

CRP enhanced bisap’s score for predicting organ failure in acute pancreatitis

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Abstract

Acute pancreatitis is a relatively common and a potentially life-threatening disease. It is defined as “an inflammatory process of pancreas with possible peripancreatic tissue involvement and multi organ dysfunction syndrome with increasing mortality rate”. Estimates of incidence are often inaccurate, because mild cases are often unreported, and deaths may occur in severe forms even before a diagnosis is made.

Severe acute pancreatitis accounts for about 20 % of the cases, and it is associated with one or more of the following: Pancreatic necrosis, distant organ failure, and development of local complications like haemorrhage, pancreatic necrosis, pseudocyst etc. Mortality in severe acute pancreatitis is 15-30 % and is only 0-1% in case of mild acute pancreatitis.

Keywords: Pancreatitis, Mortality Rate, Haemorrhage.

Aims and objectives of the study

- To determine the usefulness of C-REACTIVE PROTIEN enhanced BISAP’S score to predict organ failure in acute pancreatitis.
- To evaluate the ability of C-REACTIVE PROTIEN enhanced BISAP score to predict mortality in acute pancreatitis patients from our institution
- To assess the ability of the C-REACTIVE PROTIEN enhanced BISAP score to predict which patients are at risk for intermediate markers of severity including the development of organ failure, persistent organ failure and pancreatic necrosis.
- To correlate the outcome of the study with the scores observed, in terms of disease severity and mortality.

Materials and methods

First 70 patients attending the general surgery department with clinical features of Acute Pancreatitis are evaluated clinically and subjected to laboratory and radiological

investigations as per the designed proforma. Data pertinent to the scoring systems will be recorded within 24 h of admission to the hospital.

Once diagnosis is established the patient disease severity will be assessed by BISAP scoring system with CRP levels

The prospective observational study is intended to be carried out in 70 patients of acute pancreatitis admitted in ESIC MC BENGALURU, the present study will be conducted after receiving approval from ethics committee of our institution. Study includes the C-REACTIVE PROTIEN cut-off value of ≥ 90 mg/l will be considered for the study. The value of less than 90mg/l will be scored as zero and the value of >90 mg/l will be scored as one.

BISAP'S score will carry a score of 5, So C-REACTIVE PROTIEN enhanced BISAP'S score will carry a total score of 6, With the help of modified marshall (gold standard score) the patient who is in organ failure will be identified. With the help of C-REACTIVE PROTIEN enhanced BISAP'S score, each patient who came with diagnosis of acute pancreatitis at the time of admission at 24hours and after 48hrs of admission will be scored. Later sensitivity and specificity of the C-REACTIVE PROTIEN enhanced BISAP'S score is calculated, to determine the usefulness of the c-reactive protein enhanced BISAP score for prediction of organ failure in acute pancreatitis.

Observation and results

This study was conducted in the department of general surgery, ESIC MC PGIMSR RAJAJINAGAR BENGALURU for a period of 12 months. The 70 persons with features of acute pancreatitis who fulfilled the inclusion criteria were enrolled in this study after obtaining an informed consent.

Table 1: Age and Gender distribution of the study participants

Age	Male	Percent	Female	Percent	Total	Percent
18-29	13	18.6	4	5.7	17	24.3
30-39	26	37.1	2	2.9	28	40.0
40-49	10	14.3	4	5.7	14	20.0
50-59	7	10.0	1	1.4	8	11.4
>60	3	4.3	0	0.0	3	4.3

