

Clinical Profile and Correlation of Serum Amylase and Lipase with mCTSI Score on Outcome of Acute Pancreatitis in a Tertiary Care Hospital

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Abstract

Introduction: Acute pancreatitis is defined as the inflammation of the pancreas with variable involvement of nearby organs and other organ systems. Alcohol and gallstones are the most common causes of acute pancreatitis. Severe pancreatitis is associated with organ failure or local complications like necrosis, abscess, pseudocyst and extra pancreatic complications. Serum amylase, serum lipase and contrast enhanced computed tomography play an important place in diagnosis of acute pancreatitis and associated complications. Most of the scoring systems employ serum amylase; serum lipase and modified CT Severity Index (mCTSI) score to predict the severity, guide in management and reduce the mortality in acute pancreatitis.

Objective/Aim: The aim of the study is to study the clinical profile of acute pancreatitis and to find out the correlation between serum amylase and serum lipase with modified computed tomography severity index (mCTSI) score in predicting the outcome of recovery and discharge or death in acute pancreatitis managed in a tertiary care medical college hospital.

Materials and Methods: This prospective descriptive study was done in the wards of General surgery department in a tertiary care medical college hospital in 100 patients more than 18 years of age presenting with features suggestive of acute pancreatitis over the period from February 2021 to November 2022. Apart from routine blood investigations, serum amylase and serum lipase were done for all patients. Contrast enhanced computed tomography was done on all these patients in two to four days after the onset of symptoms and modified computed tomography severity index (mCTSI) score calculated. The observations of these patients were entered into Microsoft excel and SPSS version 22 was used for data analysis. Data were analysed statistically by unpaired t test for numeric variables and chi square test for categorical variables. The clinical profile of acute pancreatitis and the correlation between serum amylase and serum lipase with modified computed tomography severity index (mCTSI) score in predicting the outcome of acute pancreatitis namely recovery and discharge or death in acute pancreatitis was arrived.

Results: In patients with acute pancreatitis, male to female ratio was 7:3. 70% patients had history of chronic alcohol consumption with male predominance. 34% had gallstone disease with female predominance. Pancreatic abscess was seen in 12%, pancreatic necrosis in 36%, pseudocyst in 36%, respiratory failure and ARDS in 34% of patients. Out of the 100 patients 84% of patients

recovered and were discharged and the mortality rate was 16%. The modified computed tomography severity index (mCTSI) in patients who recovered and were discharged in mCTSI5 score range was 58.82%. The modified computed tomography severity index in patients with mCTSI5, the mortality rate was 41.18%. On correlation of enzymes serum amylase and serum lipase with mCTSI of 0 to <5 and from 5 to 10 the p-value for serum amylase and lipase were 0.183 and 0.090 which is insignificant and had a negative correlation.

Conclusion: Acute pancreatitis was common in the age group of 30 to 40 years and alcohol and gallstones were the common cause in males and females. Pancreatic necrosis and pseudocyst were the common complications. Serum amylase and lipase values have a negative correlation with mCTSI score in predicting the clinical outcome of recovery or death in acute pancreatitis. mCTSI score when done within two to four days of onset of symptoms has got more diagnostic and prognostic value than enzymes in predicting the clinical outcome in acute pancreatitis.

Keywords: Acute Pancreatitis, Amylase, Lipase, mCTSI, Modified CT Severity Index.

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Introduction

Acute pancreatitis is defined as the inflammation of the pancreas with variable involvement of nearby organs and other organ systems and one of the most common causes of hospitalization among gastrointestinal diseases. It usually involves damage to the surrounding tissue. The mortality due to acute pancreatitis ranges from 10-20%. [1] Alcohol and gallstones are the most common causes of acute pancreatitis in India. Gallstones in common bile duct obstruct flow of pancreatic enzymes and leads to activation of trypsinogen within the pancreas and by activation of inflammatory pathway manifesting as systemic inflammatory response syndrome. Other causative factors are hypercalcemia, drug-induced, and dyslipidemia. Acute pancreatitis can be mild, moderate or severe. Mild pancreatitis has no local or systemic complications or organ failure. Moderately severe acute pancreatitis has local or systemic complications with transient organ failure. Severe pancreatitis is associated with organ failure or local complications like necrosis, abscess, pseudocyst and extra pancreatic complications. [2] Severe acute pancreatitis has worst prognosis in terms of persistent organ failure and mortality. Serum amylase and serum lipase are the enzymes

