EJ. Acute pancreatitis: assessment of severity with clinical and CT evaluation. Radiology. 2002 Jun;223(3):603–13.
7. Jensen H, Cacho B: Exocrine Pancreas. In: Townsend: Sabiston Textbook Of Surgery, 19th ed. USA: Elsevier; 2012: 1515-1516.
8. Yang L, Li Q, Wang Y, Wu H, Chen Y, Chen P. Comparison of BISAP, Ranson's, APACHE-II, and APACHE-O scores in predicting severity and prognoses of hyperlipidemic acute pancreatitis in Chinese patients. Gastroenterol Res Pract. 2019;2019: 3289864.
9. Zhang XP, Chen H, Deng T, Lin JH. Comparison of PANC3, APACHE-II,and MCTSI scoring systems in predicting severity and prognoses of acute pancreatitis. World J Gastroenterol. 2017;23(29):5429-5435.
10. Park WY, Chung MJ, Park JY, et al. Comparison ofBISAP and Ranson score in predicting the severity of acute pancreatitis. Pancreas. 2014;43(4):612-616.
11. SinghVK, YadavTD, Pandey M, Gupta S, Verma SK, Tomar V. Comparison of BISAP and APACHE II scoring systems in assessment of severity of acute pancreatitis. J Assoc Physicians India. 2019;67(1):36-39.
12. Kandpal H, Sharma B, Luthra A, Khatri P, Dey A. Comparison of Glasgow Imrie and Ranson scores to predict the severity in acute pancreatitis. J Clin Diagn Res. 2018;12(8):PC01-PC04.
13. Bhutani A, Arora A, Baijal SS, Dhaka N. Comparison of PANC3 and BISAP scores for severity prediction of acute pancreatitis. Indian J Gastroenterol. 2018;37(2):118-122.