Original Research Article

A prospective comparative study of MEWS and BISAP scores with CTSI in predicting severity of Acute pancreatitis

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Abstract

Aim: To evaluate the accuracy of MEWS and BISAP scoring systems to predict the severity of Acute Pancreatitis in comparison to CT Severity Index (CTSI) in patients with acute pancreatitis (new & known cases). **Method:** A prospective cross-sectional study conducted on 111 Patients with clinical/laboratory/ultrasonography diagnosed acute pancreatitis (new & known cases) who are willing to undergo Contrast enhanced computed tomography. BISAP and CTSI scores were calculated at 6, 24 and 48 hours after admission. Contrast enhanced CT scan was done at 72 hours and calculated CTSI score. Predictive accuracy of the MEWS, BISAP and CTSI was measured by the area under the receiver-operating curve (AUC). **Results:** Most of the pancreatitis occurs in the age group 20-40. Among the 111 patients studied, majority (N=99, 89%) were males. The mean age of presentation was 39.7+13.5. Alcohol (N=63, 57%) followed by Gall stones (N=31, 28%) was the most common etiology. BISAP score at presentation was compared against CTSI (P=0.001) and 95% confidence interval between 0.651 and 0.963. BISAP score had a sensitivity of 75% and specificity of 78.8%, Positive PPV of 50% and NPV of 89.69%. MEWS at 6, 24 and 48 hours was plotted against CT severity index, P= 0.005, 95% Confidence interval lied between 0.604 and 0.896, 0.602 and 0.902 and 0.603 and 0.899 respectively. MEWS had a sensitivity of 75% and specificity of 64.6%, NPV and PPV were 92% and 26% respectively. **Conclusion:** Low MEWS and BISAP scores have high negative predictive value in predicting severe acute pancreatitis. Thus it can be reliably used in early prognostication of severity in acute pancreatitis in our setting.

Keywords: Acute pancreatitis, Bedside index of severity of acute pancreatitis, Computed Tomography Severity Index.

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Introduction

Acute Pancreatitis is a common condition presenting as acute abdomen. Contrast Enhanced CT (CECT) is considered to be the gold standard imaging modality in the evaluation of patients with acute pancreatitis. The structural changes in pancreatitis will evolve subsequent to functional and biochemical abnormalities that occur earlier. The probability of picking the necrotizing pancreatitis hence will be higher if imaging is done more than 48-72 hours after the onset of symptoms[1]. Owing to these limitations, though CTSI is a good prognostic system to identify severe pancreatitis on later stage of disease process, there is need to develop/ validate clinical and biochemical scoring systems that can prognosticate at much earlier stage and at presentation. This helps in stratifying the patients for appropriate level of care i.e ward or ICU which can prevent the pancreatitis to progress into severe pancreatitis. Further, CTSI do not take into consideration the presence or absence of organ failure in acute pancreatitis patients. In addition, inter-observer agreement for scoring the CT scans using the CT Severity Index was only moderate (approximately 75%) while biochemical and clinical scoring systems are more objective with a reported agreement of approximately 75%[2,3].

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In order to circumvent these limitations and detect the severe pancreatitis earlier, newer clinical methods have always been searched for. Incorporation of clinical parameters, organ failure, sepsis and biochemical parameters is important for more structured assessment of severity. It also avoids the 48 – 72 hours delay involved in obtaining a Contrast Enhanced CT. Modified Early Warning Score (MEWS) and Bedside index of severity of acute pancreatitis (BISAP) are relatively newer scoring systems with this objective.

MEWS is purely a clinical assessment of pancreatitis avoiding biochemical tests and still taking into account sepsis and complications of pancreatitis whose efficiency needs to be evaluated against Computed Tomography Severity Index, which is the objective of this study. BISAP is a good model widely used to detect severe acute pancreatitis, which takes into account the age, biochemical parameters and sepsis which has proven efficacy at par with CT severity index. In this study we assessed the usefulness of MEWS and BISAP score in comparison to CTSI in predicting the severity of Acute Pancreatitis.

