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Radiological and Clinical Scoring Systems and Laboratory Parameters in Early Prediction of Severity in Acute Pancreatitis: A Comparative Prospective Study in a Tertiary Care Hospital of Eastern India

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ABSTRACT:
Background: Acute pancreatitis (AP) is a disease with wide clinical variation, which makes its diagnosis complex. The severity of AP forms a continuum, and the average mortality rate approaches 2-10%. Most of the cases are mild and conservative treatment results in a rapid recovery in most of them. However, severe AP constitutes 15–20% of all cases. In recent decades, mortality rate of severe AP has decreased from 30- 80% to 15- 20%. Various scoring systems like APACHE II scoring, RANSON scoring and BISAP have been used to asses Severity in Acute Pancreatitis. Among these BISAP and RANSON scoring systems have been considered to be predictive and most widely used. The need of a scoring system with maximum accuracy and simplicity has been emphasized upon. **Aim of the Study**: This study attempts to evaluate the radiological and clinical scoring system and laboratory parameters in early prediction of severity of AP. **Materials and Methods**: Prospective observational study was conducted for 50 patients admitted with acute pancreatitis during the study period from March 2021 to October 2022. All the patients were subjected to detailed clinical examination, laboratory investigations and radiological imaging with their consent. BISAP score & RANSON score were calculated in all such patients based on data obtained within 48 hours of hospitalization. **Results:** According to Atlanta Revised criteria, 30 patients had mild pancreatitis, 10 patients had moderately severe pancreatitis, and 10 patients had severe pancreatitis. Of the 50 patients, 34 patients had RANSON score less than or equal to 3, and 16 patients had a score of more than 3. Of the 50 patients, 36 patients had a BISAP score less than or equal to 3, and 14 patients had a score of more than 3. **Conclusion:** From this study, we can conclude that BISAP scoring system is not inferior to RANSON scoring system in predicting the severity of acute pancreatitis. BISAP scoring system is very simple, cheap, easy to remember and calculate. BISAP scoring system accurately predicts the outcome in patients with acute pancreatitis. Moreover, the values in BISAP score are instantaneous and there is no time delay.

KEY WORDS: RANSON, APACHE II, BISAP, Atlanta Revised criteria.

INTRODUCTION:

Acute pancreatitis (AP) is a disease with wide clinical variation, which makes its diagnosis complex. Serum / Urinary amylase measurement is a standard diagnostic method, although it was shown to be unable to recognize one fifth of AP patients. The average mortality rate approaches 2-10%. Most of the cases are mild and requires conservative treatment. However, severe AP constitutes 15–20% of all cases. In recent decades, mortality rate of severe AP has decreased from 30- 80% to 15- 20%.

Severe AP is now recognized to be a two-phase systemic disease. In the first phase, extensive pancreatic inflammation and/or necrosis are followed by a systemic inflammatory response syndrome (SIRS) that may lead to multiple organ dysfunction syndrome (MODS) within the first week.

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Unless the first phase is arrested and reversed by natural defences or therapeutic intervention, the second phase ensues usually after the second week of onset, and includes the formation of infected pancreatic necrosis or fluid collection with possible progression to overt sepsis, MODS and death.

The mortality figures associated with MODS vary between 30 and 100%. The association between increasing age and death from AP is well documented. Respiratory failure is the most common type of organ failure in AP.

The purpose of the present investigation was to study the diagnosis and severity assessment of AP.
In more detail, the first aim was to evaluate whether diagnosis of AP could be improved. Secondly, inflammatory variables were assessed in predicting severe AP with special reference to subsequent organ failure and radiological parameters were also taken into account. In addition, the mechanisms of the inflammatory cascade and development of immunoparalysis were studied with new cellular markers in AP patients with organ failure. AP is a common emergency presentation, being responsible for 3% of all hospital admissions with acute abdominal pain.

