Original Research Article

Role of PANC-3 score to predict severe acute pancreatitis

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ABSTRACT

Background: Acute pancreatitis is the most terrible of all the calamities that occur in connection with the abdominal viscera. Prediction of severity is an essential step in the management of acute pancreatitis. 50% of mortality can be reduced to 8% by its early recognition. PANC-3 score is widely available test that can be performed quickly, easy to measure with high accuracy in predicting acute pancreatitis.
Methods: This cross-sectional study was conducted in the department of general surgery, VMMC and Safdarjung Hospital over 50 patients admitted with acute pancreatitis. After making the clinical diagnosis, PANC -3 score, modified ATLANTA score, APACHE II were done. CRP and CTSI (computed tomography sensitivity index) were calculated and correlated.
Results: Mean age was 44.74 years and most common cause was biliary tract pathology. Mortality observed in 5 patients, 11 patients had severe disease. Sensitivity of PANC- 3 was 81.82%, specificity -92.31% with 75% PPV and 94.7% NPV.
Conclusions: PANC-3 can be used to predict the severity of pancreatitis as efficiently as Modified ATLANTA classification/APACHE II. It uses only three criteria which are easily done, and available in the basic health care setup. Its interpretation does not need expertise and can be applied at the time of admission which is an advantage when compared to classical scoring systems.

Keywords: PANC-3, Modified ATLANTA, APACHE II, CRP, CTSI

INTRODUCTION

Acute pancreatitis is the most terrible of all the calamities that occur in connection with the abdominal viscera. It may be defined as an acute pancreatic inflammation due to activation of digestive enzymes present in the interior of the gland, which affect the pancreas, adjacent tissues and other organs.[1,2] With the Incidence between 30/10,000 to 50/100,000 population ,[3] and miscellaneous etiological factors[4,5], this inflammatory condition is most commonly caused by bile stones or excessive use of alcohol. Upto 25% mortality seen in cases of severe acute pancreatitis.[6] The typical findings observed are acute onset of upper abdominal pain with radiation to the back, nausea and vomiting, local peritonitis located in the epigastrium and sometimes an effect on the circulatory system, in combination with elevated pancreatic enzymes in blood or urine.

After the initial diagnosis, the treatment depends upon the assessment of disease severity as early as possible. 50% mortality associated with severe acute pancreatitis can be reduced to 8% by its early recognition implicating the importance of early diagnosis of the disease.[7] In such a situation we need an indicator which can predict the outcome of an attack, as severe or mild, as early as possible and it should be sensitive and specific enough to trust upon.

Worldwide, different indicators have been given the status of prognostic importance with different sensitivity and specificity however; the search for the best indicator is still on. Experts are continuously working to combine such indicators to fit them into a scoring system rather than systems to obtain the maximum possible predictive value. Although multiple clinical scoring systems have been developed, they show modest accuracy in predicting persistent organ failure in acute pancreatitis.[8,9] Most of these indicators are cumbersome, requires advanced laboratory set up, take greater than 48 hours to enable complete severity stratification . The most commonly used classification system is the 2012 version of Atlanta classification using early prognostic signs, organ failure and local complications to define disease severity. Other classification systems are Ranson score, Glassgow score, Balthazar score, APACHE (acute physiology and chronic health evaluation) and SOFA (sequential organ failure assessment).

PANC 3 scoring system developed by Brown et al of Harvard Medical School claimed to be an approachable, assessable scoring which uses only 3 parameters such as hematocrit, body mass index (BMI) and pleural effusion. It is rapid, easy to apply, needs facilities of a basic hospital and is as good as other scoring systems in predicting the outcome of an attack of an acute pancreatitis.[10]

METHODS

The proposed study was conducted in Department of Surgery, Vardhman Mahavir Medical College and Safdarjung Hospital, New Delhi. It was a cross-sectional study with the population consisted 50 cases of acute pancreatitis admitted in the hospital between September 2016 to April 2018 fulfilling the inclusion criteria.

