# **Original Research Article**

DOI: http://dx.doi.org/10.18203/2349-2902.isj20175412

# PANC 3 score as a simple cost-effective scoring system in predicting severity of acute pancreatitis

# Charan Panda, Niranjan Kumar Nayak\*, Manas Ranjan Behera, Sanjit Kumar Nayak

Department of General Surgery, Maharaja Krishna Chandra Gajapati Medical College and Hospital, Brahmapur, Odisha-760004, India

**Received:** 20 September 2017 **Accepted:** 28 October 2017

# \*Correspondence:

Dr. Niranjan Kumar Nayak,

E-mail: drniranjankumarnayak@gmail.com

**Copyright:** © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

# **ABSTRACT**

**Background:** Acute pancreatitis presents as acute abdomen, is an inflammatory process of the pancreas associated with local and systemic complications requiring, in such cases, an intensive care. At present, there are lots of scores (such as Ranson's, APACHE II, bedside index for severity in acute pancreatitis) that help us in predicting severity at the time of admission, but these are time consuming or require complex calculation and are costly. Our aim here is to analyse the simplified stratification system of the PANC 3 score, and its assessment in Predicting Severity of Acute Pancreatitis as decided by modified Marshals score.

**Methods:** It is a prospective analytical observational study in which 74 patients were evaluated with PANC 3 scoring, who were diagnosed with acute pancreatitis and admitted to Dept. Of General Surgery, MKCG.

**Results:** The results showed that PANC3 score had a 95.91% specificity, 68% sensitivity, 89.47% positive predictive value, and 85.45% negative predictive value, 86.48% diagnostic accuracy.

**Conclusions:** PANC3 scoring system is one of the better systems because the three criteria used (haematocrit, body mass index, and pleural effusion) are simple, easy to assess, readily available, and economic Hence, the PANC3 score is a cost-effective, promising score that helps in predicting the severity of acute pancreatitis and triaging the patient, leading to prompt management.

Keywords: APACHE score, PANC3 score, Pancreatitis, Ranson's score

## INTRODUCTION

Pancreatitis is defined as inflammation of the pancreas. It is one of the most common causes of acute abdomen. The most severe form of the disease is present in up to 30% of the cases. The mortality rates vary from 1% in the mild form to 20-30% in the severe form, corresponding to the 14th main cause of death of gastrointestinal origin. 1,2 Clinically Acute pancreatitis was defined as two or more of the following:

Characteristic acute abdominal pain

- Increased levels of serum amylase and/or lipase three times the normal value
- Ultrasound of the abdomen demonstrating changes consistent with acute pancreatitis.

Acute pancreatitis was classified as mild and severe acute pancreatitis in the original Atlanta classification in 1992, and was revised in 2013 as 'revised Atlanta classification' which classified pancreatitis into mild, moderate, and severe based on the duration of organ failure.<sup>3</sup> Mild acute pancreatitis was defined as no organ failure (organ failure as defined by modified Marshall

Score) with no local or systemic complications. Moderately severe acute pancreatitis was defined as organ failure that resolves within 48 h (transient organ failure). Severe acute pancreatitis defined as persistent organ failure (>48 h).<sup>3</sup> A lot of scoring systems, such as Ranson's, APACHE II, bedside index for severity in acute pancreatitis (BISAP), are there to predict the severity of acute pancreatitis. These scoring systems either take more than 48 h to evaluate (Ranson's, computed tomography severity index) or are difficult to memorize and cumbersome (APACHE II) or are costly and not widely available (C-reactive protein [CRP], trypsinogen activation peptide [TAP]).

Based on these problems, a retrospective study done by Brown et al. in 2007 found out that combining parameters such as haematocrit, body mass index (BMI), and pleural effusion led to post-test likelihood of disease to be 99% and hence the term PANC3 score was coined. PANC3 score, which does not utilize any sophisticated scoring parameters, is economic and easy scoring system for triaging patients according to severity early in the course of disease, at the time of admission, for better outcomes.

## **METHODS**

Prospective analytical observational study, carried out in Department of General Surgery, Maharaja Krishna Chandra Gajapati Medical College and Hospital, from patient admitted during time period from February 2016 to July 2017, a total 1yr and 6-month study.

#### Inclusion criteria

The patients who met the criteria defining acute pancreatitis above and had onset of pain <48 hr were included in the study.

#### Exclusion criteria

- Patients presented with organ failure at presentation or within 24 hr of admission (They were already in severe pancreatitis)
- Acute on chronic pancreatitis
- Recurrent attack of acute pancreatitis
- Patients with comorbid conditions such as cardiac failure, liver failure, and renal failure.

