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A COMPARATIVE STUDY OF RANSON'S SCORING VS BISAP SCORING IN PREDICTING MORBIDITY AND MORTALITY IN ACUTE PANCREATITIS

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ABSTRACT

Aims:
To identify association of Ranson's criteria and BISAP scoring with the outcome of Acute Pancreatitis.

Materials and Methods:
This 24-month prospective longitudinal study at the Department of General Surgery, RIMS, Ranchi,

Jharkhand, included all acute pancreatitis patients attending the surgery OPD and emergency services. Patients over 18 years old diagnosed according to the Atlanta criteria were included, while those who refused participation or presented with an acute abdomen more than 48 hours after pain onset were excluded. Based on a pancreatitis prevalence study (Ouyang et al., BMC Medicine, 2020), a sample size of 76 was calculated with a 95% CI and 5% margin of error, but 203 samples were included to enhance study power.

Results:
This study of 203 acute pancreatitis patients predominantly involved males (77.3%), mostly aged 31-40 years (32.0%). Alcohol consumption (76.8%) and gallstones (23.2%) were major etiological factors. A mortality rate of 3.4% were observed among the subjects. Complications such as SIRS, pleural effusion, ARDS, ARF, liver failure, cardiac failure, neuropathy, abnormal hematopoiesis, MODS were observed. Continuous variables like age and TLC were statistically analyzed, revealing significant findings about disease severity and prognosis.

Conclusion:
RANSON'S score offers superior prediction accuracy for morbidity and mortality in acute pancreatitis, BISAP score's ease of calculation and immediate applicability make it a practical alternative. Each score has its advantages, with RANSON'S being more effective over 48 hours and BISAP providing quick, bedside assessment.

KEYWORDS: Ranson's scoring; BISAP scoring; acute pancreatitis; Systemic Inflammatory Response Syndrome; Acute Respiratory Distress Syndrome; Acute Renal Failure; Multiple Organ Dysfunction Syndrome; abnormal hematopoiesis; prognosis; Morbidity; Mortality

INTRODUCTION:

Acute pancreatitis varies widely in severity, ranging from mild, self-limiting cases to severe disease with multiple organ failure and high mortality. Its incidence is increasing, with approximately 20%-25% of patients developing severe forms, often leading to pancreatic necrosis, systemic inflammatory response syndrome (SIRS), multi-organ failure, and even death.[1-3] The mortality rate is about 15% for necrotizing pancreatitis and 30% for infected pancreatic necrosis.[4] Due to its wide spectrum, patients require individualized care. Mild cases can be managed with supportive care, while severe cases may need intensive care and occasionally surgical or endoscopic debridement.

Early assessment of severity is crucial due to the significant differences in morbidity and mortality between mild and severe

cases. Various criteria, such as Ranson's and BISAP scoring systems, help predict prognosis and severity. Ranson's criteria have a high negative predictive value (90%), mainly used to rule out severe acute pancreatitis, while BISAP, calculated within 24 hours of admission, helps identify patients at risk of severe disease early, improving management and outcomes.[5-9] The revised 1992 Atlanta Classification provides a more precise description of the clinical behavior and imaging characteristics of acute pancreatitis, aiding in better diagnosis and treatment. [10]

MATERIALS AND MEHODS:

The aim of this prospective longitudinal study was to identify association of the scorings of two different severity scoring systems - Ranson's criteria and BISAP scoring with the outcome of Acute Pancreatitis. This study was conducted at the surgical wards of the Department of General Surgery, RIMS, Ranchi, Jharkhand after the institutional review board approved the study protocol. All measures were taken to ensure that no personal identity of patients could be revealed. It was a brief observational study carried out within the duration of 24 months.

SUBJECTS:

Subject patients were included from both sexes, male 157 and female 46 within the age group of 21 to 80 years

TOOLS:

Socio demographic data sheet: The socio-demographic data sheet included the age and gender of the patients. It also recorded clinical information like etiological factors, years of education, marital status, religion, occupation, and habitat.

Ranson's Criteria: This is a clinical prediction rule for predicting the severity of acute pancreatitis. It includes 11 parameters measured at admission and 48 hours after admission, including age, white blood cell count, blood glucose, serum LDH, and AST levels at admission, and a range of other parameters after 48 hours. The total score helps predict the patient's prognosis.

