

Original Research Article

Comparison of ultrasound and serum amylase in the diagnosis of acute pancreatitis

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ABSTRACT

Background: Acute pancreatitis is an inflammatory disease of the pancreas. Though, severe acute pancreatitis constitutes 15-20% of all cases of pancreatitis, in recent times, mortality rate of severe acute pancreatitis has reduced from 30-80% to 15-20%. Ultrasound is the first imaging modality in most centres for the preliminary screening of an acute abdomen.

Methods: In this prospective study between October 2017 to March 2019, 113 patients with clinical signs and symptoms of acute pancreatitis were screened with an ultrasonogram of the abdomen and serum amylase in the emergency room. Patients also underwent a complete physical exam.

Results: In our study 38.9% of patients were in the age group of 45-55 years, 25% in the 35-45 age group and 20.4% in the 55 to 70 age group. 92.9% of the patients were men. 89.4% of the participants had a history of alcoholism. Only 37.2% of the participants who were clinically positive for acute pancreatitis, also showed USG findings for acute pancreatitis while 69% of the clinically positive patients showed serum amylase level positive for acute pancreatitis.

Conclusions: Ultrasonogram though cheap and easily available is not ideal for the diagnosis of acute pancreatitis. As shown in the study serum amylase is able to detect nearly twice as many cases of pancreatitis compared to ultrasonogram. The sensitivity and specificity of ultrasonography to detect acute pancreatitis is too low to use as a diagnostic test but it is a valuable tool in the evaluation of an acute abdomen.

Keywords: Acute pancreatitis, Ultrasound, Serum amylase, Diagnostic accuracy

INTRODUCTION

Acute pancreatitis is an inflammatory disease of the pancreas that also involves surrounding tissues. It has a sudden onset and short duration and it is characterized by self-digestion of the pancreatic parenchyma, necrotizing vasculitis and interstitial fat necrosis due to inappropriate intracellular activation of proteolytic pancreatic enzymes. Symptoms of acute pancreatitis includes abdominal pain localized in the epigastrium in majority of the cases and radiating to the back in half of the cases often accompanied with features of acute abdomen. Acute

pancreatitis may cause multi organ failure and occasional death.^{1,2}

The severity of acute pancreatitis keeps on increasing; in acute pancreatitis the average mortality rate approaches 2-10%. Most of the cases are not severe and conservative treatment leads to a rapid recovery in the patients.³

Acute pancreatitis typically shows increase in serum and urine levels of amylase and lipase. Elevated amylase is not specific to acute pancreatitis and may be caused by bowel obstruction, infarction, cholecystitis, or perforated ulcer. The serum level of the alanine aminotransferase

enzyme also increased in biliary acute pancreatitis. Presence of abdominal pain, at least three-fold increase in the serum levels of amylase or lipase activity, presence of the characteristic imaging findings is indicative of acute pancreatitis.⁴

The two most common causes of acute pancreatitis are gall stones (30-45%) and alcohol abuse (30-35%). Less common cause include hypertriglyceridemia, hypercalcemia, viral infections (mumps, coxsackie), biliary parasites (ascaris), drugs (azathioprine, mercaptopurine, didanosine), sphincter of oddi dysfunction, tumor, trauma, surgery, endoscopic retrograde cholangio pancreatography (ERCP) and congenital abnormalities (pancreatic divisum, annular pancreas, choledochocoele, duodenal duplication cyst). Acute pancreatitis is idiopathic in 20% of all cases.⁵

Ultrasound is the first imaging modality in most centres for the conformation of the diagnosis of acute pancreatitis and ruling out of other causes of acute abdomen, because it is quick and easy to perform, it is repeatable, free of radiation and can be carried out at the bedside.⁶ The advantage of ultrasound in the early period is that it allows to evaluate the gall bladder and biliary tract, and to detect gallstones and dilatation of the bile ducts. In 30% of cases, pancreatic enlargement and decreased parenchymal echogenicity due to interstitial edema may be seen. Focal ill-defined hypo/hyperechoic areas (edema/hemorrhage), which maybe observed in parenchyma. Blurring of the pancreatic contours due to edema of the surrounding adipose tissue and the fluid collection in the peripancreatic region, especially in the lesser sac and the left anterior pararenal space may be seen. Ultrasound is used in characterization of the contents of the fluid collections and the pseudocysts.^{7,8}

