

Original Research Article

Study of parameters associated with severity of acute pancreatitis

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ABSTRACT

Background: Acute pancreatitis is a condition associated with a lot of morbidity. There are several scoring systems that predict the severity of acute pancreatitis, but none are perfect. The aim of this study is to study the various predictors of severity know the association of the parameters with severity of disease.

Methods: Our study is a prospective observational study conducted on 80 consecutive patients who presented with features of acute pancreatitis between 20-80 years age group, attending the department of General Surgery, Sree Gokulam Medical College and research foundation, Venjaramoodu, Trivandrum during the period of November 2012 to May 2014. The obtained data was uploaded in Microsoft excel sheet and analysed. Finally, all these variables were correlated with the severity of the disease to find out the association and significance using appropriate statistical methods like Pearson Chi-square test, ANOVA and Kruskal Wallis test.

Results: In our study 59 (74%) were males and mean age was 45.78. Pulse rate, total count C-reactive protein, serum amylase, lipase, Low density lipoprotein (LDH), pH, calcium, lowering of haematocrit, Computerized tomography severity index (CTSI) and Ranson's score had significant association with severity of pancreatitis.

Conclusions: One should not wait for any single scoring system to get scored for effective treatment. A diagnosis of pancreatitis should be made using clinical, laboratory and radiological means and treatment in the form of aggressive crystalloid resuscitation should be started with intensive care monitoring at the earliest.

Keywords: Acute pancreatitis, Severity of pancreatitis, Predictors of severity of pancreatitis

INTRODUCTION

Acute pancreatitis is defined as an acute condition presenting with abdominal pain and usually associated with raised pancreatic enzyme levels in the blood or urine as a result of inflammatory disease of the pancreas.¹ Acute pancreatitis can recur and it accounts for 3 percent of all cases of abdominal pain admitted to hospital in the UK.²

The disease may occur at any age, with a peak in the young males and the older females. The mortality has remained unaltered at 10-15 percent over the past 20 years. About one-third of patients die in the early phase of an attack from multiple organ failure, while deaths occurring after the first week of onset are due to infective complications.³

Eighty percent of patients will have a mild attack of pancreatitis in which the mortality is around 1 percent, while in those who have a severe attack of pancreatitis the mortality varies from 20 to 50 percent. The two major causes of acute pancreatitis are biliary calculi, which occurs in 50-70 percent of patients, and alcohol, which occurs in 25 percent. The remaining cases may be due to rare causes or be idiopathic.⁴

The studies done in Indian subcontinent revealed the leading aetiology as alcoholism (42%) followed by gall stones (24%) and trauma (17%). The study also showed more incidence in males (75%) and more in the age of 30s. The attacks were found to be severe in those with alcoholic pancreatitis.⁶

The assessment of severity is one of the most important issues in the management of acute pancreatitis. Various scoring systems fail to point out the patients going for severe disease and the expense for calculating various scores was also high. So, the study was aimed at the individual variables which can give early signal of patients going in for severe disease. And as the volume of admission due to acute pancreatitis is high in this region this topic was taken up for study.

METHODS

A prospective observational study that was carried out on 80 consecutive patients who presented with features of acute pancreatitis between 20-80 years age group, attending the department of General Surgery, Sree Gokulam Medical College and research foundation, Venjaramoodu, Trivandrum during the period of November 2012 to May 2014 (18 months). Patients who were having chronic pancreatitis and those who didn't wish to be included in the study were excluded from the study. All patients were properly examined after a detailed history taking using the proforma. Then, they were investigated by various blood investigations like haemoglobin, total leukocyte count, differential count, haematocrit, calcium, Blood urea nitrogen (BUN), arterial blood gas analysis, serum electrolytes, Random blood sugar (RBS), liver function tests, Lactate dehydrogenase (LDH), serum amylase, serum lipase, ultrasound abdomen and contrast Computed tomography (CT) for those indicated. Various variables included in different prognostic scores for acute pancreatitis were studied individually. The two commonly used scoring systems in our institution were also analysed viz. Ranson's score and modified Glasgow score.^{6,7} Data obtained was complied with Microsoft excel. Finally all these variables were correlated with the severity of the disease to find out the association and significance using appropriate statistical methods like Pearson Chi-square test, ANOVA and Kruskal Wallis test.