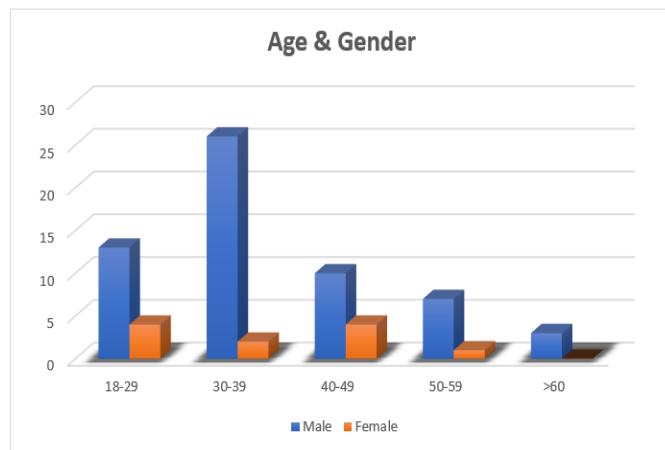


Figure 1: Age and Gender distribution of the study participants

Table 2: Gender distribution of the participants

Gender	Frequency	Percent
Male	59	84.3
Female	11	15.7

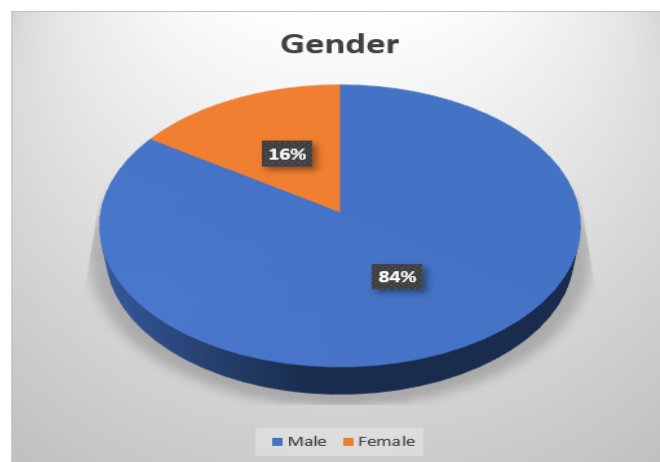


Figure 2: Gender distribution of the study participants

Table 3: Length of the hospital stay of the study participants

Length of stay	Number	Percentage
1-2 days	10	14.3
3-7 days	27	38.6
8-14 days	14	20.0
15-21 days	11	15.7
22-28 days	8	11.4

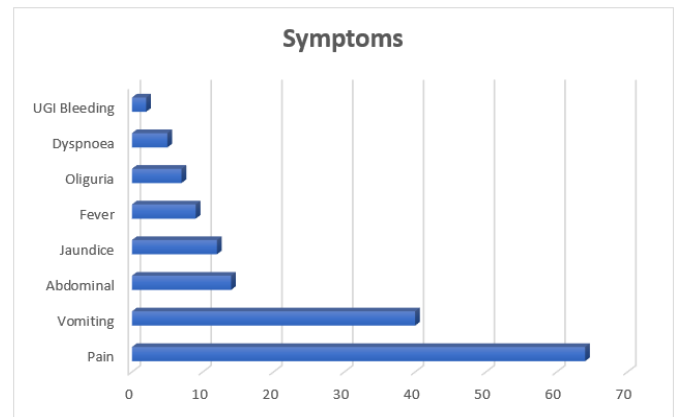


Figure 4: Symptoms related to the acute pancreatitis.

Table 5: Laboratory parameters related to the acute pancreatitis.

Parameter (Normal values)	Normal	Percent	Abnormal	Percent
Bilirubin (<1.2 mg/dl)	31	44.3	39	55.7
AST (<40 IU/ml)	29	41.4	41	58.6
ALT (<40 IU/ml)	44	62.9	26	37.1
Albumin (>3 gm/dl)	59	84.3	11	15.7
Blood Urea (<40 mg/dl)	57	81.4	13	18.6
Creatinine (<1.2 mg/dl)	53	75.7	17	24.3
Haematocrit (44%)	51	72.9	19	27.1

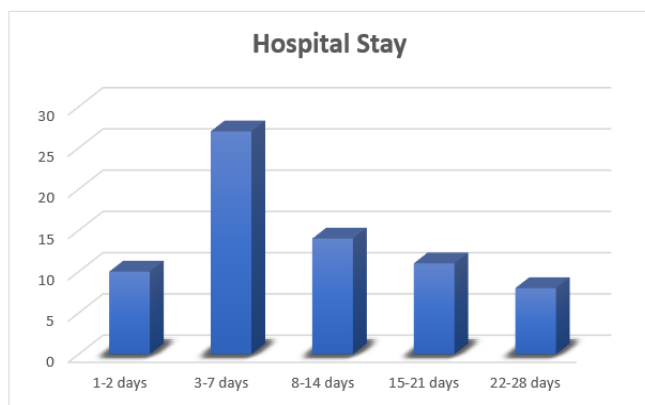


Figure 3: Length of the hospital stay of the study participants.