Inclusion criteria included, case with clinical history of abdominal pain, an increased level of pancreatic enzymes suggestive of acute pancreatitis and age >12 years. Exclusion criteria included, patients with other co-morbid conditions like cardiac failure, liver failure, renal failure haematological disorder or any lung pathology, patient of chronic pancreatitis and recurrent attack of acute pancreatitis of the previous history of complications like pseudo cyst, pancreatic abscess etc.

All patients presenting to the hospital with diagnosis of acute pancreatitis not falling in the exclusion criteria were evaluated. Diagnosis of acute pancreatitis was based on typical clinical history of severe acute onset upper abdominal pain radiating to back, persisting for more than 24 hours and associated with raised serum amylase more than 3 times to the upper limit of normal. After taking written informed consent all patients underwent the following investigations: hemoglobin, hematocrit, total leukocyte count (TLC), liver function tests including total serum albumin (in g/dl), blood urea and Serum creatinine, serum electrolytes, serum amylase, serum lipase, random blood sugar, serum calcium, ABG analysis, chest X-ray and ultrasound abdomen (to rule out any associated pathology).

PANC 3 score (using BMI, haematocrit, pleural effusion), Modified ATLANTA criteria, APACHE-II scoring were done in patients. CRP estimation was carried at 48 hours. Cut off value of 120 mg/l and above was taken as indicator of severe acute pancreatitis.

Contrast enhanced CT abdomen were also done in patients and CT severity index (CTSI) was calculated by combining the scores of pancreatic inflammation and pancreatic necrosis. An index of 5 & above was taken as severe acute pancreatitis. Severity of acute pancreatitis was assessed on the basis of Modified ATLANTA criteria, APACHE II scoring, CTSI score, CRP estimation.

All patients were managed as per the standard guidelines for acute pancreatitis. Assessment of severity was performed at admission and after 48 hours. Systemic complications included in the severity were, organ failure, shock (systolic blood pressure <90 mm Hg), pulmonary failure (PaO2<60 mm Hg), renal failure (creatinine level >2 mg/dl after rehydration) or gastro-intestinal bleeding (>500 ml/24 hours). Systemic fibrionolysis, disseminated intravascular coagulation (platelets 100,000/cubic mm, fibrin split products >80 µg/ml). Severe metabolic disturbance (serum calcium level <7.48 mg/dl). The local complications in the severity were, pancreatic necrosis (an area of more than 3cm diameter or involving more than 30% of pancreas in CT and contrast density increase <50 Hounsfield units in the area of necrosis after intravenous administration of contrast medium. In addition, pancreatic necrosis or peri-pancreatic necrosis defined at surgery characterize SAP. Acute fluid collections (occur early in the course of AP, and are located in or near the pancreas, and always lack a wall of granulation or fibrous tissue). Abscess (a circumscribed intra-abdominal collection of pus, usually in proximity to the pancreas, containing little or no pancreatic necrosis, which arises as a consequence of AP or pancreatic trauma). Pseudocyst (a collection of pancreatic fluid enclosed by a wall of fibrous or granulation tissue, which arises as a consequence of AP, pancreatic trauma or chronic pancreatitis).

Statistical analysis

Categorical variables were presented in number and percentage (%) and continuous variables were presented as mean±SD and median. Normality of data was tested by Kolmogorov-Smirnov test. If the normality was rejected then non parametric test was used.

Statistical tests were applied as follows, quantitative variables were compared using ANOVA/Kruskal Wallis test (when the data was not normally distributed) between more than two groups, qualitative variables were

correlated using Chi-Square test, inter Rater kappa agreement was used to find out the strength of agreement between PANC3 and modified Atlanta, receiver operating characteristic curve was used to find out cut off point of PANC3 for predicting modified Atlanta. P <0.05 was considered statistically significant. The data was entered in MS EXCEL spreadsheet and analysis was done using Statistical Package for Social Sciences (SPSS) version 21.0.