AP has many distinct etiologies, though approximately 80% of all cases can be attributed to either gallstones or alcohol. In addition, more than 85 drugs have been reported to cause AP. It has also been recognized that AP can rarely be autosomal dominant hereditary caused by a mutation in the trypsinogen-1 gene that allows prematurely activated Trypsinogen to cause acinar cell autodigestion.

The clinical course of acute pancreatitis is highly unpredictable. Although predictive scores initially have been designed to guide clinicians in the initial management and the level of care or observation needed in each patient, their value for day-to-day clinical practice is only limited.
Various scoring systems like APACHE II scoring, RANSON scoring and BISAP have been used to asses Severity in Acute Pancreatitis. Among these BISAP and RANSON scoring systems have been considered to be predictive and most widely used.

BISAP has the advantage over RANSON score of being calculated within 24hrs of admission. RANSON score seems to perform accurate prediction of persistent organ failure.

Acute Necrotizing pancreatitis being associated with high mortality, scoring systems has been devised to assess the severity. The Neutrophil-Lymphocyte Ratio (NLR) and Platelet Lymphocyte ratio (PLR) calculated from the WBC differential count provides a rapid indication of the extent of an inflammatory process.

AIMS AND OBJECTIVES:

- To analyze and compare the various clinical presentations of acute pancreatitis.
- To correlate the severity of acute pancreatitis with regard to available biochemical parameters.
- To assess the severity in relation to computerized tomography of abdomen.
- To predict the outcome of acute pancreatitis with regard to **CT abdomen.**
- To prognosticate the disease.
- To decide the further management with CT abdomen and to decide when to intervene.
- To compare predictability of organ failure between **BISAP** Scoring and **RANSON** Scoring system.
- To investigate if **Neutrophil Lymphocyte Ratio** (NLR) and **Platelet lymphocyte ratio** (PLR) can act as an early predictor of necrosis in acute pancreatitis.

MATERIALS AND METHODS:

METHODS OF COLLECTION OF DATA:

All patients who presented at the SCB MEDICAL COLLEGE AND HOSPITAL, who were diagnosed as Acute Pancreatitis.
Acute pancreatitis was defined as 2 or more of the following:

- Characteristic abdominal pain radiating to back
- Increased levels of Serum amylase and/or lipase 3 times the normal value
- Ultrasonography of the abdomen within first 3 days of hospitalization demonstrating changes consistent with acute pancreatitis

BISAP score & RANSON score were calculated in all such patients based on data obtained within 48 hours of hospitalization.

SOURCE OF DATA: Patients admitted to Surgical wards at SCB MCH, CUTTACK.

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COLLECTION OF DATA:
Prospective observational study was conducted on patients admitted with acute pancreatitis during the study period from March 2021 to October 2022.

All the patients were subjected to detailed clinical examination, laboratory investigations and radiological imaging with their consent.

INCLUSION CRITERIA:
Patients with history and clinical findings suggestive of acute pancreatitis with evidence of bulky edematous pancreas on USG/CT abdomen.

EXCLUSION CRITERIA:
- Chronic pancreatitis
- Acute on chronic pancreatitis
- Recurrent pancreatitis
- Patients with known haematological disorder
- Patient diagnosed with malignancy

SAMPLE SIZE:
After considering both inclusion and exclusion criteria, total number of patients included in the study were first 50 patients.
All the 50 patients were subjected to both BISAP and RANSON scoring systems. Scoring was done on admission/time of diagnosis and at 48 hours.

The scores were compared with the clinical severity which was graded according to revised Atlanta criteria and persistent organ failure graded by Modified Marshall scoring system is used to assess both scores reliability in predicting organ failure.
The NLR and PLR for day 0, day1 and day 2 for mild pancreatitis and severe pancreatitis were analyzed using independent sample t test. A p value of <0.05 was considered significant

STATISTICAL ANALYSIS:
Independent t test was used to examine differences in age; Fischer's exact test for sex; and chi square test for etiology were used.
Sensitivity, specificity, positive predictive value, negative predictive value and accuracy were calculated. A "p" value of less than 0.05 was considered to be statistically significant. Data analysis was performed using SPSS software.
Data was analyzed statistically using WILCOXON SIGN RANK TEST and FISHERS EXACT TEST by SPSS version 17.
Comparative charts were made and the data was analyzed.