Table 4: Symptoms related to the acute pancreatitis.

	Present	Percent	Absent	Percent
Pain	64	91.4	6	8.6
Vomiting	40	57.1	30	42.9
Abdominal	14	20.0	56	80.0
Jaundice	12	17.1	58	82.9
Fever	9	12.9	61	87.1
Oliguria	7	10.0	63	90.0
Dyspnoea	5	7.1	65	92.9
UGI Bleeding	2	2.9	68	97.1

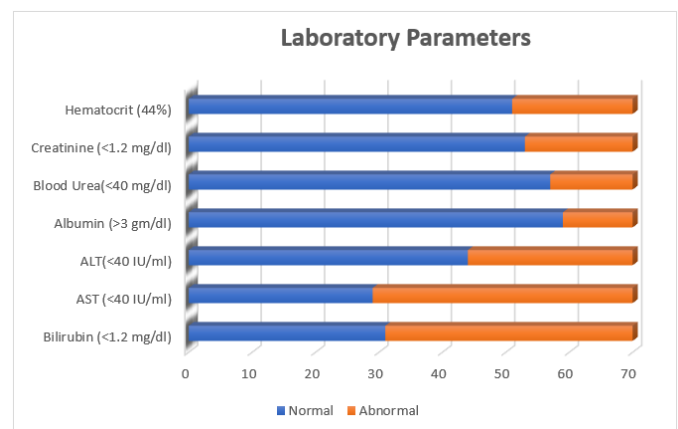


Figure 5: Laboratory parameters related to the acute pancreatitis

Table 6: Type of etiological cause for the acute pancreatitis

Type	Number	Percentage
Biliary	36	51.4
Alcoholic	3	4.3
Hyperlipidaemia	23	32.9
Idiopathic	8	11.4

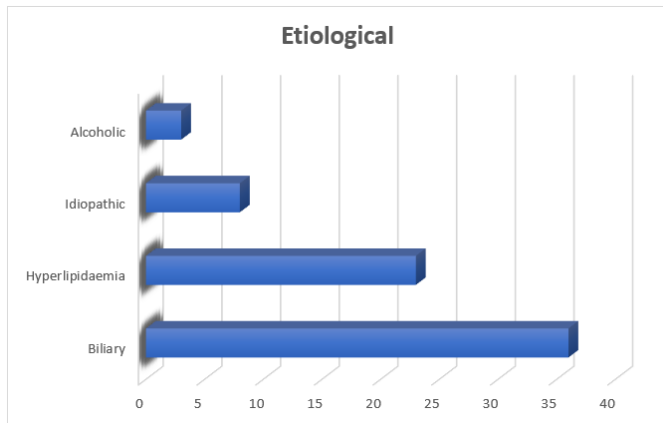


Figure 6: Type of etiological cause for the acute pancreatitis

Table 7: Serum laboratory values among study participants

Calcium Level	Number	Percentage
<8.5	12	17.1
8.5-10	54	77.1
>10	4	5.7
C Reactive Protein	Number	Percentage
<150	23	32.9
>150	47	67.1
Amylase Level	Number	Percentage
<100	23	32.9
101-200	13	18.6
201-300	11	15.7

301-400	9	12.9
401-500	8	11.4
>500	6	8.6
Lipase Level	Number	Percentage
<100	41	58.6
100-500	19	27.1
>500	10	14.3