RESULTS

The present study was conducted in the department of general surgery, Safdarjung Hospital over a period of 18 months. In this study patients >12 years of age, diagnosed with acute pancreatitis were included. Patients with co-morbidities, those with history of chronic pancreatitis/ related complications were excluded.

Majority of the patients in the present study were in age group of 31-40 years (26%) followed closely by the patients in the age group of 51-60 years (20%). Mean age of patients in study was 44.74±15.69 years (Table 1).

Table 1: Age of the patients.

Age in years	Frequency	Percentage
<21	3	6.0
21-30	9	18.0
31-40	13	26
41-50	8	16
51-60	10	20
>60	7	14
Total	50	100

The commonest etiological factor in our study was biliary tract pathology (70%), followed by alcohol (30%). Out of 50 patients in the study, there was mortality in 5 patients (10%) and all of them belonged to the severe group according to the modified ATLANTA classification. The cause of death was multiple organ failure secondary to sepsis in 4 patients and 1 death was due to peritonitis due to pancreatic ascites. Multiple organ failure encountered was cardiovascular and respiratory failure (Table 2). Maximum 52% patients developed pleural effusion, 10% patients showed USG guided pig tail and walled of necrosis. However, 36% patients showed no complications.

Table 2: Complications/sequels observed.

Sequel	Frequency	Percentage
Abdominal drain	1	2
No sequel	18	36
Walled of necrosis	3	6
Pleural effusion	26	52
USG guided pig tail	2	4
Total	50	100

Patients in the mild group had an average stay of 4.5 days, 8.46 days in moderate group where as it was 8.2 days in cases of severe acute pancreatitis. 22% (11 patients) of the patients had severe disease as per the modified ATLANTA classification. CRP levels at 48hours were 4.74 mg/dl in mild, 8.98 mg/dl in moderate and 12.74 mg/dl in severe acute pancreatitis. In patients with 1 positive PANC-3 score CTSI score was 6.19, in patients with 2positive PANC-3 score it was 8.11 and in patients with 3 positive PANC-3 score mean CTSI score was 9.33. Mean CTSI score was 3.96 in patients with negative PANC-3 score.

The mean BMI of patients under the study was 23.65 kg/m² in mild type, 25.27 kg/m² in severe type with the p value of 0.001. The mean hematocrit of patients at the time of admission was 36.62% in mild cases, 42.31% in moderate cases while 47.67% in cases with severe acute pancreatitis. Out of 50 patients, pleural effusion was noted in 26 patients (Table 3).

On evaluating PANC 3 score, among 38 patients with 1 positive or negative PANC score 25 had mild pancreatitis, 11 had moderate and 2 patients had severe pancreatitis. Out of 9 patients with 2 positive parameters 1 patient had mild, 2 patients had moderate and 6 patients had severe pancreatitis, while 3 patients with 3 positive PANC 3 score had severe acute pancreatitis. In present study the sensitivity of PANC 3 was81.82%, and the specificity was 92.31%. The positive predictive value (PPV) was 75% and the negative predictive value (NPV) was 94.7% in predicting acute severe pancreatitis with the p value of 0.005 and the kappa value of 0.266 which is significant and show fair strength of agreement (Table 4).
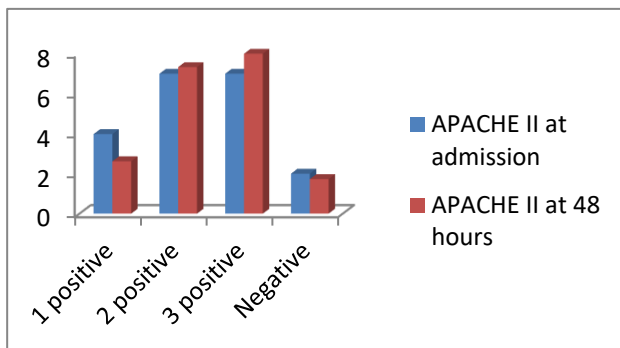
Table 3: PANC 3 score and its parameters.