Inclusion criteria

All the patients diagnosed as acute pancreatitis on the basis of clinical signs, biochemical markers and radiological signs.

Exclusion criteria

The exclusion criteria for the study was as follows: patients not willing to be included in the study and cases of chronic pancreatitis.

Sample size

All consecutive cases admitted to the surgical wards of Department of General Surgery, SGMC and RF, Venjaramoodu, Trivandrum for a period of 18 months from November 2012 to May 2014 are to be studied. All consecutive patients were included in the study.

RESULTS

During the study period 80 cases of acute pancreatitis were admitted in general surgery department, out of which 59 (73.75%) were males and 21 (26.25%) were females. Age of the patient in our study varied from 20 to 80 years, the youngest being 23 years and oldest being 80 years. Majority cases were seen in between 41 to 50 years 29 (36.3%). (Table1) In our study the 60 cases were mild acute pancreatitis (75%), 14 cases were moderately severe acute pancreatitis (17%) and 6 cases severe acute pancreatitis (8%). In our study the majority of cases who presented with acute pancreatitis were of alcohol induced type, 52 (65%). Gall stone pancreatitis accounted for 17 (21%) cases. Drugs, tumours, Post Endoscopic retrograde cholangiopancreatography (ERCP) and hypertriglyceridemia accounted for the rest (Table 2).

Table 1: Age distribution.

Age (years)	Frequency	Percentage
20 to 30	8	10.0
31 to 40	18	22.5
41 to 50	29	36.3
51 to 60	14	17.5
>60	11	13.8

Table 2: Aetiology distribution.

Aetiology	Frequency	Percentage
Alcohol induced	52	65.0
Gallstones	17	21.3
Idiopathic	6	7.5
Drugs	1	1.3
Post ERCP	1	1.3
Tumor	2	2.5
Hypertriglyceridemia	1	1.3

In our study 46 (58%) patients had diabetes mellitus, 32 (40%) had hypertension and 37 (46%) had dyslipidemia. Major co-morbidity was diabetes mellitus among the studied population. In our study the 39 cases were having a Body mass index (BMI) of 18.5 to 24.9 (49%) and 1 case with BMI less than 18.5 (1.3%). 5 (6%) were having a BMI of above 30 and 39 (44%) had BMI between 18.5 to 19.9. In our study majority of the patients were non-vegetarian 75 (93.8%) and only 5 (6.3%) were vegetarians. Majority of the cases 54 (67.5%) who presented were having habit of consuming alcohol. 2 (2.5%) patients in our study died due to complications of severe acute pancreatitis. One due to Acute respiratory distress syndrome (ARDS) and the other due to multi organ failure.

The mean BMI in those with mild acute pancreatitis was 23.93 ± 0.36 (Standard error (SE)), moderately severe acute pancreatitis was 27.93 ± 0.65 and severe acute pancreatitis was 29.05 ± 1.62 . ANOVA test was done and found

significant difference in mean values of BMI across mild, moderate and severe acute pancreatitis with F value of 18.157 and p value of 0.001 (significant).

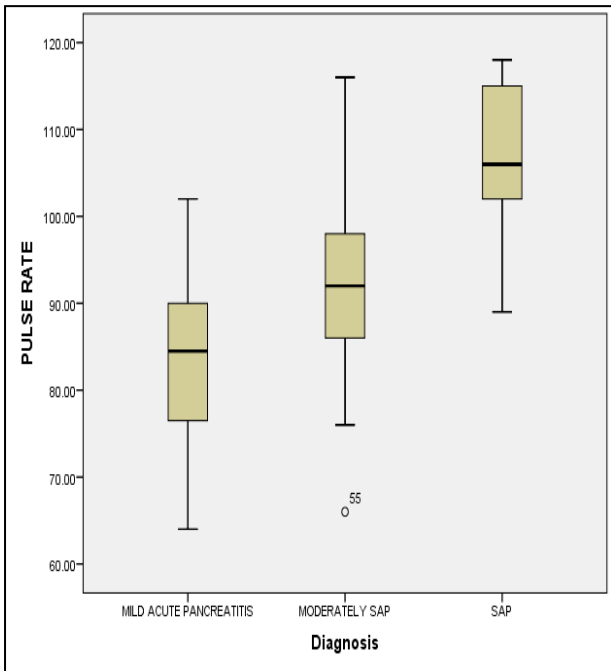


Figure 1: Comparison of pulse rate with severity showing significant difference in mean values.