There are three factors in PANC3 score:

- Hematocrit of >44%
- BMI of  $>30 \text{ kg/m}^2$
- Chest X-rays that reveals pleural effusion

The number of factors positive for PANC3 score at the time of admission was determined. The PANC3 parameters were measured, and it was seen if the patients with all the three parameters positive had severe acute pancreatitis or not.

Modified Marshall Score was applied at time of admission, 24 hr, 48 hr, and 7 days to check the development of organ failure and to group acute pancreatitis into mild, moderate, severe.

#### Statistical analysis

It was done using proportions. The sensitivity, specificity, positive predictive value (PPV) negative predictive value (NPV), and diagnostic accuracy were determined for PANC3 Score using the following formulae.

The distribution of diagnostic statistics used in the study test are tabulated in Table 1.

Table 1: Distribution of diagnostic statistics used in the study test.

Test	Criteria			
	Severe acute pancreatitis	Mild-moderate acute pancreatitis	Total	
PANC3 (all factors positive)	A =true positive	B =false positive	A+B	
PANC3 (all factors not positive)	C =false negative	D =true negative	C+D	
Total	A+C	B+D	N =total sample size	

#### **RESULTS**

Out of the total 74 cases, 45% cases were mild acute pancreatitis, 21% cases were moderate acute pancreatitis, and 34% cases were severe type. The three parameters of PANC3 score were combined for predicting severe acute pancreatitis. The distribution of PANC 3 score in different types of acute pancreatitis in our study is shown in Figure 1. The majority of patients belonged to 40-55 years age group, with mean age of presentation of severe acute pancreatitis being 49.2 years.

The majority of patients (57) in our study were male (77%). The most common aetiology that we encountered was alcohol intake (62% cases), and gallstones were the  $2^{\text{nd}}$  most common cause.

The mean BMI (weight in kg/height in m²) of patients were 25.076 kg/m² in mild type, 26.093 kg/m² in moderate type, and 30.867 kg/m² in severe type. Pleural effusion was seen in 29 patients, out of which 21 patients of severe acute pancreatitis had pleural effusion (84%).

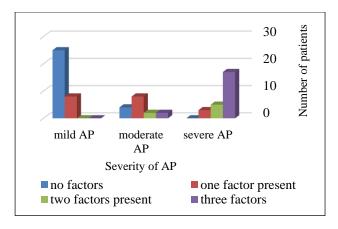


Figure 1: Distribution of PANC 3 score in different types of acute pancreatitis.

The hematocrit was calculated, and the mean hematocrit in patients of mild, moderate, and severe acute pancreatitis was 34.5%, 42.63%, and 46.81%, respectively. Out of the 25 cases of severe acute pancreatitis, 17 (68%) had all three parameters positive, 5 (20%) had two parameters positive, and 3 (12%) had just one parameter positive.

Out of the 25 cases of severe acute pancreatitis, 4 died on the 5<sup>th</sup> day of admission. 21 patients stayed in the Intensive Care Unit for minimum 10 days, and all of them required ventilator support.

The distribution of type of pancreatitis according to number of PANC3 parameters positive are tabulated in Table 2.

Table 2: Distribution of type of pancreatitis according to number of PANC3 parameters positive.

Test	Criteria		
	Severe acute pancreatitis	Mild-moderate acute pancreatitis	Total
PANC3 (all factors positive)	17	2	19
PANC3 (all factors not positive)	8	47	55
Total	25	49	74

The sensitivity of PANC3 score was 68%, and the specificity was 95.91%, PPV was 89.47%, and the NPV was 85.45% in predicting severe acute pancreatitis. The diagnostic accuracy is 86.48%. The Chi-square statistic is 35.49.

# **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. 1,2 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, which are markers of severity, early prediction, pancreatic necrosis and infective pancreatic necrosis, and mortality. According to Atlanta 1992 criteria, severe pancreatitis forms are those that fall under

the following criteria: Ranson's score  $\geq$ 3, Apache II  $\geq$ 8, organic dysfunction (shock, SBP <90mmHg, renal failure, creatinine >2mg/dl after hydration), local complication (necrosis, pseudocyst or abscess), systemic complication (DIC, platelets <100,000/mm³, fibrinogen <100mg/dl, degradation fibrinogen products >80mcg/ml, calcium <7.5mg/dl).

Other reviews published indicate new definitions for the classification of severity of acute pancreatitis, introducing concepts of mild acute pancreatitis which is characterized by the absence of pancreatic necrosis and organ failure, moderate acute pancreatitis characterized by the presence of sterile pancreatic necrosis and/or transitory organ failure, severe acute pancreatitis characterized by the presence of infected pancreatic necrosis or with persistent organ failure and the critical acute pancreatitis when the infected pancreatic necrosis and the persistent failure of organs are present.<sup>7</sup> This classification is shown in Table 3.