BISAP Score (Bedside Index for Severity in Acute Pancreatitis): This scoring system includes five criteria: BUN level, impaired mental status, SIRS, age over 60 years, and pleural effusion. Each criterion scores one point, with a total score indicating the risk of mortality. BISAP score of ≥1.5 was associated with higher morbidity and mortality, with specificities for various complications ranging from 96.43% to 98.99% and positive predictive values (PPV) and negative predictive values (NPV) highlighting its diagnostic accuracy

Decision Curve Analysis (DCA): DCA was employed to evaluate the clinical usefulness and potential net benefit of different predictive models. It helps determine the practical value of using a particular model in clinical settings. DCA was specifically utilized to compare the predictive accuracy of the nomogram model ABL (which includes age, blood urea nitrogen (BUN), and lactate) with that of the APACHE IV model for predicting in-hospital mortality in acute pancreatitis patients.

Bootstrap Resampling Method: This statistical technique was used for the internal validation of the nomogram model, enhancing the reliability of the study's findings. This method involves creating multiple simulated samples from the original dataset by randomly sampling with replacement.

Nomogram Model: This model, evaluated by the concordance index (C-index) and calibration plot, is used to predict outcomes based on multiple factors. It was compared with the APACHE IV model for its predictive accuracy. Decision Curve Analysis (DCA) is employed to assess the clinical utility of the nomogram by evaluating the potential net benefit across different threshold probabilities. The results indicate that the nomogram, which utilizes readily available clinical data, provides a high predictive value for in-hospital mortality, making it a useful tool in clinical settings.

PROCEDURE:

It was a prospective longitudinal study over 24 months. The study includes patients with acute pancreatitis, aged over 18, diagnosed according to the Atlanta criteria. The sample size was calculated based on the prevalence rate of pancreatitis, and 203 participants were included to increase the study's power. Data analysis was conducted using SPSS version 25, with qualitative data expressed as percentages and quantitative data as mean ± SD or median. Statistical methods included Chi-square tests, ANOVA, and Spearman's Rank Correlation Coefficient. The study aims to compare the effectiveness of Ranson's and BISAP scoring systems in predicting the outcomes of acute pancreatitis.

STASTICAL ANALYSIS:

The collected data of all the patients was analyzed by Statistical Methods, provides an in-depth analysis of a study population, focusing on various demographic and clinical characteristics. It employs several statistical methods to analyze the data, ensuring the results are robust and reliable. The study population consists of 203 individuals, with a detailed breakdown of their age, sex, and other clinical factors.

RESULT:

The study population consists of 203 individuals. The age distribution of the study population is diverse, with the majority falling within the 31-40 years age group (32.0%), followed by the 41-50 years group (25.1%). The smallest groups are those aged 61-70 years (3.0%) and 71-80 years (1.0%). Regarding sex distribution, the study population is predominantly male (77.3%), with females comprising 22.7%.

Two primary etiological factors were examined: alcohol consumption and the presence of gallstones. A substantial portion of the population (76.8%) reported alcohol consumption, while 23.2% did not. Similarly, 76.8% of the population did not have gallstones, whereas 23.2% did. These distributions are also represented using pie diagrams for clarity. The study assesses various morbidity factors, including Systemic Inflammatory

Response Syndrome (SIRS), pleural effusion, Acute Respiratory Distress Syndrome (ARDS), acute renal failure (ARF), liver failure, cardiac failure, and neuropathy. The prevalence of these conditions in the population is relatively low:

SIRS: 3.4%; Pleural effusion: 2.5%; ARDS: 3.4%; ARF: 3.4%; Liver failure: 2.0%; Cardiac failure: 2.0%; Neuropathy: 2.5%.

The study also examines hematopoiesis, revealing that 81.8% of the population had normal hematopoiesis, while 18.2% had abnormalities, such as leukocytosis (16.7%), leukocytopenia (0.5%), thrombocytosis (0.5%), and thrombocytopenia (0.5%).