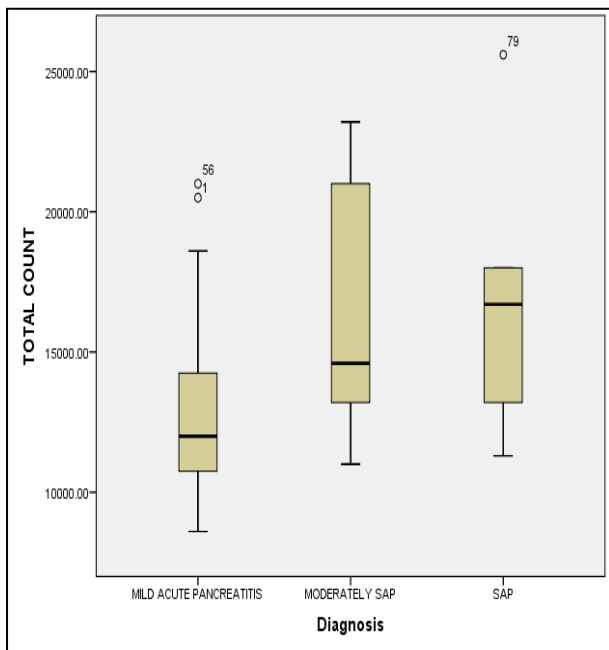


Figure 2: Comparison of total count with severity showing significant difference in mean value.

In our study it was found that those with diabetes mellitus developed more severe disease. It was found to be statistically significant with Pearson Chi-square test value of 8.262, degree of freedom (df) of 2 and a p value of 0.016. In our study it was observed that severe disease was

seen in those with hypertension. On analysis hypertension was found to be statistically significant with Pearson Chi-square test value of 10.635, df of 2 and a p value of 0.005.

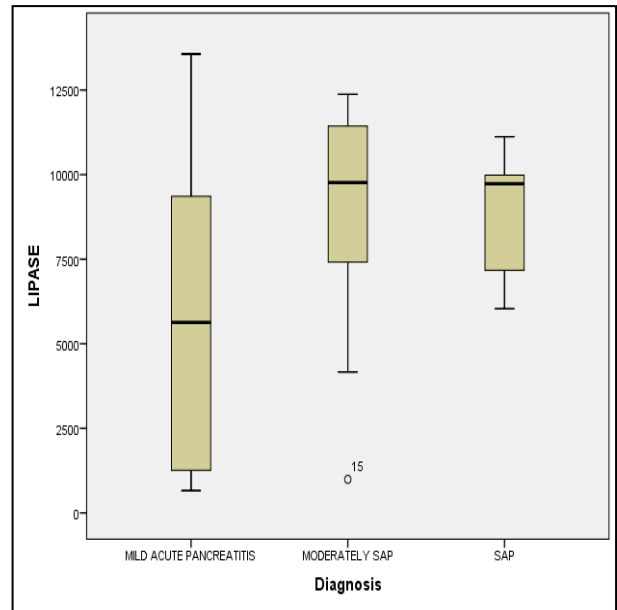


Figure 3: Comparison of serum lipase with severity showing significant difference in mean values.

In our study the mean pulse rate in mild pancreatitis was 83.40 ± 1.14 (SE), moderately severe pancreatitis was 92.50 ± 3.51 and severe acute pancreatitis was 106.00 ± 4.32 . ANOVA test showed significant difference in mean values of pulse rate across mild, moderate and severe pancreatitis with an F value of 17.351 and p value of 0.001 (significant) (Figure 1).