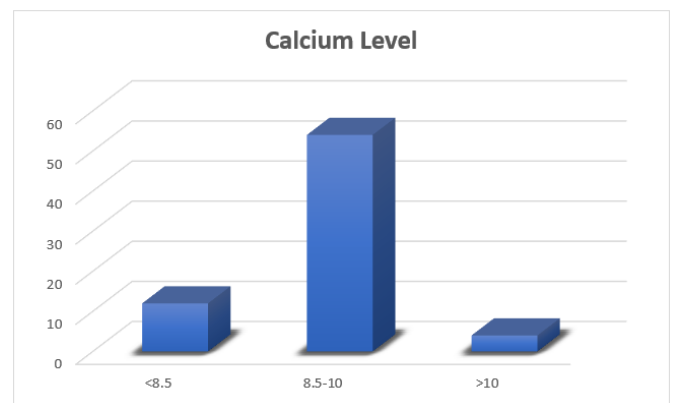


Figure 7.1: Serum calcium laboratory values among study participants

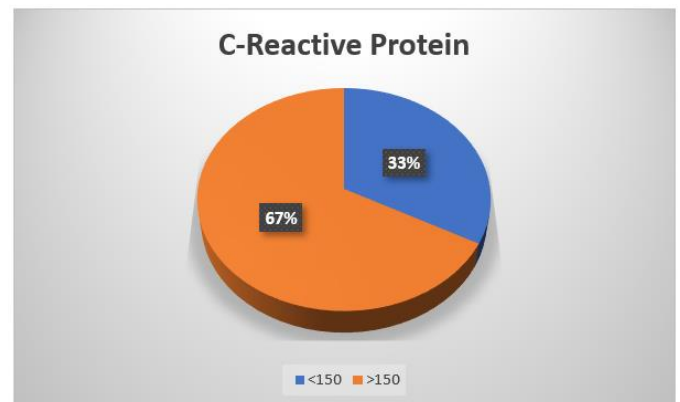


Figure 7.2: CRP laboratory values among study participants

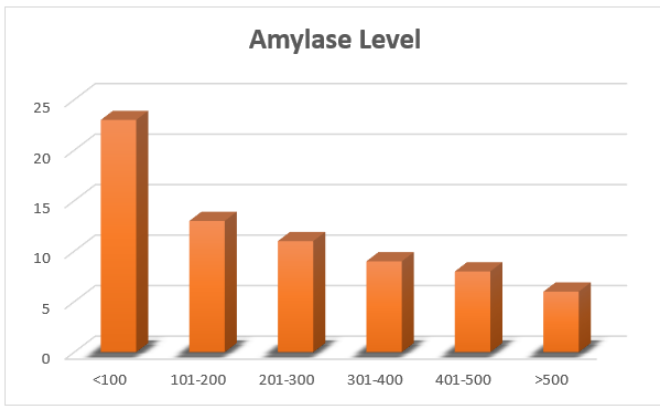


Figure 7.3: Serum Amylase laboratory values among study participants

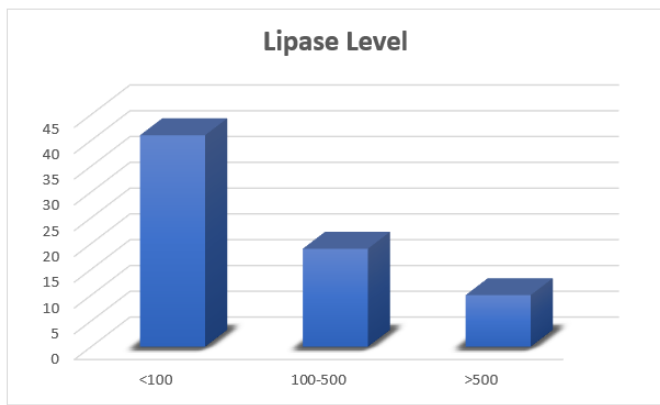


Figure 7.4: Serum Lipase laboratory values among study participants

Table 8: Serum laboratory values among study participants

Mean Score	Baseline	No Organ Failure	Organ Failure	F-Value	P-value
WBC	13.9±4.8	11.4±2.9	15.9±4.84	3.45	0.034
Neutrophil	11.8±4.7	10.5±3.6	18.02±4.7	2.464	0.023
Lymphocytes	1.31±0.9	1.04±0.51	0.92±0.58	1.117	0.07
CRP	59.9±97.6	64.5±67.5	103.9±104	14.321	<0.001
Neutrophil–lymphocyte ratio;	13.15±8.50	10.22±5.5	20.26±6.8	0.657	0.412
Platelet–lymphocyte ratio	229.1±141.3	174.6±64	241.6±83.6	3.574	0.003
PCT (ng/ml)	3.41	2.44	2.01	0.444	0.781