which are elevated more than threefold of upper limit of normal range in acute pancreatitis. [3] Contrast enhanced computed tomography has an important place in diagnosis of acute pancreatitis and associated complications. The modified computed tomography severity index (mCTSI) consists of scoring with the parameters namely pancreatic inflammation, pancreatic necrosis and extra pancreatic complications aids in diagnosis and assessing the severity of disease in acute pancreatitis. [4] To reduce the mortality and morbidity in acute pancreatitis, staging the severity and early recognition of severe cases is essential for early escalation of care and appropriate management which will have a significant impact in the outcome of the patients. The myriad of scoring systems and their efficacies creates much confusion in stratifying the disease severity. Most of the scoring systems employ serum amylase, serum lipase and modified CT Severity Index as a guide to treatment. [1-5].

Serum amylase and serum lipase are the initial investigations done in clinically diagnosed cases of acute pancreatitis apart from routine complete blood counts. The aim of the study is to study the clinical profile of acute pancreatitis and to find out the

correlation between serum amylase and serum lipase with modified computed tomography severity index (mCTSI) score in predicting the outcome of acute pancreatitis namely recovery and discharge or death in patients managed in General surgery department in a tertiary care hospital. This may help patients not to undergo hazardous exposure to radiation if serum amylase and lipase can estimate similar findings with a certain level of confidence.

Materials and Methods

This prospective descriptive study was done in the wards of General surgery department in a tertiary care hospital. This study was done after obtaining Institutional Human ethics committee clearance. Patients more than 18 years of age presenting with clinical features suggestive of acute pancreatitis over the period from February 2021 to November 2022 were enrolled in the study.

Patients admitted with features of acute pancreatitis namely acute onset of a persistent, severe epigastric pain often radiating to the back and with serum amylase or serum lipase activity at least three times greater than the upper limit of normal and characteristic findings suggestive of acute pancreatitis on ultrasonography and contrast enhanced computed tomography were included in the study [5] Patients less than 18 years of age and those who had already undergone pancreatic surgery, pancreatic malignancies were excluded from the study.

Apart from routine blood investigations, liver and renal function tests, serum amylase and serum lipase is done for all patients. Serum amylase and serum lipase were done using automated clinical chemistry analyser AU-480 Beckman Coulter for these patients. Contrast enhanced computed tomography is done on all these patients in two to four days after the onset of their symptoms. Computed tomography scan was done with Toshiba MDCT scanner with 120 KVp and 300 mAs with 5 mm slice thickness and images were reconstructed into 1.25 mm thickness and reformatted to sagittal and coronal planes for analysis. Bolus tracker method is used for post contrast scan with tracker placed at descending aorta at level of diaphragmatic dome.

The contrast material used was Iohexol 350 mg/ml. 75 ml of contrast was injected using pressure injector at a rate of 3 to 4 ml per second. Threshold was set at 150 Hounsfield units. A delay of 3 seconds and 60 seconds was given for attainment of threshold for arterial and venous phases respectively from the time of contrast injection. Scanning was performed in cephalocaudal direction in arterial and venous phase from diaphragm to bifurcation of aorta in arterial phase and from diaphragm to pubic symphysis in venous phase. Modified computed tomography severity index (mCTSI) calculated as per criteria shown in Table-1 [4]

Table 1: Components of Modified Computed Tomography Severity Index (mCTSI)

Pancreatic Inflammation	
Normal Pancreas	0
Intrinsic pancreatic abnormalities with peripancreatic inflammatory changes	2
Pancreatic or peripancreatic fluid collection or peripancreatic fat necrosis	4
Pancreatic Necrosis	
None	0
Less than 30 %	2
More than 30 %	4
Extrapancreatic Complication	

Pleural effusion, ascites, vascular complication venous thrombosis, arterial hemorrhage, pseudoaneurysm), parenchymal complication (infarction, hemorrhage, subcapsular fluid collection), Gastrointestinal involvement (inflammation, perforation, intraluminal fluid collection)	2
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Total score – 10

0 – 2: Mild

4 – 6: Moderate

8 – 10: Severe

There was a total of 102 patients during this study period of which 2 of them were discharged at request for further management in their native place. Therefore, a total of 100 patients were included in the study during this study period of 22 months.