In our study there was statistical significance between systolic blood pressure (BP) score and severity with a Pearson Chi-square value of 25.299, df of 4 and a p value of 0.001 (significant). There was statistical significance observed between respiratory rate and severity in our study with a Pearson Chi-square value of 22.786, df of 4 and a p value of 0.001 (significant).

In our study the mean total count for mild acute pancreatitis was 12671 ± 374.03 (SE), moderately severe pancreatitis was 16492 ± 1142.74 and severe pancreatitis was 16916 ± 2036.73 . ANOVA test showed significant difference in mean values of total count in mild, moderate and severe pancreatitis with an F value of 10.538 and p value of 0.001 (significant) (Figure 2). There was statistical significance observed between BUN and severity with a Pearson Chi-square value of 39.921, df of 2 and a p value of 0.001 (significant).

There was statistical significance observed between creatinine score and severity of pancreatitis in our study with Pearson Chi-square value of 91.429, df of 4 and a p value of 0.001 (significant). There was statistical significance observed between C-reactive protein (CRP)

and severity of pancreatitis in our study with Pearson Chi-square value of 9.290, df of 2 and p value of 0.010 (significant).

In our study the mean value of serum amylase for mild acute pancreatitis was 1833.8 ± 238.67 (S.E), moderately severe pancreatitis was 2983.64 ± 600.16 and severe pancreatitis was 2632 ± 514.86 . Kruskal Wallis test was used to compare the value of serum amylase with mild, moderate and severe pancreatitis and was found to be significant with a p value of 0.046 (significant).

In our study the mean value of serum lipase for mild acute pancreatitis was 5567 ± 509.30 (SE), moderately severe pancreatitis was 8610 ± 875.215 and severe pancreatitis was 8961.50 ± 788.224 . Kruskal Wallis test was used to compare the value of serum lipase with mild, moderate and severe pancreatitis and was found to be significant with a p value of 0.007 (significant).

In our study the mean value of LDH for mild acute pancreatitis was 529.77 ± 22.46 (SE), moderately severe pancreatitis was 667.71 ± 52.97 and severe pancreatitis was 888.67 ± 85.20 . Kruskal Wallis test was used to compare the value of LDH with mild, moderate and severe pancreatitis and was found to be significant with a p value of 0.001 (significant).

In our study the mean value of pH in mild acute pancreatitis was 7.37 ± 0.003 (SE), moderately severe pancreatitis was 7.36 ± 0.008 and severe pancreatitis was 7.33 ± 0.003 . ANOVA test showed significant difference in the mean value of pH with mild, moderate and severe pancreatitis with an F value of 6.673 and a p value of 0.002 (significant).

In our study the mean value of calcium in mild acute pancreatitis was 8.42 ± 0.057 (SE), moderately severe pancreatitis was 8.05 ± 0.149 and severe pancreatitis was 7.97 ± 0.267 . ANOVA test showed significant difference in the mean value of calcium with mild, moderate and severe pancreatitis with an F value of 5.066 and a p value of 0.009 (significant).

In our study there was statistical significance observed between fall in $>10\%$ hematocrit with severity of pancreatitis with a Pearson Chi-square value of 39.331, df of 2 and a p value of 0.001 (significant).

In our study there was statistical significance observed between base deficit with severity of pancreatitis with a Pearson Chi-square value of 58.661, df of 4 and a p value of 0.001 (significant).

In our study two patients had peripancreatic inflammation with necrosis less than 33% and one had peripancreatic inflammation with single fluid collection. None had infected necrosis. In our study there was statistical significance observed between CTSI with severity of

pancreatitis with a Pearson Chi-square value of 80.801, df of 8 and a p value of 0.001 (significant).

In our study there was statistical significance observed between Ranson's score and severity of pancreatitis with a Pearson Chi-square value of 46.122, df of 2 and a p value of 0.001 (significant).

In our study it was observed that the IP duration of the patients with severe disease was more. 13 out of 14 cases of moderately severe acute pancreatitis and 4 out of 6 cases of severe acute pancreatitis had prolonged hospital stay. In our study there was statistical significance observed between IP duration and severity with a Pearson Chi square test value of 49.032, df of 2 and a p value of 0.001 (significant).