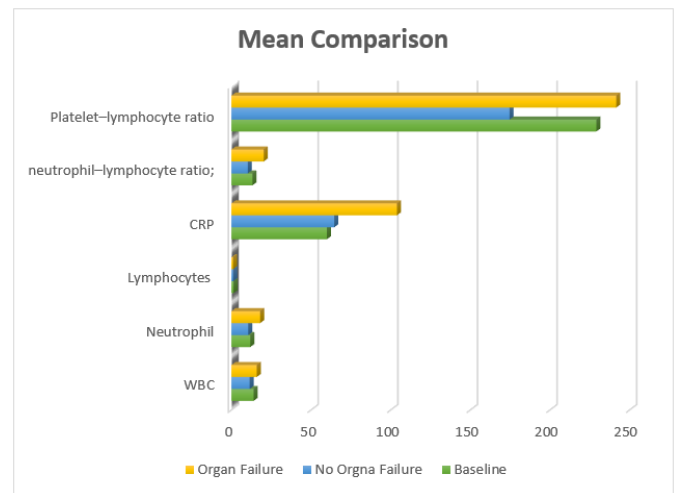


Figure 8: Serum laboratory values among study participants

Table 9: Mortality distribution among the Organ failure patients

Mortality	Organ Failure	Percentage	No Organ Failure	Percentage	Total
Yes	11	36.7	3	7.5	14
No	19	63.3	37	92.5	56
Total	30	100	40	100	70

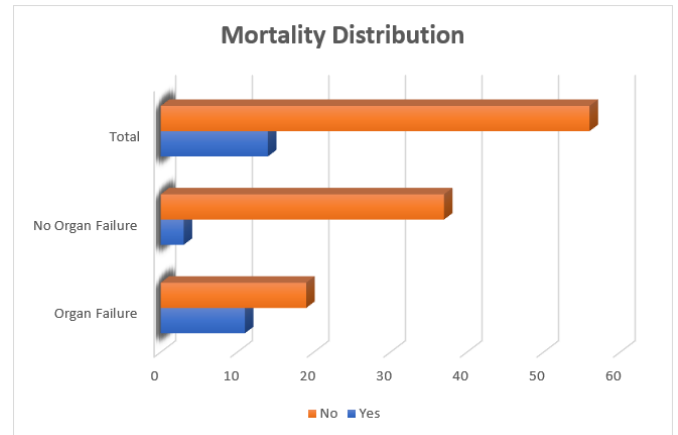


Figure 9: Mortality distribution among the Organ failure patients

Table 10: Morbidity and mortality of the different organ failures

Type of organ failure	Morbidity	Mortality	P-value
Multiple organ failure	1	3	<0.001
Specific single organ failure	2	1	

Pulmonary failure	1	3	
Renal failure	4	1	
Cardiovascular failure	3	4	
Hepatic failure	2	2	
Neurologic failure	3	0	
Gastrointestinal failure	3	0	
Total	19	14	

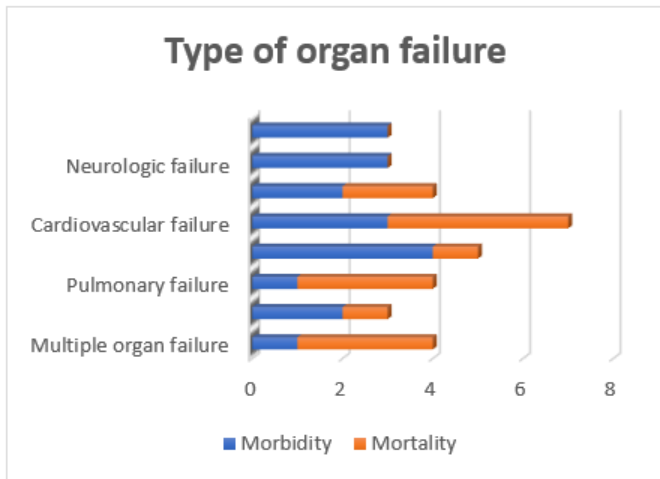


Figure 10: Morbidity and mortality of the different organ failures

Table 11: Distribution of the study participants related to the CRP cum BISAP related to organ failure