The observations on management and outcome of these patients were entered into Microsoft excel and SPSS version 22 was used for data analysis. Data's were analysed statistically by unpaired t test for numeric variables and chi square test for categorical variables. P value less than 0.05 was considered as significant.

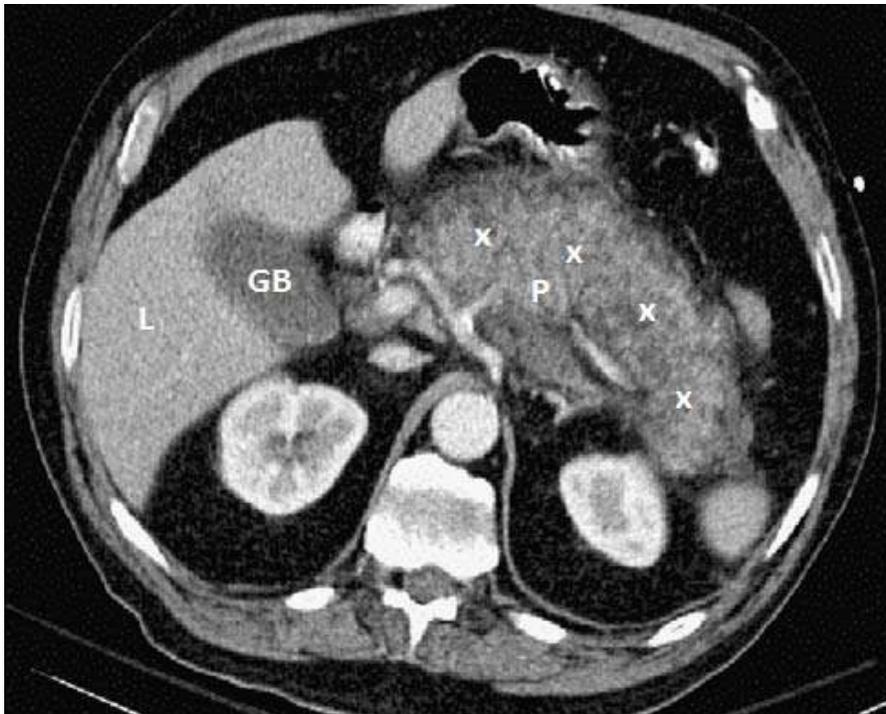


Figure 1: Acute pancreatitis in CT scan

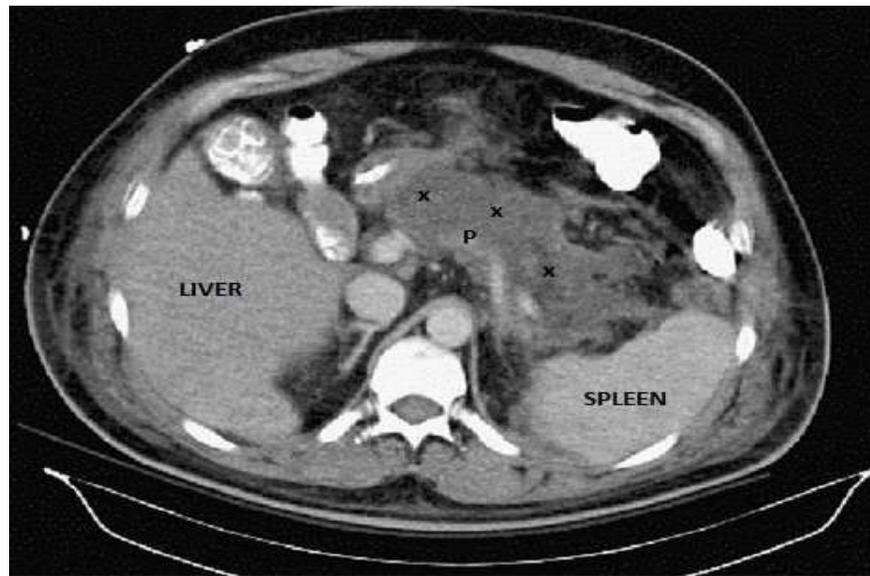


Figure 2: Acute necrotizing pancreatitis in CT scan

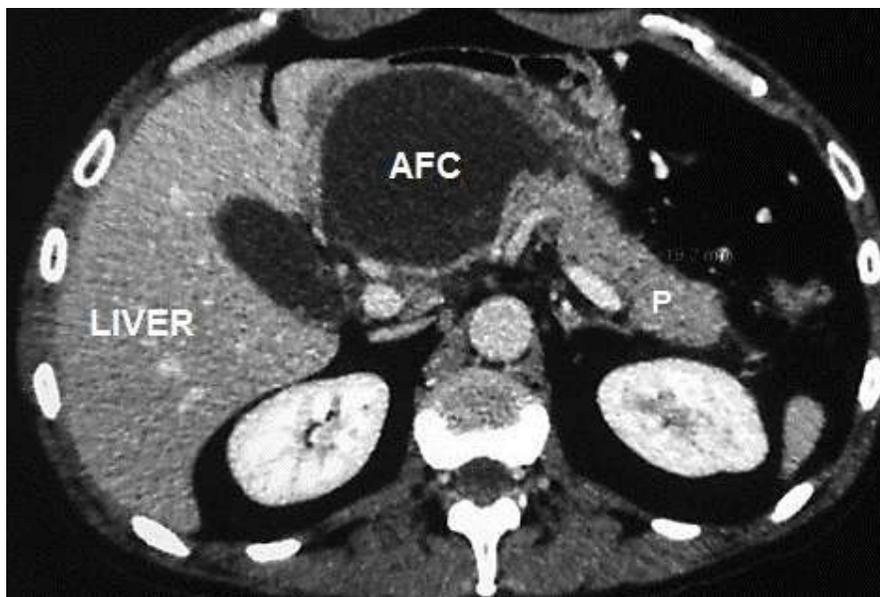


Figure 3: Acute pancreatitis with fluid collection in CT scan



Figure 4: Pancreatic necrosis in CT scan

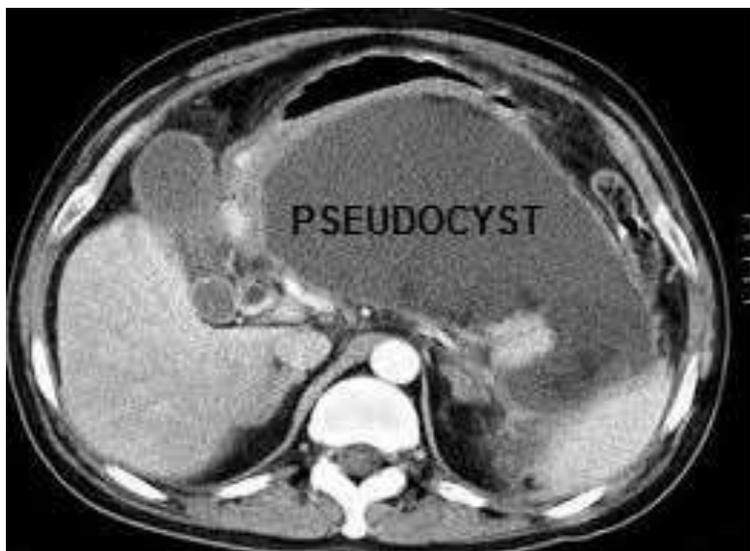


Figure 5: Pseudocyst of pancreas in CT scan

Results

The results of the clinical profile and outcome of acute pancreatitis in this study are given below in Table-2.

Table 2: Clinical Profile and Outcome in Acute Pancreatitis

Parameter	N(%)
Age in years	
<20	4(4)
21-30	28(28)
31-40	32(32)
41-50	16(16)
51-60	16(16)
>60	4(4)
Sex preponderance	
Male	70(70)
Female	30(30)
Chronic alcohol intake (Y/N)	
Yes (N=70)	
Males	66(94)
Females	4(6%)
No (N=30)	
Males	4(13)
Females	26(87)
Gall stones (Y/N)	
Yes (N=34)	
Males	8(24)
Females	26(76)
No (N=66)	
Males	62(94)
Females	4(6)
Pancreatic abscess	
Present	12(12)
Absent	88(88)
Pancreatic necrosis	
Present	36(36)
Absent	64(64)
Pancreatic pseudocyst	
Present	36(36)
Absent	64(64)
Acute Respiratory Distress Syndrome	
Present	34(34)
Absent	66(66)
Outcome	
Recovered and Discharged	84(84)
Died	16(16)