DISCUSSION

Our study was a prospective observational study conducted at Sree Gokulam Medical College, Venjaramoodu, Trivandrum from November 2012 to May 2014. This institution is located in a rural area. Majority of the draining population are either in the middle class or low socio-economic strata.

In this study on 80 patients, acute pancreatitis was found more commonly in males (73.8%) than in females with a mean age of 45.78 years and with alcohol being the most common aetiology (65%), in agreement with a study by Rithin et al in which the mean age was 40.9 years and alcohol being common aetiology in 72% of the patients.⁸ Similar results were mentioned by Baig et al, in which alcoholism accounted for 41.14% of cases forming the majority followed by gall stones contrary to the studies outside India which showed 51.7% cases due to gall stones and 48.3% cases due to alcohol in a study conducted by Maher et al.^{9,10} In a study by Bota et al 41.6% cases were due to gall stones and 37.1% cases were due to alcohol consumption.¹¹

Among the cases 60 were mild acute pancreatitis (75%), 14 were moderately severe acute pancreatitis (17.5%) and 6 were severe acute pancreatitis (7.5%). We had mortality of 2 patients who developed severe pancreatitis. Both were due to complications of pancreatitis viz. ARDS and multi organ failure. The mortality rate in the study by Bota et al was 4.6% and that in a study by Simoes et al was 5.7%.^{7,11}

Among the various aetiologies encountered in our study, alcohol was the most common (65%) followed by gall stones (21.3%).

In our study systolic BP score and creatinine score showed significance with the severity of disease as mentioned in the revised Atlanta classification.¹² Significance was also seen with total count and was in agreement with a study by Maher et al.¹⁰

Laboratory parameters like serum amylase, serum lipase, LDH, CRP, creatinine, total count, arterial pH, serum calcium and fall in hematocrit correlated well with the severity of pancreatitis, while liver function tests other than Aspartate aminotransferase (AST), serum sodium, serum potassium, RBS, platelet count and hemoglobin had no significant correlation with the severity of the disease. This was in agreement with the study conducted by Maher et al.¹⁰ The significant association with CRP was also demonstrated in a study by Campos et al.¹³

CT scan is not routinely done for all pancreatitis patients. But CTSI is considered to be the gold standard for imaging in acute pancreatitis.¹⁴ In our study CT scan showed significant correlation with severity of the disease. Exposure to radiation and multiple scans to assess progress and complications are limitations in the use of CECT. It carries a risk of anaphylactic reactions to IV contrast. Moreover, contrast cannot be used in patients with renal insufficiency. In our study CT scan was done for 17 cases and two patients had peripancreatic inflammation with necrosis less than 33% and one had peripancreatic inflammation with single fluid collection. None had infected necrosis. There was no surgical intervention done in our study cases. CTSI showed significance with severity which is in agreement with study by Simoes et al.⁷

Presence of pleural effusion in chest x-ray showed significant correlation with severity. In our study 5 out of 6 cases of severe acute pancreatitis and 8 out of 14 cases of moderately severe pancreatitis showed pleural effusion. This shows significance of presence of pleural effusion with severity which was in agreement with the study of Maher et al.¹⁰

USG abdomen showed significant correlation with severity. It is better than CT scan in detection of gall stones.¹⁵ Ultrasonogram is the most sensitive modality in evaluating the biliary tree and gall bladder.¹⁶

The mean IP duration of patients with mild acute pancreatitis was 4.73 ± 0.23 , moderately severe acute pancreatitis was 11.14 ± 0.87 and severe acute pancreatitis was 11.33 ± 2.40 , maximum stay was 18 days and minimum were 3 days. The morbidity increased with severity of the disease.

In our study, of the 80 patients with pancreatitis, 60 were diagnosed to have mild pancreatitis, 14 with moderate and 6 with severe pancreatitis. Ranson's score identified 56 patients as having non severe forms of pancreatitis, while a larger number of patients 24 were identified as cases of severe pancreatitis. Since no single scoring system can accurately predict the severity of the disease it is always better to rely on the individual predictors which are cost effective and promptly available.