ETHICAL ISSUE:
The present study was approved by the Ethics Committee of the S C B Medical College Cuttack vide IEC No. 806 dated 04/06/2021as per the principles of Helsinki Declaration.

OBSERVATIONS:
This study was conducted at SCB Medical college and hospital, Cuttack from March 2021 to October 2022.
Total number of patients studied were 50.
According to Atlanta Revised criteria, 30 patients had mild pancreatitis, 10 patients had moderately severe pancreatitis, and 10 patients had severe pancreatitis.
Of the 50 patients, 34 patients had RANSON score less than or equal to 3, and 16 patients had a score of more than 3.
Of the 50 patients, 36 patients had a BISAP score less than or equal to 3, and 14 patients had a score of more than 3.
The study also showed higher preponderance of acute pancreatitis in male patients.
The common age group affected were from 31- 40 yrs of age.
The most common etiology of acute pancreatitis in male patients was alcohol induced.
The most common etiology of acute pancreatitis in female patients was gallstones induced.
Rest of the causes were miscellaneous.

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TABLE 1- OUTCOMES OF THE PATIENTS:

NO. OF PATIENTS WITHOUT COMPLICATIONS	NO. OF PATIENTS WITH COMPLICATIONS	COMPLICATIONS LOCAL COMPLICATIONS 13 SYSTEMIC
35	15	SIRS 2

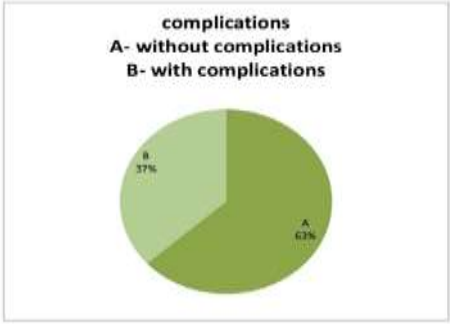

TABLE 2- OUTCOME OF PATIENTS BASED ON RANSON SCORE:

RANSON SCORE	UNCOMPLICATED OUTCOME	LOCAL COMPLICATIONS			SYSTEMIC COMPLICATIONS
		PSEUDOCYST	PANCREATIC NECROSIS	HAEMORRHAGIC PANCREATITIS	MODS/ARDS/RENAL FAILURE
<=3	33	1	0	0	0
>3	2	8	0	0	1
5	0	4	0	0	1

TABLE 3- OUTCOME OF PATIENTS BASED ON BISAP SCORE:

BISAP SCORE	UNCOMPLICATED OUTCOME	LOCAL COMPLICATIONS			SYSTEMIC COMPLICATIONS
		PSEUDOCYST	PANCREATIC NECROSIS	HAEMORRHAGIC PANCREATITIS	SIRS
<=3	33	3	0	0	0
>3	2	10	0	0	2