Out of 100 patients, males were more commonly affected than females, at a ratio of 7:3. 70 patients (70%) in this study had associated history of chronic alcohol consumption. 34 patients (34%) with acute pancreatitis had associated gallstone disease. Out of 100 patients in the study, 50 patients (50%) had elevated renal function test, 36 patients (36%) had elevated liver function tests. 12 of

the 100 patients (12%) had the finding of pancreatic abscess at presentation. 36 of the 100 patients (36%) of the patients had pancreatic necrosis. Pseudocyst formation of the pancreas was seen in 36 patients (36%). Respiratory failure and ARDS was seen in 34 patients (34%). Out of the 100 patients with acute pancreatitis, 84 patients recovered and were discharged and 16 died and the mortality rate was 16% in acute pancreatitis patients in this study.

The comparison of outcome in acute pancreatitis with mCTSI score below 5 and above 5 is given in Table-3.

Table 3: Comparison of Outcome in Acute Pancreatitis with Modified Computed Tomography Severity Index (mCTSI)

Parameter	mCTSI < 5	%	mCTSI >5	%
Recovered and Discharged	64	96.97	20	58.82
Died	2	3.03	14	41.18
Total	66	100	34	100

The modified computed tomography severity index (mCTSI) in patients who recovered and were discharged in mCTSI<5 score range was 96.97% and in mCTSI>5 score range was 58.82%. The modified computed tomography severity index in patients with mCTSI<5 the mortality rate was 3.03%, whereas for patients with mCTSI>5, the mortality rate was 41.18%.

The correlation of serum pancreatic enzymes with mCTSI 0 to <5 and from 5 to 10 is given in Table-4

Table 4: Correlation of Serum Pancreatic Enzymes With mCTSI

Parameter	mCTSI	Number	Mean	SD	t-value	p-value
Serum Amylase	0 to < 5	62	420.4	262.5	1.707	0.183 #
	5 to 10	38	717.1	913.6		
Serum Lipase	0 to < 5	62	533.5	335.3	2.227	0.090 #
	5 to 10	38	1089.4	1330.4		

No Statistical significance with p at a value of<0.05

The mean serum amylase value at a modified CT severity index of 0 to <5 was 420 and for a score of 5 to 10 were 717. The mean serum lipase values at a modified CT severity index of 0 to <5 was 533 and for a score of 5 to 10 were 1089.

On correlation of enzymes serum amylase and serum lipase with mCTSI of 0 to <5 and from 5-10 the p-value for serum amylase and lipase were 0.183 and 0.090 which is insignificant and had a negative correlation.

Discussion

The mean age of occurrence of acute pancreatitis was around 26 to 50 years of age. Male: Female ratio was 7:3. Nearly three fourth of the patients had associated history of chronic alcohol consumption. One third of the patients with acute pancreatitis had associated gallstone disease. 12% of the study population had the finding of pancreatic abscess at presentation. Nearly

one third patients had pancreatic necrosis and another one third had pseudocyst formation of the pancreas. One third of the patients went in for respiratory failure and ARDS. Alcoholic pancreatitis was more common in middle aged male patients whereas gallstone pancreatitis was more common in female patients. The acute pancreatitis incidence and mortality increased with age. The mortality

rate was 16% in acute pancreatitis patients. The mortality in acute pancreatitis with mCTSI score of 0 to <5 was 3.03%, whereas for mCTSI score of 5-10, the mortality rate was 41.18% in this study. The mean serum amylase value at a mCTSI score of 0 to <5 was 420 and for a mCTSI score of 5 to 10 it was 717. The respective mean serum lipase values for mCTSI score of 0 to <5 and for 5 to 10 were 533 and 1089 in this study. On correlation of enzymes serum amylase and serum lipase with mCTSI, the p-value for serum amylase and lipase were 0.183 and 0.090 which is insignificant and a negative correlation.