Continuous variables in the study, including age, total leukocyte count (TLC), glucose levels, lactate dehydrogenase (LDH), and several other clinical parameters, are summarized with their minimum, maximum, mean, median, and standard deviation values. Associations between continuous variables are captured using Spearman's Rank Correlation Coefficient due to non-normal distribution. The analysis also explores the relationship between morbidity factors and clinical scores like Ranson's score and BISAP score. Significant differences are found, with p-values less than 0.001 indicating strong statistical significance.

DISCUSSION:

The study examined the demographic characteristics and medical conditions of patients, revealing key patterns and associations. The majority of patients (32.0%) fell within the 31-40 age range, with 18.7% aged between 21-30 years. Male patients constituted a significant majority at 77.3%, and a notable portion of patients (76.8%) were identified as alcoholics.[12] Additionally, gallstones were found to be an etiological factor in 23.2% of the patients. These demographic insights provide a comprehensive overview of the patient population, highlighting prevalent age groups, gender distribution, and contributing factors such as alcohol consumption and gallstones.[11][12]

The study also detailed various medical conditions observed among the patients. SIRS was present in 3.4% of the cases, with most of these patients exhibiting high RANSON (≥6.5) and BISAP (≥1.5) scores. Pleural effusion was detected in 2.5% of patients, and all of these patients had elevated RANSON and BISAP scores.[16] Similarly, ARDS and ARF were each present in 3.4% of patients, with the majority showing high scores on the RANSON and BISAP scales. Additionally, liver failure and cardiac failure were both noted in

2.0% of the patients, while neuropathy was present in 2.5%. The occurrence of MODS and death were each recorded at 3.4%. These findings underscore the severity of these conditions and their strong correlation with high RANSON and BISAP scores, suggesting the utility of these scores in identifying at-risk patients.[13] The diagnostic performance of the RANSON and BISAP scores was a key focus of our analysis. The RANSON score demonstrated high sensitivity (100%) for pleural effusion, liver failure, cardiac failure, and neuropathy, and 85.71% sensitivity for SIRS, ARDS, ARF, MODS, and death.[14] Its specificity was also high, with values of 98.48% for pleural effusion and neuropathy, and 98.98% for SIRS, ARDS, ARF, MODS, and death.[15] Positive predictive values (PPV) for SIRS, ARDS, ARF, MODS, and death were 75%, while pleural effusion and neuropathy had PPVs of 62.50% and 50% for liver failure and cardiac failure. The negative predictive value

(NPV) was 100% for pleural effusion, liver failure, cardiac failure, and neuropathy, and 99.49% for SIRS, ARDS, ARF, MODS, and death.[18] The BISAP score showed lower sensitivity but high specificity for various conditions, with notable diagnostic accuracy for both scores in identifying severe cases.[17]

A total of 250 patients were screened for eligibility, presenting with acute abdomen at our hospital, RIMS Ranchi. Of these, 47 patients were excluded due to refusal to participate (31 patients) or being underage (16 patients). This left a substantial sample size for analysis, providing robust data for our findings. The study underscores the importance of RANSON and BISAP scores in predicting morbidity and mortality in acute pancreatitis, offering valuable insights into the prevalence and severity of complications such as SIRS, ARDS, ARF, MODS, and various organ failures. These insights are crucial for clinical decision-making and improving patient outcomes in acute pancreatitis management.

CONCLUSION:

RANSON'S score offers superior prediction accuracy for morbidity and mortality in acute pancreatitis, BISAP score's ease of calculation and immediate applicability make it a practical alternative. Each score has its advantages, with RANSON'S being more effective over 48 hours and BISAP providing quick, bedside assessment.

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BISAP Score				Total
		<1.5	>=1.5	
Death	No	189	7	196
	Yes	1	6	7
Total		190	13	203

Scoring system	TP	TN	FP	FN	Sensitivity	Specificity	PPV	NPV
SIRS	1	189	7	6	14.29	96.43	12.50	96.92
PLEURAL EFFUSION	1	196	2	4	20.00	98.99	33.33	98.00
ARDS	1	189	7	6	14.29	96.43	12.50	96.92
ARF	1	189	7	6	14.29	96.43	12.50	96.92
Liver failure	0	197	2	4	0.00	98.99	0.00	98.01
Cardiac failure	0	197	2	4	0.00	98.99	0.00	98.01
Neuropathy	1	196	2	4	20.00	98.99	33.33	98.00
HAEMATO-POESIS	24	166	0	13	64.86	100.00	100.00	92.74
MODS	1	189	7	6	14.29	96.43	12.50	96.92
DEATH	1	189	7	6	14.29	96.43	12.50	96.92