Sample size	Mean±SD	Median	Range	Inter quartile range	Sample size
BMI	50	25.55	25.55	17.5-33.3	22.300 - 26.900
PANC-3 at admission					
Hematocrit	1 positive	2 positive	3 positive	Negative	p-value
Sample size	16	9	3	22	
Mean±SD	36.62±5.07	42.31±7.57	47.67±3.79	34.36 ± 5.23	0.0002

Table 4: Correlation between the PANC 3 score at admission and the modified ATLANTA classification at 48 hours.

PANC 3 at admission	Mild	Moderate	Severe	Total	Kappa	P-Value
Negative/1 positive	50%	22%	4%	76%		
2 positive	2%	4%	12%	18%	0.266	0.005
3 positive	0	0	6%	6%		
Total	52%	26%	22%	100%		

APACHE II score is a very good predictor of severity. Mean APACHE II score after 48 hours in patients with 1 positive, 2 positive, 3 positive parameters of PANC 3 score was 2.62, 7.33 and 8 respectively with p value 0.01. In present study APACHE II (score ≥8) after 48 hours of admission had sensitivity of 90.91, specificity of 87.18, PPV of 66.7, NPV of 97.1 (Figure 1).

Figure 1: Relation between PANC 3 score and APACHE II at admission and at 48 hours.

In patients with 1 positive parameter of PANC 3 mean APACHE II score was 3.94 admission which improved to 2.62 after 48 hours; patients with 2 positive parameters of PANC 3 score had mean APACHE II score of 7 which worsened to 7.33 after 48 hours, patients with 3 positive parameters of PANC 3 score had mean APACHE II score of 7 which worsened to 8 after 48 hours.

Results of PANC 3 score were comparable with the modified ATLANTA classification and the APACHE II score (p-value 0.005, kappa value of 0.266; p-value of 0.01 respectively).

DISCUSSION

Prediction of severity is an essential step in the management of acute pancreatitis. Approximately 15%-30% patients present with severe disease, and the early recognition of such patients is essential to avoid morbidity and mortality associated with the attack. 50% mortality associated with severe acute pancreatitis can be reduced to 8% by early recognition. Various markers have been evaluated to predict the outcome of acute pancreatitis in terms of severity, early prediction, pancreatic necrosis and infective pancreatic necrosis, and mortality.

The commonest etiological factor in our study was biliary tract pathology (70%), followed by alcohol (30%). In a study by Uhl et al.[11] The incidence of biliary tract pathology was in the range of 36-38%. Marshall in a study found that biliary pathology and alcohol account for 60- 80% cases of AP.[12] Steinberg et al. mentioned that biliary disease is the most common cause of AP in the United States, Asia and most of western Europe[13].

Prospective study by Brown et al showed that Haematocrit at admission ≥44% and/or failure of haematocrit to decrease at 24 hours of admission was associated with development of necrotizing pancreatitis and organ failure with negative predictable value for necrotizing pancreatitis and organ failure of 96% and 97% respectively.[14,15] In our study the mean hematocrit of the patients at the time of admission was 36.62% in mild, 42.31% in moderate, 47.67% in severe acute pancreatitis.

