



## EARLY PREDICTION OF SEVERITY OF ACUTE PANCREATITIS BY PANC-3 CRITERIA

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### ABSTRACT

**Background:** Acute Pancreatitis is a common disease in clinical practice, developing due to sudden inflammation of Pancreas, and to a varied degree involving local tissues or distant organs in a systematic manner. Acute Pancreatitis may at times remain underdiagnosed at the extremes of clinical spectrum of very mild and very severe disease. Failure to diagnose a fulminant attack can result in otherwise preventable mortality. **Aim:** To analyze simplified stratification system of PANC-3 criteria and compare it with APACHE-II for early prediction of severity of Acute Pancreatitis. **Method:** In this Prospective, Observational study 63 patients were evaluated and admitted with diagnosis of Acute Pancreatitis. Investigations were done on all patients and PANC-3 & APACHE-II scores were calculated. **Results:** PANC-3 score showed Sensitivity, 42.85%; Specificity, 100%; Positive Predictive Value, 100%; Negative Predictive Value, 85.96%; and Diagnostic Accuracy, 87.30%. **Conclusion:** Basal Metabolic Index(BMI), Hematocrit & Pleural Effusion on plain chest radiographs are simple tests required to determine PANC-3 score & hence can be easily performed even at small peripheral centres, which is an advantage over classical scoring systems. Interpretation of PANC-3 criteria doesn't require expertise and can be determined at the time of admission, thus resulting in earlier prediction of disease severity.

**KEYWORDS:** PANC-3 criteria, APACHE-II scoring system, Severe Acute Pancreatitis.

### INTRODUCTION

Acute Pancreatitis is one of the common disease encountered in clinical practice. Acute Pancreatitis is defined as an acute inflammatory process of the pancreas with variable involvement of other regional tissues or remote organ systems.<sup>[1]</sup> The clinical course of Acute Pancreatitis varies from a mild transitory form to a severe necrotizing disease. Most episodes of Acute Pancreatitis(80%) are mild & self limiting, subsiding spontaneously within 3-5 days. Patients with mild disease respond well to medical treatment in form of intravenous resuscitation and analgesia.<sup>[2]</sup> In contrast, Severe acute pancreatitis (15-20%) is defined as pancreatitis associated with organ failure and/or local complications such as necrosis, abscess or pseudocyst formation<sup>[3,4]</sup>, often requiring aggressive Intensive care. The mortality rates vary from 1% in the mild form to 20-30% in the severe form.<sup>[5]</sup>

The early and accurate staging of severity and assessment of prognosis of the disease are of great clinical significance, so that appropriate therapeutic management can be provided to the patient of Acute Pancreatitis at the earliest. Several clinical & Imaging systems for scoring the severity & prognosis of Acute

Pancreatitis were developed, including APACHE-II, Ranson, CT Balthazar grading system and Interleukin-6, C-Reactive protein level measurement etc. Most of these criteria are difficult to memorize, take more than 48hrs for severity stratification or rely on diagnostic tests not widely available or cumbersome to use.

Thus, search for a tool which is simple, non invasive yet inexpensive, easily applicable and reproducible with statistical power to arrive to a valid conclusion accurately had been ongoing, until PANC-3 criteria was introduced by Brown et al. PANC-3 criteria predicts severity of Acute Pancreatitis on the basis of inclusion of following three very simple parameters.<sup>[6]</sup>

- (1) Hematocrit > 44%
- (2) BMI > 30kg/m<sup>2</sup>
- (3) Pleural effusion on chest radiographs.

Understanding the fact that at times it is difficult to diagnose, treat & predict severity of Acute Pancreatitis; objective of present study is to analyze simplified stratification system of PANC-3 criteria & compare it with APACHE-II for early prediction of severity of Acute Pancreatitis.