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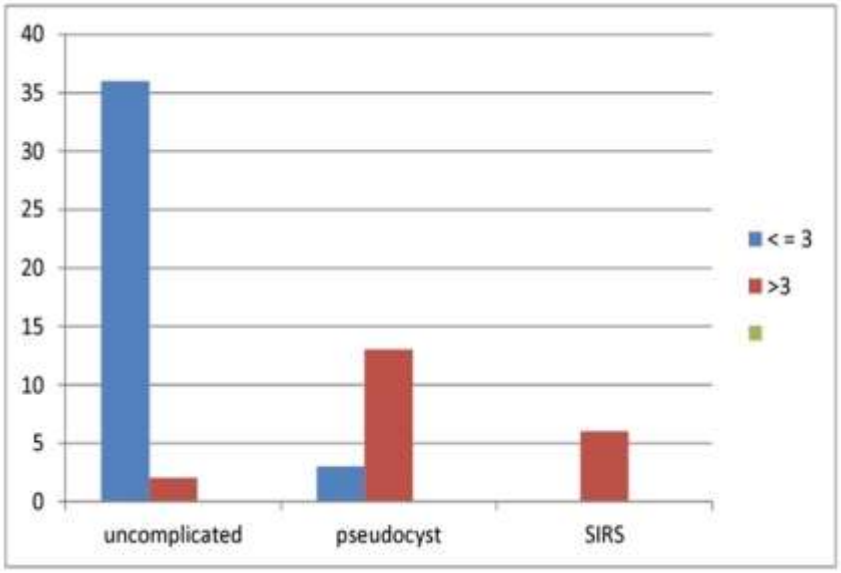

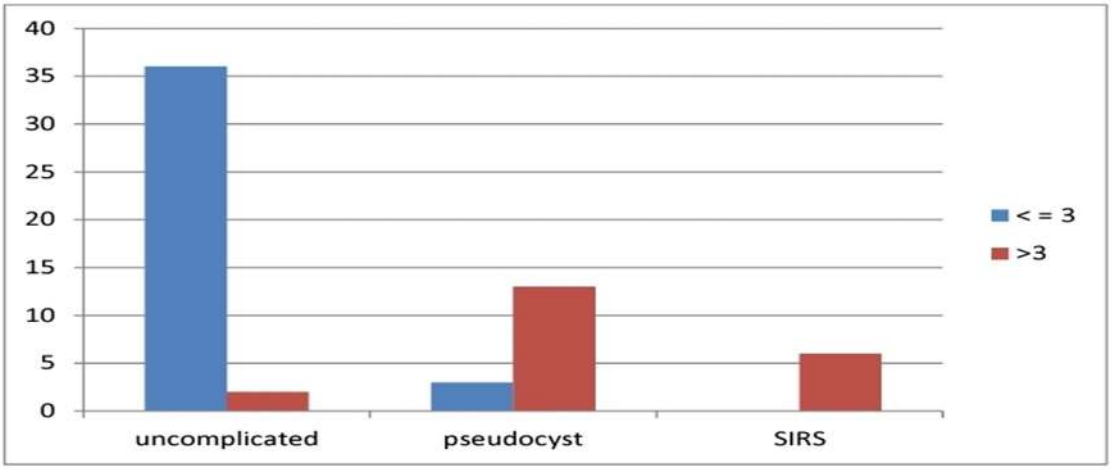

TABLE 4- SYSTEMIC COMPLICATIONS:

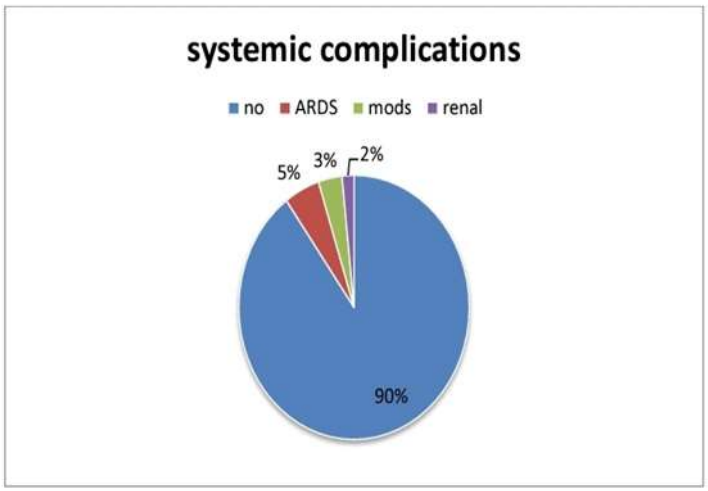

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TABLE 5- RANSON SCORE:

RANSON SCORE	NO. OF PATIENTS
1	10
2	15
3	8
4	8
5	6
6	1
7	1
8	1

MEAN IS 2.94.