	No Organ Failure	%	Organ Failure	%	Total	%
Group 1 (CRP \geq 90.7 mg/L)	26	61.9	6	21.4	32	45.7
Group 2 (BISAP \geq 3)	10	23.8	11	39.3	21	30.0
Group 3 (BISAP \geq 3 and CRP \geq 90.7),	6	14.3	11	39.3	17	24.3
Total	42	100	28	100	70	100.0

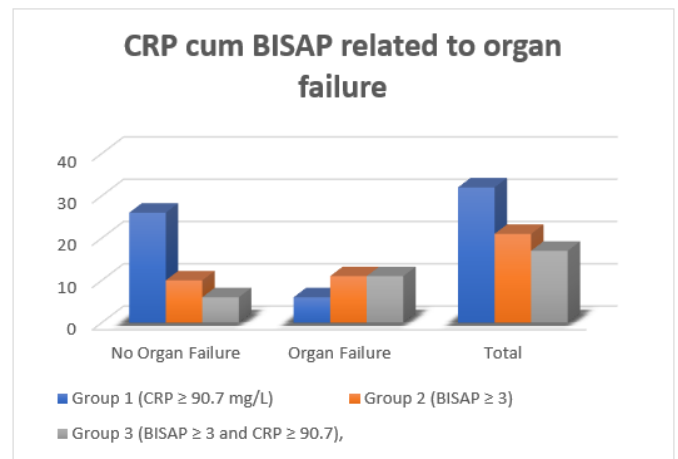


Figure 11: Distribution of the study participants related to the CRP cum BISAP related to organ failure

Table 12: Distribution of the study participants related to the Marshall's score

Marshall's score	No Organ Failure	Organ Failure	Total
0	17	0	17
1	8	1	9
2	11	2	13
3	4	11	15
4	0	16	16

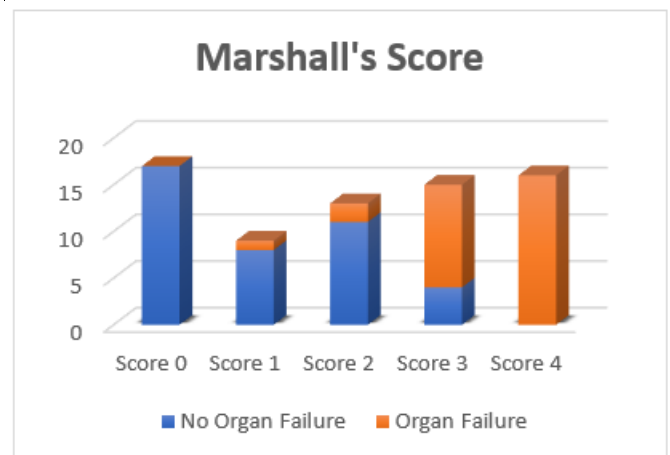


Table 13: Distribution of the study participants related to the Marshall's score and CRP+BISAP score related to organ failure.

CRP+BISAP= (1+ BISAP Score)	Marshall's score					Total
	0	1	2	3	4	
<3	0	1	2	3	5	11
>3	0	0	0	8	11	19
Total	0	1	2	11	16	30

Table 14: Diagnostic ability of the CRP+BISAP score compared to the Marshall's score as gold standard