## PATIENTS AND METHODS

### Patients

An observational Prospective study was done on 63 patients with Acute Pancreatitis admitted at L.L.R.M. Medical College, Meerut (A tertiary Hospital in western U.P. in India) from October 2016 to September 2017; 36 males and 67 females; age, 41.86  $\pm$  11.54 years. Acute Pancreatitis was defined by the presence of characteristic abdominal pain in epigastrium, radiating to back, associated with nausea & vomiting and absence of other diagnosis that would explain the symptoms associated with the serum amylase or lipase concentration at least three times the upper limit of normal. Patients with Acute Pancreatitis and onset of pain less than 48hrs before admission were considered for the study. Diagnosis and evaluation of Acute Pancreatitis was done using Ultrasonography and CECT at the time of admission.

Gender, age, Height and weight were recorded at time of admission. Etiology of Acute Pancreatitis was evaluated; alcohol was considered the culprit when history of heavy alcohol intake before the episode was documented and other etiologies were ruled out. Diagnosis of gall stone pancreatitis was sustained by Ultrasonic findings of gallstones or bile duct dilatation and/or Liver Function test suggestive of obstructive Jaundice, without other obvious cause of the attack.

All patients with age less than 15 years, history of pancreatic carcinoma, chronic pancreatitis, recurrent attacks of acute pancreatitis or with history of complications like pseudocyst, pancreatic abscess etc were excluded from the study. Also illness that could compound the interpretation of investigations such as presence of pleural effusion on chest radiographs preceding development of Acute pancreatitis, known anaemia, congestive heart failure and pregnancy were excluded from the study.

### Study design

All the patients were submitted to laboratorial tests such as Total leukocyte count, platelet count, hematocrit level, prothrombin time, serum creatinine level, serum electrolyte level, blood sugar level, serum protein level, serum bilirubin & liver enzymes level, serum amylase & lipase level and Arterial blood gas analysis was done. Plain chest radiographs and Ultrasonography of abdomen was done in all patients. CECT of abdomen was done in selected cases. PANC-3 and APACHE-II scores were calculated for each patient included in the study after taking a signed non-compulsory and explanatory term of consent.

### Statistical Analysis

Statistical analysis was performed using SPSS 21.0 software. All data was tabulated and results were evaluated using Students t-test & Fischer's Exact test.

Results with p-value less than 0.05 were considered statistically significant.

An APACHE-II score of  $\geq 8$  was considered as the determinant of disease severity, and a comparative study was conducted with PANC-3 score to predict severity of disease. Fulfillment of all three parameters of PANC-3 criteria in a patient was considered as a case of Severe acute pancreatitis.

## RESULTS

There were a total of 63 patients with Acute pancreatitis who met the study inclusion criteria. Out of these, 49(77.78%) cases were of mild Acute pancreatitis and 14(22.22%) patients presented with Severe acute pancreatitis as established by APACHE-II criteria.

Amongst 63 patients, 36(57.14%) were males and 27(42.86%) were females; age 41.86  $\pm$  11.54 years. 7 out of 36 males (19.44%) and 7 out of 27 females(25.93%) developed Severe acute pancreatitis.

Age distribution of all patients considered in the study was evaluated & most patients(25) belonged to 30-40 years age group. [Table/Figure-1].

[Table/Figure-1] Age Distribution of patients.

AGE DISTRIBUTION	NO. OF PATIENTS
20-30	9
30-40	25
40-50	14
50-60	10
>60	5

In our study, range of patient age was between 23 to 73 years with Standard deviation of 11.54 years. Mean age of all Patients of Acute Pancreatitis was found to be 41.16  $\pm$  10.93 years and of patients with Severe acute pancreatitis was found to be 44.29  $\pm$  11.91 years.

Considering Etiology, out of 63 patients, 39 were cases of Gall stone pancreatitis, 21 cases were of Alcoholic pancreatitis, 2 patients had Gall stones & were also alcoholic and for 1 patient, cause couldn't be established. Amongst 14 patients with Severe acute pancreatitis, 9 were of Gall stone pancreatitis, 4 were of Alcoholic pancreatitis and 1 patient was alcoholic with gall stones.