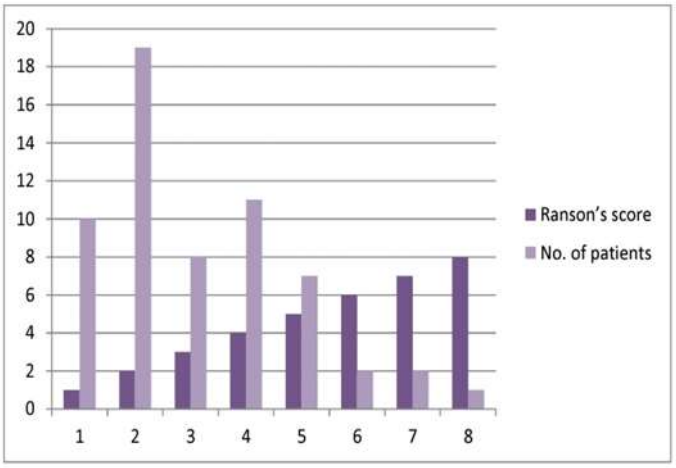

TABLE 6- BISAP SCORE

BISAP SCORE	NO. OF PATIENTS
1	10
2	15
3	8
4	15
5	2

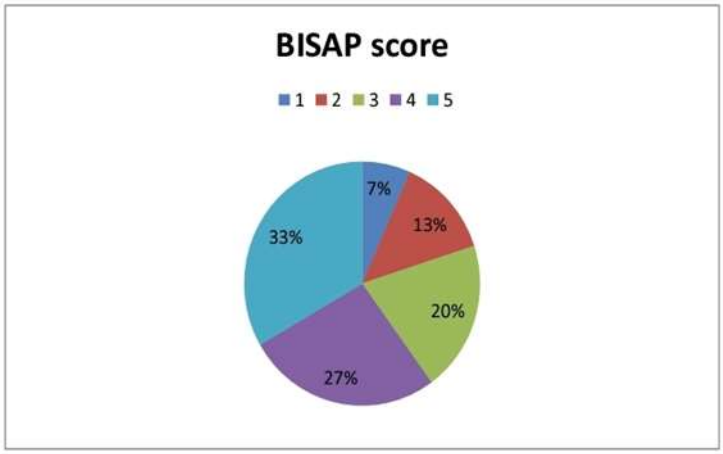

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TABLE 7- PREDICTION OF SEVERITY BY RANSON SCORE:

RANSON SCORE	SENSITIVITY	SPECIFICITY	PPV	NPV	ACCURACY
>=3	100	56	57.69	100	72.5
>=4	93.33	96	93.33	96	95
>=5	53.33	100	100	78.1	82.5

TABLE 8- PREDICTION OF SEVERITY BY RANSON AND BISAP SCORING SYSTEMS:

	SENSITIVITY	SPEIFICITY	PPV	NPV	ACCURACY
RANSON SCORE	93.33	96	93.33	96	95
BISAP SCORE	93.33	96	93.33	96	95

TABLE 9- NLR AT 0 HR, 24HR, AND 48HRS:

NLR	0HRS	%	24HRS	%	48HRS	%
POSITIVE	20	40	16	32.3	13	27
NEGATIVE	30	60	34	67.7	37	73

TABLE 10- NLR AND CT AT 48 HRS:

		CT FINDINGS		TOTAL
		POSITIVE	NEGATIVE	
NLR AT 48 HRS	POSITIVE COUNT % OF NLR AT 48 HRS	10 77.1%	3 22.9%	13 100%
	NEGATIVE COUNT %NLR AT 48 HRS	4 12.6%	33 87.4%	37 100%
TOTAL	COUNT %NLR AT 48 HRS	14 30%	36 70%	50 100%