Table 3: Classification of severity of acute pancreatitis.<sup>5</sup>

	Mild AP	Moderate AP	Severe AP	Critical AP
Peripancreatic necrosis	Absent	Sterile	Infected	Infected
	And	And/or	Or	And
Organ failure	Absent	Transitory	Persistent	Persistent

In 2015, Cho et al. did a study comparing different scoring systems and published the results as shown in Table 4.8

In 2013, Khanna et al. did a comparison of Ranson's, Glasgow, BISAP, systemic inflammatory response syndrome, Multiple Organ System Score, APACHE-II, and other scores in predicting severity, organ failure, pancreatic necrosis, and mortality in the Indian scenario. The results are shown in Table 5.9

Table 4: Various scoring systems predicting severity of pancreatitis.<sup>9</sup>

	Sensitivity	Specificity	PPV	NPV
Ranson	85.7	44.3	18.8	95.3
BISAP	61.9	72.1	25.0	92.7
APACHE-II	81.0	65.7	26.2	95.8
CRP 24	53.3	94.3	66.7	90.4

PPV: Positive predictive value, NPV: Negative predictive value, CRP: C-reactive protein, BISAP: Bedside index for severity in acute pancreatitis.

Table 5: Results of study comparing various scoring systems. 10

	Sensitivity	Specificity	PPV	NPV	Accuracy	
Ranson's	83.9	78.0	74.3	86.5	80.6	
Glasgow	71.0	78.0	71.0	78.0	75.0	
MOSS	77.4	56.1	57.1	76.7	65.3	
APACHE II	80.6	82.9	78.2	85.0	81.9	
SIRS	80.6	65.9	64.1	81.8	72.2	
BISAP	74.2	68.3	63.4	77.8	70.8	
CTSI	65.4	50.0	54.8	60.9	57.4	
IL-6	93.1	96.8	96.4	93.8	95.0	
CRP	86.2	100	100	88.6	93.3	
Procalcitonin	86.4	75.0	79.2	83.3	81	

BISAP: Bedside index for severity in acute pancreatitis, SIRS: Systemic inflammatory response syndrome, CTSI: Computed tomography severity index, CRP: C-reactive protein, IL-6: Interleukin-6, PPV: Positive predictive value, NPV: Negative predictive value, MOSS: Multiple Organ System Score.

In present study, 74 patients were evaluated over a period of 1 year 6 months. The severity of the patients was classified according to the revised Atlanta classification into three groups mild, moderate, and severe. Of the 74 patients, 45% cases were mild acute pancreatitis, 21% were moderate, and 34% were severe. These findings are comparable with that of the rest of the world. <sup>10</sup>

The mean age for presentation in mild group was 45.7 years, and 42.3 in moderate group, and 49.2 in severe group. The majority of patients were in 40-55 years groups. The mean age of presentation for severe group was slightly more than the other two groups. The mean age of presentation was in the 5th decades of life. The mean age of presentation in world literature was 6th decades. The difference is probably explained due to alcohol being common in this part of world.

The majority of patients (57) in our study were male (77%). Severe acute pancreatitis was more common in males as compared to females with a ratio of 3:1. It has been studied that gallstone pancreatitis tends to occur more common in female subjects 3:1 when compared to male, and alcohol is more common for pancreatitis in male 6:1. The most common aetiology in our study was alcohol-induced pancreatitis. It was seen in 62% of patients. Second, most common aetiology was gallstones (33%). 17 out of 25 patients of severe acute pancreatitis

were due to alcohol-induced pancreatitis. Although world literature supports the fact that severity has no relation with cause. <sup>13</sup>

Obesity was seen mainly in cases of severe acute pancreatitis with mean BMI of 30.867 kg/m². The mean BMI of mild and moderate group was 25.076 kg/m² and 26.093 kg/m². These findings are supported by literature, which state that severity of an attack is influenced by BMI of patient. <sup>14</sup> Pleural effusions on X-rays were seen in 84% of severe acute pancreatitis cases in our study. These findings were similar to that observed by Heller et al., who in their study found abnormal chest radiograph in 84.2% of their patients. <sup>15</sup>

Hematocrit >44% and failure to fall in this measure after 24 h has been shown to be related to the development of pancreatic necrosis and predict organ failure. In our study, the mean hematocrit of patients having mild, moderate, and severe pancreatitis was 34.5%, 42.63%, and 46.81%, respectively. Hence, as observed by Brown et al., the hemoconcentration can be used as a predictor of severity. Using these three factors combined that is hematocrit of >44%, pleural effusion, and BMI >30 kg/m2 evaluation was done in present study to predict the severity on admission. The predictions were compared to what was observed by modified Marshall Score to see if the patient actually went into the respective predicted

category. PANC3 score was devised by Brown et al. in a retrospective study on 393 patients. They found out that all three factors combined had a post-test likelihood ratio of 99% of developing severe acute pancreatitis.<sup>17</sup>

In our study, the sensitivity of PANC3 score was 68%, and the specificity was 95.91%. The PPV was 89.47%, and the NPV was 85.45% in predicting severe acute pancreatitis. The Chi-square statistic is 35.49. The diagnostic accuracy is 86.48%. These scores are comparable to that observed by Fukuda et al, who 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%. The difference in results is probably due to small size of their study and less number of patients with severe acute pancreatitis. Although the results of our study are promising, the limitation to its generalizability is the small number of cases.