Materials and Methods

This was a prospective cross-sectional study of patients admitted for acute pancreatitis at a tertiary care Government hospital in south India. Ethical committee approval was taken. Patients of acute pancreatitis who were consecutively admitted from June 2019 to January 2020 were included till the calculated sample size was met. The sample size of 111 patients was calculated based on the incidence of severe pancreatitis in 15.5% of patients of acute pancreatitis. During the study period, 200 patients clinically suspected with acute pancreatitis with characteristic abdominal pain with radiation to back attending our hospital were selected. After clinical examination, laboratory blood tests including serum amylase, lipase was done along with Ultrasound scan of the abdomen.

Acute pancreatitis was diagnosed if there was either elevation of Serum amylase and lipase three times the upper limit or normal or if there were features suggestive of acute pancreatitis on ultrasound examination of abdomen in addition to the typical pain characteristics. Patients with recurrent symptoms and chronic pancreatitis (N=89) were excluded and rest of patients (N=111) having 2 out of 3 features mentioned above were diagnosed with Acute Pancreatitis. They were included in the study after taking informed consent. The demographic, clinical and laboratory data was recorded prospectively. All patients had abdominal sonography and BISAP score at admission. MEWS was calculated at 6, 24 and 48 hours after admission. Contrast enhanced CT scan was done at 72 hours and CTSI score was noted. Clinical course, complications, length of stay and mortality were recorded. Data was recorded and coded in Microsoft excels. S

Statistical analysis was done using SPSS version19 (SPSS Inc, IL). Predictive accuracy of the MEWS, BISAP and CTSI was measured by the area under the receiver-operating curve (AUC). Sensitivity, specificity, negative predictive value and positive predictive value of each of them were deduced.

Results

There were 111 patients included in the study for analysis. There was 11(9.9%), 54(48.64%), 37(33.3%), and 9(8.10%) patients recorded in 0-20years, 21-40 years, 41-60 years, and >60years of age respectively. Majority (N=99, 89%) were males. The mean age of presentation was 39.7+13.5. Alcohol (N=63, 57%) followed by Gall stones (N=31, 28%) was the most common etiology (Fig 1).

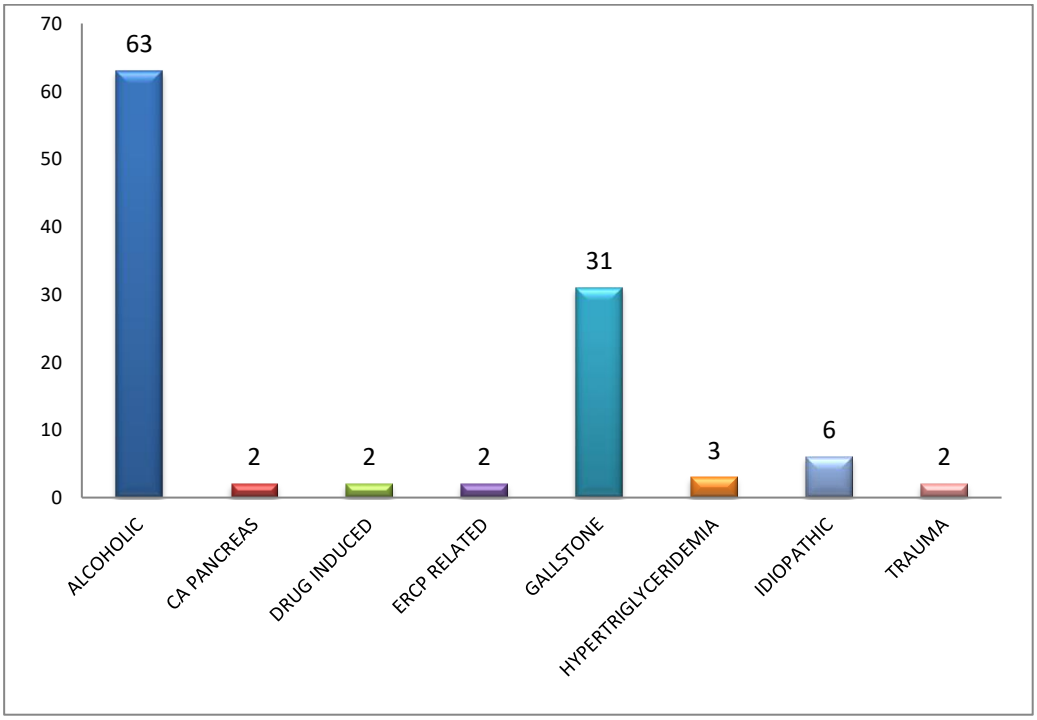

Fig 1: Etiology of acute pancreatitis. Alcohol was the most common etiology (N=63, 53%).