Sheetal Gonapati *et al* observed acute pancreatitis to be more common in the age group of 41 to 50 years in their study.[6] Sakshi chawla *et al* observed acute pancreatitis to be more common in age group of 26 to 45 years similar to our study.[7] Manu R *et al* observed maximum incidence of acute pancreatitis in age group of 26 to 30 years.[8] Rahul J shirol *et al* and Amogh VN *et al* observed that the maximum incidence of acute pancreatitis was in the age group of 31 to 40 years similar to our study.[9, 10]

Pezzilli R *et al* observed gallstones in 65% of patients as the etiology for acute pancreatitis. [11] Sheetal Gonapati *et al* observed gall stones 44% as the most common etiology of acute pancreatitis.[6] Sakshi chawla *et al* observed gall stones in 53 % of patients and alcohol in 47% of patients in their study.[7] whereas in our study gall stones was observed only in 34 % of patients.

Manu R *et al* had observed Alcohol in 76% of patients and gall stones only in 16% of patients. [8] Rahul J shirol *et al*, Sonali Prabhakar *et al* observed that alcohol was common cause of acute pancreatitis in males and gall stones were the common cause of acute pancreatitis in females similar to our study. They observed alcohol intake in 55 % of patients and gall stones in 38% of patients

similar to our study. [9,12] Alcohol was the most common cause in the study by Amogh VN *et al* accounting for 86.6% of patients and only 10% of patients had gall stones [10] whereas Thomas L Bollen *et al* showed gall stones as predominant etiological agent. [13]

Pancreatic necrosis usually develops 24 to 48 hours after onset of acute pancreatitis. Sakshi chawla *et al* observed pancreatic necrosis in 37 % of patients similar to our study. [7] Manu R *et al* had observed pancreatic necrosis in 70 % of patients in their study whereas Amogh VN *et al* in their study had observed pancreatic necrosis in only 25 % of patients. [8,10] Sakshi chawla *et al* observed pseudocyst in only 7% of patients with acute pancreatitis. [7] Amogh VN *et al* observed pseudocyst of pancreas in 35% of patients which was similar to our study.[10]

Amogh VN *et al* observed that serum amylase and serum lipase were not able to differentiate type of acute pancreatitis. [10] Pezilli R *et al* found that serum amylase and lipase were not able to establish etiology or predict severity of acute pancreatitis. [11] Heidar Aliesmaili *et al* observed that Serum amylase and lipase were helpful in diagnosis of acute pancreatitis and was not able to predict the severity and complications. [14]

Bollen *et al* in their study observed that radiologic scoring system more accurately diagnose clinically severe disease and the need for intervention. [11] Joshi BR *et al* have observed serum amylase and lipase had a negative correlation with mCTSI score and thus not indicates severity of pancreatitis which is concurrent with our study. [15]

Manu R *et al* have found that mCTSI score had a significant correlation in prediction of end organ failure, systemic complications, and duration of hospital stay though they have not studied the correlation with serum amylase and lipase. [8] Manes G *et al* has observed that serum amylase and lipase is not useful in assessing severity of acute

pancreatitis which is concurrent with our study. [16] Sonali Prabhkar *et al* observed that serum amylase and serum lipase had a negative correlation with mCTSI score similar to our study. [12] Rahul J shirol et al in their study had observed that mCTSI score has a significant correlation in prediction of complications and can be used as a tool for screening of patients of acute pancreatitis. [9] Amogh VN *et al* in their study have found that mCTSI helps to predict early the possibility of local and systemic complications in acute pancreatitis. [10] Coffey *et al* found no advantage of testing both lipase and amylase, as well as no advantage in serially trending them for monitoring the clinical progress of the patient. [17] Individual studies done by Sakshi chawla *et al*, Pezzilli *et al*, Ranson *et al*, Clavien *et al*, Winslet *et al* found that serum amylase and lipase levels were not correlated to the severity of the disease which were concordant with our study [7,11,18-20].

Conclusion

Acute pancreatitis was more common in the age group of 30 to 40 years and alcoholic pancreatitis was common in males and gall stone pancreatitis was common in females. Pancreatic necrosis and pseudocyst were the common complications. Serum amylase and lipase values had a negative correlation with mCTSI score in predicting the clinical outcome of recovery or death in acute pancreatitis. mCTSI score when done within two to four days of onset of symptoms has got more diagnostic and prognostic value than enzymes in predicting the clinical outcome in acute pancreatitis.

Ethical approval

The study was approved by the institutional human ethics committee.

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