#### **CONCLUSION**

The ultimate goal of any scoring system or markers is to predict the patients with severe attack early in the course of disease and prompt management. Assessment of severity of pancreatitis helps in better outcome of the patient in terms of morbidity and mortality, as we can give early and advanced care to those in need.

Various scoring systems are in use to assess the severity and each one has its pros and cons. Some have better predictability but have to wait for 48 hr for full scoring, others can be used to assess the severity at admission and have good predictability but very cumbersome to use and not universally available. The single best marker for predicting severity has yet to be found though serum CRP, TAP, etc., are being studied. PANC3 scoring system is one of the better systems because the three criteria used are simple, easy to assess, available at every health-care centre, and cost effective compared to other systems and hence can be used in peripheral/rural centres for early referral.

Funding: No funding sources Conflict of interest: None declared

Ethical approval: The study was approved by the

Institutional Ethics Committee

# REFERENCES

- Muniraj T, Gajendran M, Thiruvengadam S, Raghuram K, Rao S, Devaraj P. Acute pancreatitis. Dis Mon. 2012;58:98-144.
- Talukdar R, Vege SS. Recent developments in acute pancreatitis. Clinical Gastroenterol Hepatol. 2009;7:S3-9.
- Banks PA, Bollen TL, Dervenis C, Gooszen HG, Johnson CD, Sarr MG, et al. Classification of acute pancreatitis-2012: Revision of the Atlanta

- classification and definitions by international consensus. Gut. 2013;62:102-11.
- 4. Werner J, Feuerbach S, Uhl W, Büchler MW. Management of acute pancreatitis: From surgery to interventional intensive care. Gut. 2005;54:426-36.
- Al Mofleh IA. Severe acute pancreatitis: Pathogenetic aspects and prognostic factors. World J Gastroenterol. 2008:14:675-84.
- Baddeley RNB, Skipworth JRA, Pereira SP. Acute pancreatitis. GI Emergencies Medicine. 2010;39:2.
- Bruno MJ, Dellinger EP, Forsmark CE. Determinant-Based classification of acute pancreatitis severity an international multidisciplinary consultation. Ann Surg. 2012;256:326-31.
- Cho JH, Kim TN, Chung HH, Kim KH. Comparison of scoring systems in predicting the severity of acute pancreatitis. World J Gastroenterol. 2015;21:2387-94.
- Khanna AK, Meher S, Prakash S, Tiwary SK, Singh U, Srivastava A, et al. Comparison of Ranson, Glasgow, MOSS, SIRS, BISAP, APACHE-II, CTSI Scores, IL-6, CRP, and Procalcitonin in predicting severity, organ failure, pancreatic necrosis, and mortality in acute pancreatitis. HPB Surg. 2013;2013:367-581.
- Bradley E. A clinically based classification system for acute pancreatitis: Summary of the Atlanta international symposium. Arch Surg. 1993;128:586-90.
- Neoptolemos JP, Raraty M, Finch M, Sutton R. Acute pancreatitis: The substantial human and financial costs. Gut. 1998;42:886-91.
- 12. Cavallini G, Frulloni L, Bassi C, Gabbrielli A, Castoldi L, Costamagna G, et al. Prospective multicentre survey on acute pancreatitis in Italy (ProInf-AISP): Results on 1005 patients. Dig Liver Dis. 2004;36:205-11.
- 13. Whitcomb DC. Clinical practice. Acute pancreatitis. N Engl J Med. 2006;354:2142-50.
- Martínez J, Sánchez-Payá J, Palazón JM, Suazo-Barahona J, Robles-Díaz G, Pérez-Mateo M. Is obesity a risk factor in acute pancreatitis? A meta-analysis. Pancreatol. 2004;4:42-8.
- Heller SJ, Noordhoek E, Tenner SM, Ramagopal V, Abramowitz M, Hughes M, et al. Pleural effusion as a predictor of severity in acute pancreatitis. Pancreas. 1997;15:222-5.
- 16. Brown A, Orav J, Banks PA. Hemoconcentration is an early marker for organ failure and necrotizing pancreatitis. Pancreas. 2000;20:367-72.
- Brown A, James-Stevenson T, 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.
- 18. 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.

Cite this article as: 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;4:4066-70.