Based on CTSI done after 72 hours, the study group was grouped into Mild -Moderate severity (N=99, 89%) and Severe Acute pancreatitis (N=12, 11%). The means and standard deviation (SD) MEW scores at 6, 24 and 48 hours and BISAP were calculated for both the groups and are shown in (Table 1).

Table 1:Comparing means of MEWS and BISAPscores between both groups divided based on CT severity Indecx (CTSI)

CT Severity Index (CTSI)	MEWS @6HRS	MEWS @24HRS	MEWS @48HRS	BISAP
Mild to moderate N= 99 (89%)	1.19 ±1.25	1.24±1.28	1.23±1.30	0.29±0.63
Severe N=12 (11%)	2.58±1.83	2.58±1.78	2.58±1.78	1.50±1.08
Total N=111	1.34±1.38	1.39±1.39	1.38±1.42	0.42±0.78

After defining the Severity based on CTSI scores, `Receiver operating Curves (ROC) were plotted for BISAP score MEWS at 6 hours, 24 hours, and 48 hours. The area under the curve (AUC), P values at 95% confidence Intervals (95% CI), sensitivities, specificities, Negative predictive value (NPV) and positive predicting value (PPV) were calculated (Figure 2-Figure 5).

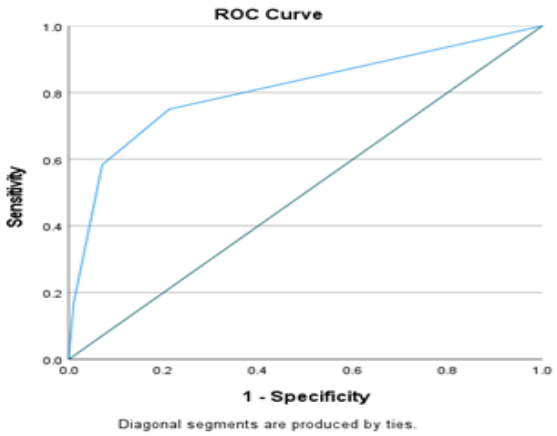

Fig 2: The BISAP score was plotted against CTSI and a ROC curve was plotted. The area under the curve (AUC) was 0.81 and P value was 0.001 which formed a significant curve. 95% confidence interval lied between 0.65 and 0.96. A cutoff value of 0.5 was chosen and sensitivity and specificity were calculated which were 75 and 78.8 respectively. Negative predictive value was 89.69 and Positive Predictive value was 50.

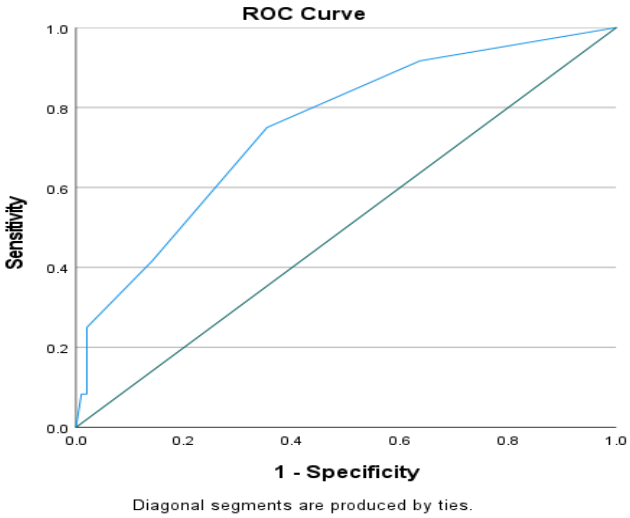

Fig 3: ROC curve plotted for MEWS at 6 hours against CTSI has an AUC of 0.75 with standard error of 0.075 and p value of 0.005. 95% Confidence interval lied between 0.604 and 0.896. Sensitivity and specificity were 75% and 64.6% respectively for a cutoff of 1.50 negative predictive value was 92% and Positive Predictive value was 26%.