Diagnostic Ability	Values
Sensitivity	0.88
Specificity	0.84
PPV	0.77
NPV	0.91

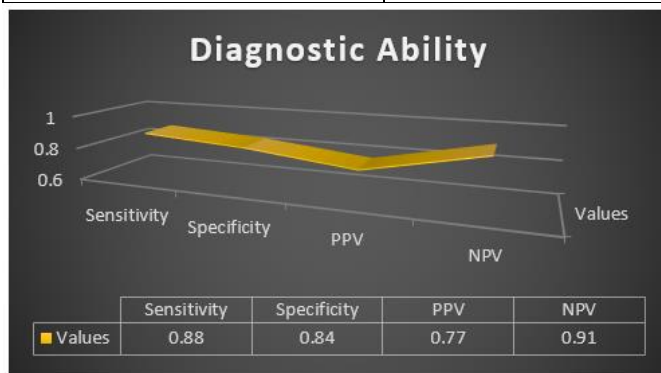


Figure 13: Diagnostic ability of the CRP+BISAP score compared to the Marshall's score as gold standard

Discussion

Acute pancreatitis is undoubtedly a disease in which the progression can be greatly altered by early intervention. Numerous scores and single prognostic markers have been suggested to predict the severity of pancreatitis. However, the available scores or markers to predict the severity of the disease among the acute pancreatitis cases is not very clear.

Scores which had many markers may have had an increased sensitivity but simpler and easily available scores and markers were taken. In our country where resources are limited, the simplest and the most economical of the scores or markers are the ones which would have a great impact clinical judgement and prediction of severity in Acute Pancreatitis. Hence, the present study was conducted to determine the usefulness of C-REACTIVE PROTIEN enhanced BISAP'S score to predict organ failure in acute pancreatitis.

In the present study, among 70 study participants, about 40% were under the age range of 30-39 years and 84.3% were males. This is higher than studies from the Mediterranean by Davoret al⁴⁵ and the study of Roberts from UK who showed only a slight male predominance of 53% and 50.7% respectively. The Mean age of presentation was 37.7 years this is in contrast to studies by Davor and Roberts who reported a mean age of 61 and 74 57.7 years respectively, but is in alignment with the study by Thamilselvam from Malaysia who reported a high prevalence in the third decade.

Related to the length of the stay in the hospital, about 38% of the participants were admitted for 3-7 days followed by 20%, those were admitted for 8-14 days. Data from the 1997 National Inpatient Sample of community hospitals in the United States show the median postoperative length of stay to be 4.6 days, which is similar to the present study (mean=4.5 years). This might be attributed to the condition and severity of the acute Pancreatitis.

In the present study, most common etiological factors of the Acute Pancreatitis were biliary in 51% of the study participants, which is similar to the previous studies done^{41,44}. Previous study suggested the most common etiological factor was Gall bladder stone or biliary. However, some of the study suggested the, the

predominant cause of AP being alcohol which is more abused by men than women and are young. Sekimoto²⁴ showed, in the Japanese population alcohol contributed to 37% of AP and the biliary system contributed to 20%⁴⁸, while Abbasi et al showed in African americans alcohol was the predominant cause in 53 % of patients⁴⁹.

Symptoms abdominal pain (91.4%) and vomiting (57.1%) were the predominant complaints seen in the study population. This is similar to the study by Milheiro et al who stated the predominant symptom in AP as abdominal pain in 100% followed by vomiting in 69.2%⁵⁰. A symptom association of extra-pancreatic manifestations to the occurrence of acute pancreatitis was done, which showed that the presence of extra pancreatic manifestations in acute pancreatitis had a high probability to be associated.

More than half of the participants had abnormal bilirubin and AST value. Also related to the laboratory values, 5.7% of study participants had calcium >10.5, 6% have serum amylase >500 and more than half had <100 lipase. Similar findings were present in the previous studies^{44,46}.

Related to organ failure, Total 30 patients out of 70 had organ failure and 40 had no organ failure. About 14% of the patients died in our study. In the recent literature, severe AP rate has a 10% to 20% incidence rate, and the mortality rate for severe AP is 20% to 30%^{51,52,53}. Using the last Atlanta classification, the rate of severe AP was 20.1%, and the mortality rate in this group was 28.5%. Carnovale et al. Reported an overall mortality rate of 4.8%, and Singh et al. Reported an overall mortality rate of 3.5%. Cardiovascular system failure was highest followed by multi-organ failure⁵⁵.