TABLE 11- PLR AT 0 HR, 24 HR AND 48 HRS:

PLR	0 HR	%	24 HR	%	48HR	%
POSITIVE	21	43.1	17	35.5	15	31.5
NEGATIVE	29	56.9	33	64.4	35	68.5

TABLE 12- PLR AND CT AT 48 HRS

		CT FINDINGS		TOTAL
		POSITIVE	NEGATIVE	
PLR AT 48 HRS	POSITIVE COUNT %PLR AT 48 HRS	8 56.1%	7 43.9%	15 100%
	NEGATIVE COUNT %PLR AT 48 HRS	6 18%	29 82%	35 100%
TOTAL	COUNT %PLR AT 48HRS	14 30%	36 70%	50 100%

TABLE 13- SENSITIVITY AND SPECIFICITY OF NLR AND PLR

	0 HR		24 HR		48 HR	
	NLR	PLR	NLR	PLR	NLR	PLR
SENSITIVITY	69.2	64.1	74.4	53.8	62.2	59
SPECIFICITY	76.9	65.9	85.7	72.5	91.2	80.2

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NLR **PLR**

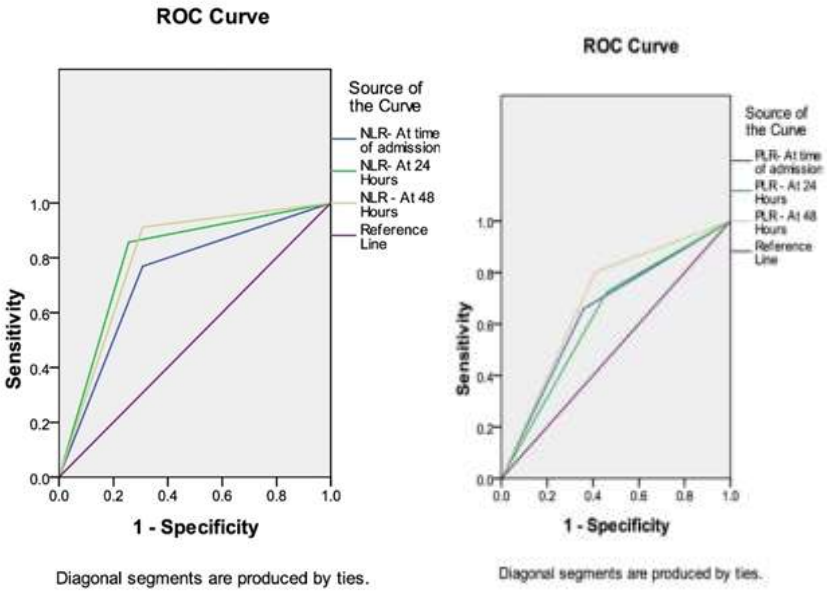

TABLE 14- AREA UNDER CURVE OF NLR

TEST RESULT VARIABLE(s)	AREA	STD ERROR[a]	ASYMPTOTIC SIG[b]	ASYMPTOTIC 95% CONFIDENCE INTERVAL	
				LOWER BOUND	UPPER BOUND
NLR AT THE TIME OF ADMISSION	.731	.050	.000	.063	.829
NLR AT 24 HRS	.800	.046	.000	.710	.891
NLR AT 48 HRS	.802	.048	.000	.709	.896

TABLE 15- AREA UNDER CURVE OF PLR

TEST RESULT VARIABLE(s)	AREA	STD ERROR[a]	ASYMPTOTIC SIG[b]	ASYMPTOTIC 95% CONFIDENCE INTERVAL	
				LOWER BOUND	UPPER BOUND
PLR AT TIME OF ADMISSION	.650	.053	.007	.546	.754
PLR AT 24 HRS	.632	.055	.017	.525	.739
PLR AT 48 HRS	.696	.053	.000	.592	.800