Out of 50 patients who underwent chest X-ray, pleural effusion was seen in 26 patients, out of which 11 patients were diagnosed with severe acute pancreatitis as per the modified ATLANTA criteria. In the 26 patients who had pleural effusion, 24 (92%) patients had atleast 1 positive parameter of PANC 3 score. According to the study conducted by Panda et al in 2017 pleural effusion was seen in 29 patients.[16] Out of which 21 patients of severe acute pancreatitis had pleural effusion (84%). In study by Beduschi et al in 2016 pleural effusion had sensitivity of 60%, specificity of 91.7%, PPV of 60%, NPV of 91.7%.[17] In a prospective study by Rathnakar et al in 2017 patients with SAP showed abnormal X-ray findings suggestive of pleural effusion in 18 (78.3%).[18,19] As compared to abnormal findings of 9 (15.3%) patients among 59 patients with mild attack (Chi-square test showed p<0.001). Abnormal X-ray findings were more common with ASP group. In the study by Brown et al pleural effusion had sensitivity of 84%, specificity of 91%, PPV of 62%, NPV of 97%.[14] Ocampo et al have stated in their study that pleural effusion is superior to multiple factor scoring system in predicting acute pancreatitis outcome by likelihood positive ratio of 16.1 for predicting total complication which is statistically significant.[20]

The evaluation of PANC 3 score in our study is comparable to that observed by Shah AS et al.[21], who did a study on 100 patients and found out that the sensitivity of PANC3 score was 75%, and the specificity was 96.43%. The PPV was 80%, and the NPV was 95.29% in

predicting severe acute pancreatitis. In 2013 Fukuda et al.[22] did a study on 65 patients and found out that PANC3 score had a specificity of 100%; PPV of 100%; and NPV of 81.66%. In 2017, Rathnakar et al, did a study on 82 patients and found out that PANC 3 score had sensitivity of 82.6% and specificity of 77.9% in predicting severe acute pancreatitis, with PPV of 59% and a NPV of 92%.[18] In 2017 study by Panda et al, PANC 3 score had the sensitivity of 68%, and specificity of 95.91%.[19] The PPV was 89.47%, and the NPV was 85.45% in predicting severe acute pancreatitis. In 2017 study by Vasudevan S et al, PANC 3 score had sensitivity of 85.4% and specificity of 65.2% in predicting severe acute pancreatitis, with PPV of 48.8% and a NPV of 92%.[23] Although the results of our study are promising, the limitation is the paucity of cases.

APACHE II score is a very good predictor of severity. Mean APACHE II score after 48 hours in patients with 1 positive, 2 positive, 3 positive parameters of PANC 3 score was 2.62, 7.33 and 8 respectively with p value 0.01. In present study APACHE II (score ≥ 8) after 48 hours of admission had sensitivity of 90.91, specificity of 87.18, PPV of 66.7, NPV of 97.1. World literature shows a sensitivity of 65%, specificity of 76% and positive predictive value of 43% and a negative predictive value of 89% when the score was taken as >7.96. In 2017 study by Rathnakar et al showed the sensitivity of APACHE II on admission in predicting acute severe pancreatitis to be 91.3% with specificity of 96.6%, it had a positive predictive value of 91% and negative predictive value of 96%.[18]

Results of PANC 3 score were comparable with the Modified ATLANTA classification and the APACHE II score (p value -0.005, kappa value of 0.266 and p value of 0.01 respectively).

CONCLUSION

The ultimate goal of any scoring system is to predict the patients with severe attack early in the course of disease and being able to interrupt the course as early as possible. Our studies showed that PANC-3 can be used to predict the severity of pancreatitis as efficiently as modified ATLANTA classification/APACHE II. It uses only 3 criteria which are easily done, and available in even the basic health care setup. The interpretation of PANC-3 does not need expertise and can be applied at the time of admission which is an advantage when compared to classical scoring systems.

LIMITATIONS

There is paucity of literature and studies on PANC-3 score. The sample size of our study was small, still large number of case studies required to approve our conclusion