CONCLUSION

Hence, from our study the following parameters were indicative of a severe disease and prompt treatment in terms of aggressive fluid resuscitation and supportive measures should be initiated at the time of admission. And one should not wait for any single scoring system to get scored for effective treatment. An individual in the older age group with associated co-morbidities like diabetes or hypertension and presence of fever, tachycardia, tachypnoea, guarding, low mean arterial pressure (MAP), low systolic BP score at the time of admission should be treated as severe disease and strictly monitored in the intensive care unit. CT scan is a very good modality to assess severity but in the initial stages of disease the sensitivity is very less. Hence these clinical findings and blood investigations should be kept in mind while assessing the severity of disease rather than using any single scoring system for predicting severity.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Banks PA, Conwell DL, Toskes PP. The management of acute and chronic pancreatitis. *Gastroenterol Hepatol (N Y)*. 2010;6(2 Suppl 3):1-16.
2. Roberts SE, Williams JG, Meddings D, Goldacre MJ. Incidence and case fatality for acute pancreatitis in England: geographical variation, social deprivation, alcohol consumption and aetiology—a record linkage study. *Aliment Pharmacol Ther*. 2008;28(7):931-41.
3. Fu CY, Yeh CN, Hsu JT, Jan YY, Hwang TL. Timing of mortality in severe acute pancreatitis: experience from 643 patients. *World J Gastroenterol*. 2007;13(13):1966-9.
4. Wang GJ, Gao CF, Wei D, Wang C, Ding SQ. Acute pancreatitis: etiology and common pathogenesis. *World J Gastroenterol*. 2009;15(12):1427-30.
5. Yadav D, Lowenfels AB. The epidemiology of pancreatitis and pancreatic cancer. *Gastroenterol*. 2013;144(6):1252-61.
6. Ranson JH. Etiological and prognostic factors in human acute pancreatitis: a review. *Am J Gastroenterol*. 1982;77(9):633-8.
7. Simoes M, Alves P, Esperto H, Canha C, Meira E, Ferreira E, et al. Predicting Acute Pancreatitis Severity: Comparison of Prognostic Scores. *Gastroenterol Res*. 2011;4(5):216-22.
8. Suvarna R, Pallipady A, Hanumanthappa BN. The Clinical Prognostic Indicators of Acute Pancreatitis by Apache II Scoring Journal of Clinical and Diagnostic Research. 2011;5(3):459-63.
9. Baig SJ, Rahed A, Sen S. A prospective study of the aetiology, severity and outcome of acute pancreatitis in Eastern India. *Trop Gastroenterol*. 2008;29(1):20.

10. Maher MM, Dessouky BAM. Simplified Early Predictors of Severe Acute Pancreatitis: A Prospective Study. *Gastroenterol Res.* 2010;3(1):25-31.
11. Bota S, Sporea I, Sirli R, Popescu A, Strain M, Focsa M, et al. Predictive factors for severe evolution in acute pancreatitis and a new score for predicting a severe outcome. *Ann Gastroenterol.* 2013;26(2):156-62.
12. Foster BR, Jensen KK, Bakis G, Shaaban AM, Coakley F V. Revised Atlanta Classification for Acute Pancreatitis: A Pictorial Essay. *RadioGraphics.* 2016;36(3):675-87.
13. De Campos T, Cerqueira C, Kuryura L, Parreira JG, Soldá S, Perlingeiro JAG, et al. Morbimortality indicators in severe acute pancreatitis. *JOP.* 2008;9(6):690-7.
14. Mayerle J, Hlouschek V, Lerch MM. Current management of acute pancreatitis. *Nat Clin Pract Gastroenterol Hepatol.* 2005;2(10):473-83.
15. Laing FC, Jeffrey RB, Wing VW. Improved visualization of choledocholithiasis by sonography. *Am J Roentgenol.* 1984;143(5):949-52.
16. Neoptolemos JP, Hall AW, Finlay DF, Berry JM, Carr-Locke DL, Fossard DP. The urgent diagnosis of gallstones in acute pancreatitis: a prospective study of three methods. *Br J Surg.* 1984;71(3):230-3.

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