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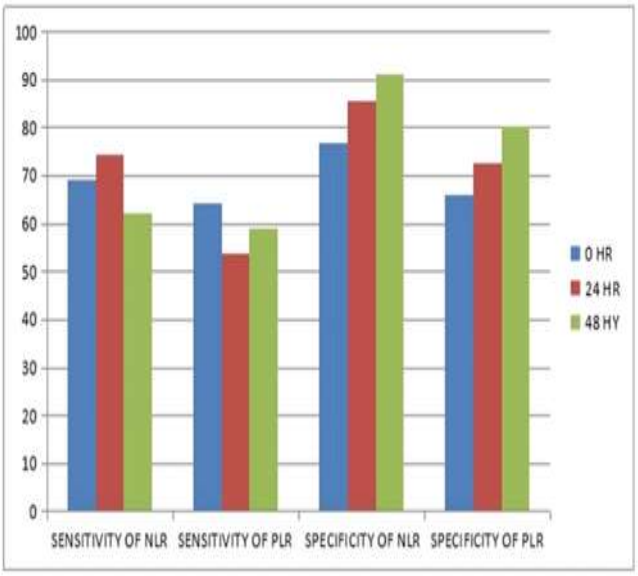
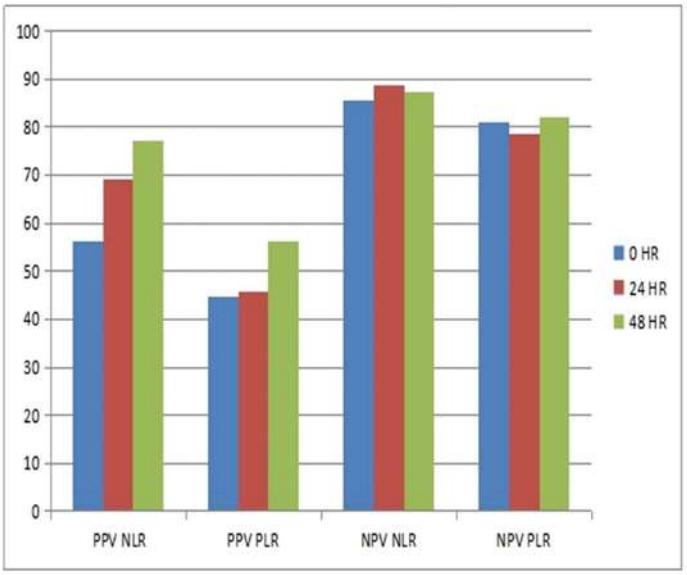


PPV AND NPV OF NLR AND PLR



DISCUSSION:

The study includes 50 patients with acute pancreatitis. The majority of patients of acute pancreatitis present with a mild disease, however approximately 20% runs severe course and require appropriate management in an intensive care unit.

Multi-organ dysfunction syndrome, the extent of pancreatic necrosis, infection and sepsis are the major determinants of mortality in acute pancreatitis. Pancreatic necrosis is considered as a potential risk for infection, which represents the primary cause of late mortality. Occurrence of acute respiratory, cardiovascular and renal failures can predict the fatal outcome in severe acute pancreatitis.

Early diagnosis and prognostic evaluation are extremely important and may reduce the morbidity and mortality associated with acute pancreatitis. On account of differences in outcome between patients with mild and severe disease, it is important to define that group of patients who will develop severe pancreatitis, predicting which still represents challenge for the clinician.

Interestingly, when seeking medical attention (usually 12 to 24 hours after the onset of pain) most patients do not exhibit multiple organ dysfunction, which is likely to emerge by the second or third day. Most patients of acute pancreatitis recover without complications, the overall mortality rate of this illness is between 2-5% to 3%.