METHODS

The study was a hospital based prospective and observational study. 113 patients admitted to SMVMCH with pain abdomen diagnosed clinically as acute pancreatitis from October 2017 to March 2019 were included in the study. Convenience sampling was done.

Sample size was calculated to be 113 using software nMaster version 2.0, taking into consideration sensitivity of ultrasound to detect acute pancreatitis as 92% based on previous study with 95% confidence interval and 5% absolute precision.

Statistical analysis

The data was entered using statistical software epi info 3, and the data was analysed using SPSS version 24.0. p<0.05 was considered as significant.

Inclusion criteria

Inclusion criterion for currents study was, patients with acute pancreatitis with age >18 years.

Exclusion criteria

Inclusion criterion for currents study were, patients aged <18 years and patients with chronic pancreatitis.

All the necessary information regarding the study was explained to the patients or their guardian. Thorough physical examination was done in each case. All patients underwent an ultrasound abdomen and had serum amylase taken as part of their workup.

RESULTS

Age distribution of the study participants

The majority of patients were in the age group of 46 to 55 years followed by the 36 to 45 years age group as shown in (Table 1).

Table 1: Age distribution of patients in the study.

Age group (years)	N	Percentage
<35	17	15.0
36-45	29	25.7
46-55	44	38.9
56-70	23	20.4
Total	113	100.0

Gender distribution of the study participants

Most patients were male in the study as depicted in (Table 2).

Table 2: Sex distribution of the patients in the study.

Gender	N	Percentage
Male	105	92.9
Female	8	7.1
Total	113	100.0

History of alcohol intake in the participants

89.4% of patients in the study reported taking alcohol prior to the episode of pancreatitis (Table 3).

USG findings of pancreas among the study participants

Majority of patients (37.2%) had findings obscured by bowel gas. 25.7% of patients had an ultrasound reported as normal. Bulky pancreas and features suggestive of acute pancreatitis were seen in 11.5% and 10.6% respectively. Gall stones were detected in 15% of patients (Table 4).

Table 3: Prevalence of alcoholism in the study population.

History of alcohol intake	N	Percentage
Yes	101	89.4
No	12	10.6
Total	113	100.0

Table 4: USG findings of the pancreas in the study population.

USG findings of pancreas	N	Percentage
Bulky pancreas s/o pancreatitis	13	11.5
Hypochoic s/o acute pancreatitis	12	10.6
Normal study	29	25.7
Obscured by bowel gas	42	37.2
Gallstone pancreatitis	17	15.0
Total	113	100.0

Association of clinical findings and USG findings of the study participants

Only 37.2% of patients who were positive for pancreatitis were detected by ultrasound (Table 5).

Table 5: Association of clinical diagnosis and USG findings.

Clinical finding	USG				Total	
	Positive		Negative		N	%
Acute pancreatitis	N	%	N	%		
	42	37.2	71	62.8	113	100

Association of clinical findings and serum amylase levels of the study participants

69% of patients positive for pancreatitis were detected by serum amylase levels (Table 6).

Table 6: Association of clinical diagnosis and serum amylase levels.

Clinical finding	Amylase level suggesting acute pancreatitis (>400 IU/L)		Elevated amylase level (140-400 IU/L)		Normal amylase level (15-140 IU/L)		Total	
	N	%	N	%	N	%	N	%
Acute pancreatitis	78	69	15	13.3	20	17.7	113	100

Table 7: Association of serum amylase levels and USG findings.