Hematocrit was measured in all patients of Pancreatitis at the time of admission. Mean Hematocrit of patients with Acute pancreatitis was 40.40%  $\pm$  2.64 against 45.61%  $\pm$  3.25 in patients with Severe acute pancreatitis. Mean value of Hematocrit for Severe acute pancreatitis patients was above cut-off value (>44%) as per PANC-3 criteria. The difference in Hematocrit of Patients with Acute & Severe acute pancreatitis was extremely significant statistically, with p-value<0.0001. [Table/Figure-2]

**[Table/Figure-2] Mean Hematocrit of Acute & Severe acute pancreatitis.**

CATEGORY	NO. OF PATIENTS	MEAN (IN PERCENTAGE)	STANDARD DEVIATION	p-VALUE
AP	49	40.40	2.64	<0.0001
SAP	14	45.61	3.25	

Mean BMI in patients with Acute pancreatitis was  $25.34 \pm 2.416 \text{ kg/m}^2$ , whereas it was  $31.89 \pm 3.899 \text{ kg/m}^2$  in patients with Severe acute pancreatitis, which was above the cut-off value i.e.  $> 30 \text{ kg/m}^2$  as per PANC-3 criteria. On comparing BMI of patients with Acute &

Severe acute pancreatitis, extremely significant statistical difference was observed between the two groups with resultant p-value being  $<0.0001$ . [Table/Figure-3]

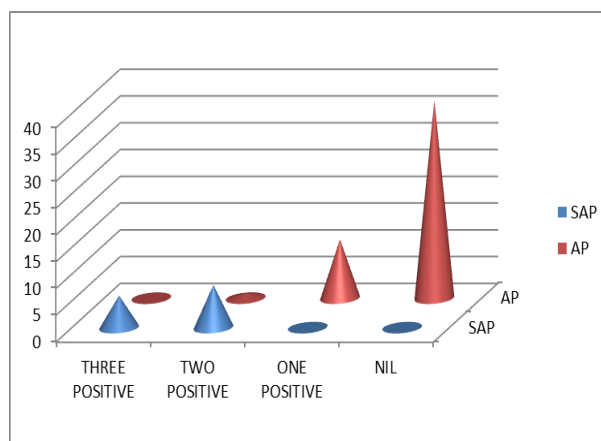
**[Table/Figure-3] Mean BMI of Acute & Severe acute pancreatitis.**

CATEGORY	NO. OF PATIENTS	MEAN (IN $\text{Kg/m}^2$ )	STANDARD DEVIATION	p-VALUE
AP	49	25.34	2.416	<0.0001
SAP	14	31.89	3.899	

Amongst 63 patients who underwent chest radiographs, 15 patients presented with Pleural effusion. 11 out of 14 patients (78.57%) of Severe acute pancreatitis had their chest radiographs suggestive of Pleural effusion, as compared to 4 out of 49 patients (8.16%) of Acute pancreatitis. Fischer's Exact test was applied, which showed p-value of  $<0.001$ , i.e. extremely significant statistical difference between the two groups.

APACHE-II scores were calculated for all the patients based on the clinical and laboratory parameters estimated at the time of admission, and the results were tabulated as score of either  $<8$  or  $\geq 8$ . 14 patients were classified in to Severe acute pancreatitis group, while remaining 49 patients were assigned Acute pancreatitis group as established by APACHE-II criteria.

Out of 14 patients of Severe acute pancreatitis all three parameters of PANC-3 criteria were positive in 6 patients, while two parameters were positive in 8 patients. Amongst 49 patients of Acute pancreatitis, two parameters were positive in one patient and one parameter was positive in 10 patients. No patient of Acute pancreatitis had all three parameters positive. [Table/Figure-4]

**[Table/Figure-4] Graphical representation of positive parameters of PANC-3 criteria in patients of Acute & Severe acute pancreatitis.**

PANC-3 criteria was applicable to 42.86% patients with Severe acute pancreatitis (six cases). 18 patients had their Hematocrit levels above 44%. Pleural Effusion was observed in Chest radiographs of 15 patients. Body mass index was found above  $30 \text{ kg/m}^2$  in 14 patients. [Table/Figure-5]

**[Table/Figure-5] Incidence of parameters of PANC-3 criteria.**

PARAMETERS	NO. OF PATIENTS	PERCENTAGE
HEMATOCRIT $>44\%$	18	28.57%
PLEURAL EFFUSION	15	23.81%
BMI $> 30 \text{ kg/m}^2$	14	22.22%