Study participants were divided into three groups so, assessment of the organ failure and CRP-BISAP value was done. As Compared to gold standard Marshall's

score, there were 28 study participants were diagnosed from the CRP-BISAP diagnostic way. About 19 out of 30 patients had the CRP BISAP SCORE >3, suggesting of organ failure.

C - reactive protein A CRP of > 150 mg /L was taken to predict acute severe pancreatitis, 67% study population had an elevated CRP at 48 hours of admission, which is in accordance to studies by Alfonso⁹⁶ and Cardoso⁹⁷ who took a CRP value of 200 mg /L and 170 mg/L respectively in predicting SAP and necrotising pancreatitis⁵⁷.

This study achieves the same association with a CRP cut off of 150mg/L as suggested by recent studies by Wilson⁶⁰ and the UK guidelines of management of AP⁶¹. Thus, this study confirms that a CRP of >150mg/L is as diagnostic as higher levels in predicting SAP.

The sensitivity of CRP BISAP was calculated 88% and specificity 84%. Similarly, in a recent meta-analysis of 1,972 patients, sensitivity and specificity values of CRP were 64.82% and 83.62%, respectively, in predicting severe Acute Pancreatitis. In another meta-analysis of 38,985 patients from four different countries, sensitivity values were 51% (43% to 60%) and specificity was 91% (89% to 92%) for severe AP⁶³. BISAP results have similar sensitivity and specificity to the literature for predicting severe pancreatitis.

The combination of CRP values with BISAP values had high sensitivity and specificity for predicting the severity of pancreatitis, BISAP is a simple and practical scoring system that leads to significant changes in the management of patients or predicts intensive care needs. The Positive predictive value of CRP BISAP in predicting organ failure in AP was 77 % while it had a negative predictive value of 91%. This is similar to previous studies which have stated PPV as 65% to 100%⁶⁴.

Severity of acute pancreatitis was high in the study, the reason could be that in our population there is a delay in presentation to the hospital as the patients seek over the counter medications or complementary and alternative forms of medicine for the most common symptom of abdominal pain or it could be that of a referral bias.

This study suggests the CRP BISAP pancreatic predictive scores have an excellent predictive value in predicting severe acute pancreatitis. The study correlates with the study by Gompertz et al's study in Spain who reported a BISAP sensitivity, specificity, positive and negative predictive value of 71.4, 99.1, 83.3 and 98.3% respectively⁶⁵.

The limitation of the study is cross sectional design. We studied only uncomplicated cases of acute pancreatitis, studies including complications may yield varying results. In conclusion, the demographic data of age, sex and symptomatology in our study was comparable to other studies. Larger studies will be needed to further consolidate our findings, but it is safe to say that CRP BISAP has the advantage of simplicity and speed over more traditional scoring systems. It is a useful means of predicting severity in acute pancreatitis in comparison to individual laboratory parameters like amylase, lipase and CRP levels. We confirm CRP BISAP score to be an accurate means for risk stratification and prognostic prediction in our patients.

Limitations of this study

- Small number of patients in this study.
- The etiology in this study were found to be different from worldwide accepted one, hence might not be correct to compare with other studies.
- The GCS score used to assess the mental status of the patient got admitted were subject to inter observer variation.

- Recently, it has been suggested that severe acute pancreatitis may have variable disease progression; therefore, the lack of predictability might be associated with this disease variability.
- Variation in timing of presentation of patients to the hospital after onset of symptoms may interfere with assessment of the scoring systems.

Conclusion

The present study was conducted to determine the usefulness of C-REACTIVE PROTEIN enhanced BISAP'S score to predict organ failure in acute pancreatitis. A total of 70 patients were enrolled and among 70, about 28 patients those have full filled the criteria of C-REACTIVE PROTEIN enhanced BISAP'S score for organ failure. The gold standard Marshall's Score, which have shown the 30 patients had the organ failure. The mortality associated with the severe pancreatitis was 14%. The sensitivity of CRP BISAP was calculated 88% and specificity was 84%. The Positive predictive value of CRP BISAP in predicting organ failure in AP was 77 % while it had a negative predictive value of 91%.

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