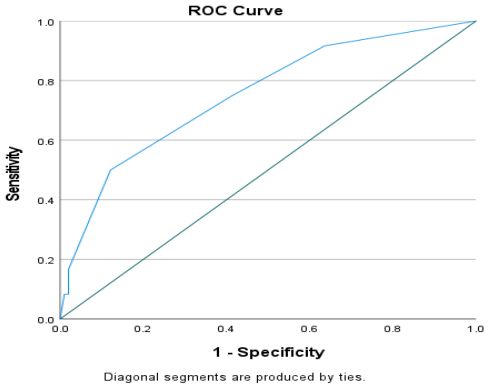

Fig 4: ROC curve plotted for MEWS at 24 hours against CTSI has an AUC of 0.752 with standard error of 0.077 and p value of 0.005. 95% Confidence interval lied between 0.602 and 0.902. Sensitivity and specificity were 75% and 58.6% respectively for a cutoff of 1.50.

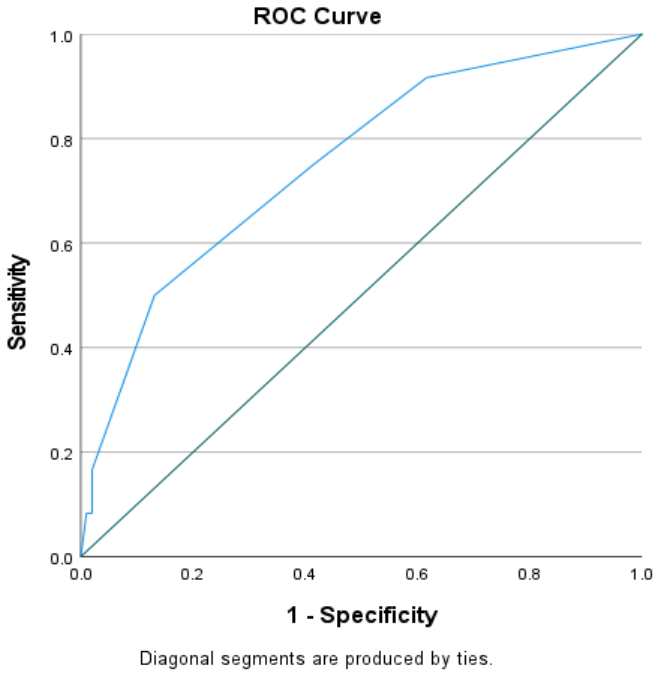

Fig 5: ROC curve plotted for MEWS score at 48 hours against CTSI has an AUC of 0.751with standard error of 0.075 and p value of 0.005. 95% Confidence interval lied between 0.603 and 0.899. Sensitivity and specificity were 75% and 58.6% respectively for a cutoff of 1.50.

Discussion

In our study, most of the pancreatitis occurs in the age group 20-40 Severe pancreatitis is more common in Males and can be attributed to alcoholism. Alcoholism accounts for 58% cases of acute pancreatitis & gall stone account for 28% of acute pancreatitis. This is also comparable with a Study of epidemiology and Clinical Profile of Acute Pancreatitis in a tertiary hospital in South India [4]. According to study alcoholism accounts for 53% & gall stone accounts for 21% of acute pancreatitis. In western literature gall stone accounts for most of the cases of acute pancreatitis, but in this part of world alcoholism is the most common etiological factor for developing acute pancreatitis.

We have calculated CT score , MEWS score and total BISAP score for every patients and categorized the patients in to those with CT severity score 0-7 and those with score 8-10.

Early stratification and aggressive management is important in acute pancreatitis. The existing predictive scoring systems have certain difficulties which are proposed to be overcome by newer grading systems like BISAP and MEWS. Ranson and Glasgow scores require 48 h for calculation and also require data that is not routinely collected at the time of admission. APACHE II was initially used in ICU patients but it requires various parameters of which some are not relevant to AP [5,6]. It is also cumbersome and difficult to remember for the clinicians.