Serum amylase levels	USG findings for acute pancreatitis					
	Negative		Positive		Total	
	N	%	N	%	N	%
Positive for acute pancreatitis	50	64.1	28	35.9	78	100.0
Increased amylase level	7	46.7	8	53.3	15	100.0
Normal amylase level	14	70.0	6	30.0	20	100.0

Association of serum amylase levels and USG findings of the study participants

Out of the 78 patients positive for pancreatitis based on their serum amylase levels only 28 patients had positive findings on ultrasound (Table 7).

DISCUSSION

The diagnosis and grading of severity of pancreatitis is of utmost importance in its early management. Imaging techniques have significantly contributed to the staging of severity and assessment of prognosis in acute pancreatitis. This present study was carried out in Sri Manakula Vinayagar medical college and hospital (SMVMCH), Puducherry to evaluate ultrasonographic features of the pancreas in clinically diagnosed cases of

acute pancreatitis and its correlation with serum amylase levels.

In current study mean age of the participants was 47.16±11.5 years. Most of the patients (38.9%) were in the age group of 46-55 years, 25% belonged to 35-45 years age group, and 20.4% were in the 56-70 years age group. Similar results were found in the study conducted by Zerem et al where mean age of the participants was found to be 50±12 years.⁹

In current study majority of the participants were male (92.9%), while 7.1% of the patients were female. Similar results were seen in the study done by Zerem et al, Bhimwal et al where 66.4% and 62.5% were males.^{9,10}

Results of this study showed that 89.4% of the patients

had a history of alcohol intake while 10.6% of the participants didn't have any history of alcohol intake. Bhimwal et al found that in his study 37.5% of the participants had a history of alcoholism.¹⁰

Majority of the participants had USG findings suggestive of obscured by bowel gas (37.2%). 25.7% of the participants had a normal study of the pancreas. 15% showed pancreatitis with associated common bile duct stone, followed by bulky pancreas suggestive of pancreatitis and hypoechoic suggestive of acute pancreatitis among 11.5% and 10.6% of the participants. In current study only 37.2% of the participants who were clinically positive for acute pancreatitis, also showed USG findings for acute pancreatitis. While in the study conducted by Bhimal et al ultrasonography imaging of pancreas was helpful in 70% of the participants.¹⁰

In current study mean serum amylase was 1264.96±957.04 IU/L. While in the study done by Zerem et al mean serum amylase was found to be 1088±248 IU/L.⁹

Out of all the participants who were clinically positive for acute pancreatitis, only 69% of the subjects showed serum amylase level positive for acute pancreatitis. While in 13.30% of the participants serum amylase level was found to be elevated above the normal level, and 17% of the clinically positive acute pancreatitis showed normal serum amylase levels. In the study conducted by Bhimal et al the amylase level was elevated in 90% of the cases.¹⁰

Out of 78 participants whose serum amylase levels were Positive for acute pancreatitis, 35.9% showed positive USG findings for acute pancreatitis. Out of 15 participants with increased serum amylase levels, 53.3% that is 8 participants, showed positive USG findings for acute pancreatitis. While 20 participants who showed negative amylase levels, 30% that is 6 participants were found to have positive USG findings for acute pancreatitis.

Limitations

Limitations of current studies was, ultrasound being a very operator dependent study, the radiologists were not blinded as to the possible diagnosis and were also aware of the study. A potential bias may exist in the reports.

CONCLUSION

Acute pancreatitis is a common differential of an acute abdomen in the emergency room. Often a bedside ultrasound is the first imaging modality used in these patients. Ultrasonogram though cheap and easily available is not ideal for the diagnosis of acute

pancreatitis. As shown in the study by using the serum amylase level one is able to detect nearly twice as many cases of pancreatitis compared to ultrasonogram. The sensitivity and specificity of ultrasonography to detect acute pancreatitis is too low to use as a diagnostic test but it is a valuable tool in the early evaluation of an acute abdomen.

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