Scoring system	TP	TN	FP	FN	Sensitivity	Specificity	PPV	NPV	Diagnostic accuracy
SIRS	6	194	2	1	85.71	98.98	75.00	99.49	98.52
PLEURAL EFFUSION	5	195	3	0	100.00	98.48	62.50	100.00	98.52
ARDS	6	194	2	1	85.71	98.98	75.00	99.49	98.52
ARF	6	194	2	1	85.71	98.98	75.00	99.49	98.52
Liver failure	4	195	4	0	100.00	97.99	5000	100.00	98.03
Cardiac failure	4	195	4	0	100.00	97.99	50.00	100.00	98.03
Neuropathy	5	195	3	0	100.00	98.48	62.50	100.00	98.52
HAEMATO-POESIS	7	165	1	30	18.92	99.40	87.50	84.62	84.73
MODS	6	194	2	1	85.71	98.98	75.00	99.49	98.52

CUT OFFS	RANSONS SCORE	BISAP SCORE
SIRS	6.5	1.5
PLEURAL EFFUSION	6.5	2.5
ARDS	6.5	1.5
ARF	6.5	1.5
LIVER FAILURE	6.5	2.5
CARDIAC FAILURE	6.5	2.5
NEUROPATHY	6.5	2.5
HAEMATOPOESIS	6.5	1.5
MODS	6.5	1.5
DEATH	6.5	1.5

SOCIODEMOGRAPHICAL

AGE	Frequency	Percent
21-30	38	18.7
31-40	65	32.0
41-50	51	25.1
51-60	41	20.2
61-70	6	3.0
71-80	2	1.0
Total	203	100.0

Distribution of the study population according to age group in years

SEX	Frequency	Percent
FEMALE	46	22.7
MALE	157	77.3
Total	203	100.0

Distribution of the study population according to sex

ALCOHOL	Frequency	Percent
NO	47	23.2
YES	156	76.8
Total	203	100.0

Distribution of the study population according to etiological factor (alcohol)

GALL STONE	Frequency	Percent
ABSENT	156	76.8
PRESENT	47	23.2
Total	203	100.0

Distribution of the study population according to etiological factor (gall stone)

MORBIDITY AND MORTALITY

SIRS	Frequency	Percentage
NO	196	96.6
YES	7	3.4
Total	203	100.0

Distribution of study population according to morbidity (SIRS)

PLEURAL EFFUSION	Frequency	Percent
NO	198	97.5
YES	5	2.5
Total	203	100.0

Distribution of study population according to morbidity (pleural effusion)

ARDS	Frequency	Percent
NO	196	96.6
YES	7	3.4
Total	203	100.0

Distribution of study population according to morbidity (ARDS)

ARF	Frequency	Percentage
NO	196	96.6
YES	7	3.4
Total	203	100.0

Distribution of study population according to morbidity (ARF)

Liver failure	Frequency	Percentage
NO	199	98.0
YES	4	2.0
Total	203	100.0

Distribution of study population acoording to morbidity (Liver failure)

Neuropathy	Frequency	Percentage
ABSENT	198	97.5
PRESENT	5	2.5
Total	203	100.0

Distribution of study population according to morbidity

HAEMATOPOESIS	Frequency	Percentage
NORMAL	166	81.8
LEUKOCYTOSIS	34	16.7
LEUKOCYTOPENIA	1	.5
THROMBOCYTOSIS	1	.5
THROMBOCYTOPENIA	1	.5
Total	203	100.0

Distribution of study population according to hematopoiesis

HAEMATOPOESIS	Frequency	Percentage
NORMAL	166	81.8
ABNORMAL	37	18.2
Total	203	100.0

Distribution of study population according to Haematopesis

MODS	Frequency	Percentage
NO	196	96.6
YES	7	3.4
Total	203	100.0

Distribution of study population according to morbidity (MODS)

DEATH	Frequency	Percentage
NO	196	96.6
YES	7	3.4
Total	203	100.0

Distribution of study population according to mortality