Based on the CTSI, 89% had mild to moderate pancreatitis and 11% had severe pancreatitis. The sensitivity & specificity of the bedside index of severity of the acute pancreatitis(BISAP) was compared with Comparison of APACHE II, CTSI, and BISAP in predicting severity of acute pancreatitis by Rudrarpan Chatterjee et al.[7] The specificity varied between 68.66 to 95.7 while sensitivity between 31.8 to 90.91[8]. Our study shows a sensitivity of 75 and specificity of 78.8 which are comparably close to most of the studies. Similarly, Positive Predictive value varied between 34.3 to 83.3 while negative predictive value between 38.9 to 99. Our study has Positive Predictive value and negative predictive value of 50 and 89.69, which is an acceptable value in comparison to Rudrarpan Chatterjee et al [7]. The area under the curve for Bedside index of severity of acute pancreatitis was 0.802 which is almost comparable to comparison with other scoring systems in predicting severity and organ failure by Ji Young Park et.al.[9] (Table 2).

Table 2:Comparing the findings of the study with the literature

Study (Bedside index of severity vs Various scores)	Sensitivity	Specificity	Positive Predictive value	Negative predictive value
Rudrarpan Chatterjee et al.[7]	80.00(56.34-94.27)	68.66(56.16-79.44)	43.24(33.43-53.61)	92.00(82.51-96.56)
Anubhav Harshit Kumar et al.[12]	90.91(58.72-99.77)	86.67(69.28-96.24)	71.43(49.63-86.38)	96.30(79.96-99.41)
Wei Gao et al.[13]	63(55-70)	82(79-84)	-	-
Yajie Li et al.[14]	88.9	86.5	34.3	99
N R Venkatesh et al.[15]	31.8(22.09-43.58)	85.7(70.62-93.74)	81.4 (63.3-91.82)	38.9(28.84-50.13)
Sumitra Hagjer et al.[16]	71.4	95.7	83.3	91.7
Papachristou et al.[17]	37.5	92.4	57.7	84.3
Current study	75	78.8	50	89.69

Ransons score predicts the disease severity on the basis of 11 parameters, which were obtained during admission and or 48 hours later. The Ranson criteria has several setbacks, which include[10]. Complicated criteria, time for calculation takes 48 hours and validation beyond 48 hours has not been studied. The overall sensitivity of the Ranson criteria is 40%-88%, and the specificity is 43% - 90%. The positive predictive value and negative predictive value was approximately 50%, and 90% respectively.

Modified Early Warning Score has not been studied much in the context and when compared our study gave a comparable specificity and negative predictive value with respect to The Modified Early Warning Score: An Instant Physiological Prognostic Indicator of Poor outcome in Acute Pancreatitis by Aravind Suppiah et al.[11].

In our study, MEWS that was calculated at 6, 24 and 48 hours had similar sensitivity but the scores at 6 hours had higher specificity than the other two and also provided a clinical advantage of faster identification of severe patients than BISAP. It was resulted a sensitivity of 75% and specificity of 64.6% which is comparable with the observation of BISAP score. The predictive accuracy of BISAP compared to other scoring systems in the literature [9]. In our study the Negative predictive value was found to be 92% and Positive Predictive value was 26%. Found to be an excellent screening tool in early identification of patients with severe acute pancreatitis with comparable efficacy with other scoring processes also providing the lead time for timely management of the critically ill patients using minimal clinical resources in identification of patients requiring critical care. Thus it may form a cornerstone in the new era where patients with acute pancreatitis are diagnosed, prioritised and treated in a fasttrack approach.

Study of a larger population is required to further validate the study as variations of population and comorbidities may affect the Modified early warning scores. Comorbidities need mention as Modified Early Warning Score is a physiologic score and a poor health status may be reflected in the score independent of the disease.

In this study, MEWS was found to be an excellent screening tool in early identification of patients with severe acute pancreatitis and had comparable efficiency with BISAP in predicting severe acute pancreatitis. Current study revealed that MEWS can provide very early prediction of severe acute pancreatitis within 6 hours using minimal clinical resources saving valuable time and resources in identification of patients requiring critical care.

Conclusion

BISAP and MEWS in our study showed high negative predictive value and are both efficient in ruling out severe acute pancreatitis in patients at earlier stage than CT and prioritizing treatment.

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