REFERENCES

1. Cruz-Santamaría DM, Taxonera C, Giner M. Update on pathogenesis and clinical management of acute pancreatitis. World J Gastrointest Pathophysiol. 2012;15(3):60-70.
2. Skipworth JRA, Pereira SP. Acute pancreatitis. Curr Opin Crit Care. 2008;14:172-8.
3. Frey CF, Zhou H, Harvey DJ, White RH. The incidence and case-fatality rates of acute biliary, alcoholic, and idiopathic pancreatitis in California, 1994-2001. Pancreas. 2006;33:336-44.
4. Baker S. Diagnosis and management of acute pancreatitis. Critical Care and Resuscitation. 2004;6:17-27.
5. Whitcomb DC. Clinical practice. Acute pancreatitis. N Engl J Med. 2006;354(20):2142-50.
6. Beger HG, Isenmann R. Surgical management of necrotizing pancreatitis. Surg Clin North Am. 1999;79:783-800.
7. Werner J, Feuerbach S, Uhl W, Büchler MW. Management of acute pancreatitis:From surgery to interventional intensive care. Gut. 2005;54:426-36.
8. Mofidi R, Duff MD, Wigmore SJ, Madhavan KK, Garden OJ, Parks RW et al. Association between early systemic inflammatory response, severity of multiorgan dysfunction and death in acute pancreatitis. Br J Surg. 2006;93:738-4.
9. Williams S, Simms HH. Prognostic usefulness of scoring systems in critically ill patients with Severe Acute Pancreatitis. Critical Care Med. 2000;28(8):3124-5.
10. Alphonso B, Toyia JS, Tara D, David. The panc 3 score: a rapid and accurate test for predicting severity on presentation in acute pancreatitis. J Clin Gastroenterology. 2007;41(9):855-8.
11. Uhl W. A randomized double blind, multi-centric trial of octreotide in moderate to severe acute pancreatitis. Gut. 1999;(45):97-104.
12. Marshall JB. Acute pancreatitis a review with emphasis on new development. Arch Int. Medicine. 1993;(153):1185-98.
13. Steinberg W, Tenner S. Acute pancreatitis. N Engl J Med. 1994;330:1198-210.
14. Brown A, Stevenson JT, Dyson T, Grunkenmeier D. The PANC 3 score: A rapid and accurate test for predicting severity on presentation in acute pancreatitis. J Clin Gastroenterol. 2007;41(9):855-8.
15. Brown A, Orav J, Banks PA. Hemoconcentration is an early marker for organ failure and necrotizing pancreatitis. Pancreas. 2000;20(4):367–72.

16. Panda C, Nayak NK, Behera MR, Nayak SK. PANC 3 score as a simple cost-effective scoring system in predicting severity of acute pancreatitis. Int Surg J. 2017;4(12):4066-70.
17. Beduschi MG, Mello ALP, Von-muhlen B, Franzon O. The PANC 3 score predicting severity of acute pancreatitis.ABCD Arq Bras Cir Dig. 2016;29(1):5-8.
18. RathnakarSK, Vishnu VH, Muniyappa S, Prasath A. Accuracy and Predictability of PANC-3 Scoring System over APACHE II in Acute Pancreatitis: A Prospective Study. J Clinical Diagnostic Res. 2017;11(2):PC10-3.
19. Uhl W, Warshaw A, Imrie C, Bassi C, McKay CJ, Lankisch PG et al. IAP Guidelines for the Surgical Management of Acute Pancreatitis. Pancreatology. 2002;2:565-73.
20. Ocampo C, Silva W, Zandalanzini H. Pleureal Effusion is Superior to Multiple Factor Scoring System in predicting Acute Pancreatitis outcome. Acta Gastroenterol Latinoam(in Spanish). 2008;38(1):34-42.
21. Shah AS, Gupta AK, Ded KS. Assessment of PANC3 Score in Predicting Severity of Acute Pancreatitis. Niger J Surg. 2017;23(1):53-7.
22. Fukuda JK, Franzon O, Resende-Filho Fde O, Kruel NF, Ferri TA. Prognosis of acute pancreatitis by PANC 3 score. Arq Bras Cir Dig. 2013;26:133-5.
23. Vasudevan S, Goswami P, Sonika U, Thakur A, Sreenivas V, Saraya A. Comparison of Various Scoring Systems and Biochemical Markers in Predicting the Outcome in Acute Pancreatitis. Pancreas. 2018;47(1):67-71.