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In addition, both require 48hrs, thereby missing potentially valuable early therapeutic window. The APACHE II score is the most widely used prediction system currently but it requires the collection of large number of parameters. APACHE II was originally developed as an intensive care instrument and requires the collection of large number of parameters, some of which may not be relevant to prognosticate the disease.

For this purpose, a simple and accurate clinical scoring system that is bedside index for severity in acute pancreatitis (BISAP) scoring system was developed. This scoring system used for stratifying patients according to their risk of hospital mortality and is able to identify patients at increased risk of mortality prior to the onset of organ failure.

Data of BISAP score was collected within the first 24hr of hospitalization. RANSON score was calculated within 48 hours. The ability to stratify patients early in their course is a major step to improving management strategies in acute pancreatitis. Out of 50 patients, 35 patients had mild pancreatitis (63.33%). In majority of patients, the disease was self-limiting.

However, it was found that there was male predominance when stratifying mortality on the basis of sex in severe acute pancreatitis. BISAP score more than 3 was above 40 years of age. With respect to etiological factors of the acute pancreatitis, we found alcohol being the most common cause of acute pancreatitis.

The proportion of two main causes greatly depends on the geographical and cultural variations. Alcohol is the main cause in the united states of America and Finland, gallstones in southern Europe, whereas central and northern Europe sees a similar frequency of the two factors or a predominance of alcohol.
In our study, out of 50 patients , 45(90%) had no organ failure, 5(10%) patients developed organ failure. Out of 5 patients 3 (60%) patients had transient organ failure and 2(40%) had persistent organ failure. Mortality was seen in 1 patient, who presented with persistent organ failure.

The primary finding in my study is that the Neutrophil Lymphocyte Ratio (NLR) and Platelet lymphocyte ratio (PLR) were elevated significantly in patients with acute necrotising pancreatitis comparing acute pancreatitis patients. In the present study, I investigated the value of NLR and PLR as predictive markers of necrosis in AP patient.

CONCLUSION:

From this study, we can conclude that BISAP scoring system is not inferior to RANSON scoring system in predicting the severity of acute pancreatitis. BISAP scoring system is very simple, cheap, easy to remember and calculate. BISAP scoring system accurately predicts the outcome in patients with acute pancreatitis. Moreover the values in BISAP score are instantaneous and there is no time delay.
RANSON score takes a minimum of 24 hours. Thus, BISAP score has proved to be a powerful tool in predicting the severity of acute pancreatitis at par with RANSON score.

- No. of patients in the study :50
- Most common age of presentation is 3rd decade of life
- Males are most commonly affected
- Alcohol consumption is the most common etiology in my study
- Males were more commonly affected by alcohol consumption
- Females were mostly affected due to gallstones pancreatitis.
- 35 patients had mild disease
- 5 patients had a complicated course
- 10 patients had moderately severe course
- Most common local complication is pseudocyst
- Mortality rate in my study is 2 %

RANSON score of more than 4 and BISAP score of less than or equal to 3 had the best accuracy of predicting severity of acute pancreatitis. Both RANSON score and BISAP score showed higher sensitivity in prediction of systemic complications than that of local complications.
No patients were treated surgically.
Sensitivity, specificity, positive predictive value, negative predictive value and accuracy were 93.33, 96, 93.33, 96 and 95 respectively for both RANSON score and BISAP scoring system.

In my study, NLR AND PLR has proved to be an indicator in predicting the necrosis in acute pancreatitis. NLR and PLR can be easily calculated from basic investigations done in all patients.

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Being a basic investigation, it adds no additional cost to the patient. NLR and PLR correlates well with predicting necrosis in acute pancreatitis. Regular monitoring on each day will provide a dynamic reflection on the immune response of the host to pancreatitis and hence predict the necrosis and the prognosis of the patient earlier.

In my study statically, NLR seems to be superior to PLR in prediction of necrosis in acute pancreatitis patient.

Conflict of interest: None to declare.
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