## DISCUSSION

Severe acute pancreatitis as defined by Atlanta 1992 criteria is diagnosed if Ranson score is  $\geq 3$  or APACHE-II score is  $\geq 8$  or signs of organic dysfunction (Shock, Renal failure, S.creatinine  $>2\text{mg/dl}$  after hydration) or Local complications (Pancreatic abscess, necrosis, pseudocyst) or Systemic complications (DIC, S.fibrinogen  $<100\text{mg/dl}$ , S.calcium  $<7.5 \text{ mg/dl}$ , Platelet

count  $<100000/\text{mm}^3$ ) are present in a patient of Acute pancreatitis. [7-10]

Early prediction of severity of an attack of pancreatitis is the key to avoid morbidity & mortality associated with the attack, as patients can be referred earlier from peripheral centres and can be managed by specialized units in ICU settings. 50% mortality associated with

Severe acute pancreatitis can be reduced to 8% by early recognition of case.<sup>[11]</sup>

In our study, 63 patients were evaluated over a period of one year. 77.78% patients were of mild pancreatitis, while 22.22% patients were diagnosed with Severe acute pancreatitis, which is comparable to world literature, where incidence is around 20%.<sup>[12]</sup> Mean age of presentation in our study was 4<sup>th</sup> decade of life, unlike world literature, which documents 6<sup>th</sup> decade as most common age group.<sup>[13]</sup>

Gall stone pancreatitis was observed in 61.90% patients, while alcoholic pancreatitis was observed in 34.92% patients.

Development of Pleural effusion in patients of Acute pancreatitis is indicative of SIRS and if detected radiologically, can act as a good predictor of disease severity. 11 out of 14 patients (78.57%) of Severe acute pancreatitis had findings suggestive of Pleural effusion on their chest skiagrams, which is comparable to world literature with 84.2%.<sup>[14]</sup>

Body mass index critically affects disease severity in patients of acute pancreatitis.<sup>[15]</sup> In this study, mean BMI in patients with Acute pancreatitis was found to be  $25.34 \pm 2.416 \text{ kg/m}^2$ , whereas it was  $31.89 \pm 3.899 \text{ kg/m}^2$  in patients with Severe acute pancreatitis. As per International literature, BMI of  $>30 \text{ kg/m}^2$  is considered as a risk factor for development of Acute pancreatitis.<sup>[16]</sup> This becomes important in the light of fact that BMI of average Indian population is low as compared to western population.

Hematocrit in patients of Acute pancreatitis increases with disease severity. This is because of fluid sequestration in extravascular space due to leaky capillary channels in proportion to disease severity. In this study, Hematocrit in patients with Severe acute pancreatitis was found to be  $45.61\% \pm 3.25$ . Hematocrit  $>44\%$  and failure to fall in this measure after 24 hours has been shown to be related to the development of pancreatic necrosis & predict organ failure.<sup>[17]</sup>

Continuous search for a tool which is simple, non invasive yet inexpensive, easily applicable and reproducible with statistical power to arrive to a valid conclusion accurately led to the development of PABC-3 criteria by BROWN et al.<sup>[5]</sup> After conducting comparative study with APACHE-II, PANC-3 criteria showed promising results with Sensitivity, 42.85%; Specificity, 100%; Positive Predictive Value, 100%; Negative Predictive Value, 85.96%; and Diagnostic Accuracy, 87.30%.

Whenever PANC-3 was positive, patient presented with Severe acute pancreatitis in accordance to APACHE-II criteria, i.e. no false positive cases were found in this study with PANC-3 criteria.

## CONCLUSION

As demonstrated in our study, PANC-3 criteria can be used to predict the severity of Acute pancreatitis as efficiently as APACHE-II, by using three simple parameters, which are available even at Peripheral centers, Basic Health centers, and are quiet inexpensive & non-invasive. Unlike other Scoring systems, PANC-3 criteria can be applied at the time of admission and also its interpretation doesn't need much expertise.

PANC-3 criteria can be used at Primary Health centers, for early referral of patients & prompt treatment.

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