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Original Research Article

A cross-sectional study on elevated levels of serum amylase as a predictive factor for appendiceal perforation in patients with acute appendicitis

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ABSTRACT

Background: Acute appendicitis is a common surgical emergency, and appendiceal perforation can lead to serious complications. Early identification of perforation is critical to improving outcomes. Serum amylase has been suggested as a potential marker for perforated appendicitis, but its diagnostic accuracy remains under-investigated. This study aimed to evaluate the diagnostic utility of elevated serum amylase levels as a predictive factor for appendiceal perforation in patients with acute appendicitis.
Methods: An observational study was conducted at Hi-tech medical college and hospital, Bhubaneswar, from December 2023 to February 2025. Sixty-four patients diagnosed with acute appendicitis and undergoing appendectomy were included. Preoperative serum levels of amylase and lipase were measured. Postoperative histopathological examination confirmed the diagnosis of perforated or non-perforated appendicitis. Statistical analysis was performed using chi-square test, t-test, and ROC curve.
Results: Among the 64 patients, 28 had perforated appendicitis, and 36 had non-perforated appendicitis. The mean serum amylase level was significantly higher in the perforated group (72.1±27.3 mg/dl) compared to the non-perforated group (30.1±11 mg/dl) ($p<0.0001$). No significant difference was observed between groups regarding serum lipase.
Conclusions: Elevated serum amylase levels were associated with perforated appendicitis in patients with acute appendicitis. Serum amylase demonstrated high diagnostic accuracy and could serve as a predictive marker for appendiceal perforation. Further studies are warranted to validate these findings and explore the clinical utility of serum amylase in the early diagnosis of perforated appendicitis.

Keywords: Acute appendicitis, Perforation, Elevated serum amylase

INTRODUCTION

Abdominal pain is one of the most prevalent encountered symptoms in OPDs and emergency services. The causes of abdominal pain are diverse and include simple causes such as peptic ulcer disease to more dangerous one including hollow viscus perforation and appendicitis. Among this appendicitis is one of the most common abdominal surgical Emergency worldwide, and it can lead to serious complications, such as ileus, peritonitis, abscess, and even death. The age-standardized incidence rate of acute appendicitis was 190.7 per 100,000 population in 1990, with a 20.5% increase from 1990 to 2019.[1] Perforation was found in 13.8% of the cases of acute appendicitis.[2] In fact, the probability of appendix perforation is highest in extreme ages (children <5 years and elderly older than 65 years) compared to other age groups.[3]

In the case of appendiceal perforation, severe complications such as bacterial peritonitis, sepsis, small

bowel obstruction, and intra-abdominal abscess can develop. Even bacterial peritonitis can have a mortality rate of 80 to 100%.[4] Importance of making the diagnosis of appendicitis, in particular perforated appendicitis and to enhance the ability of medical personnel accordingly, various laboratory methods have been investigated. Serum amylase assay is one of those methods.

Amylase is a digestive enzyme predominantly secreted by the pancreas and salivary glands and is present in other tissues at minimal levels. The primary role of amylases is to break down the glyosidic bonds within starch molecules, transforming complex carbohydrates into simpler sugars. Amylase is a frequently ordered standard diagnostic test, often combined with lipase, particularly when acute pancreatitis is suspected in patients.[5]

Some studies and case reports have noted that, the patients with raised serum amylase level were primarily observed for pancreatitis and later it was found that they had perforated appendicitis which led to serious complications.[6] But, limited studies have been done so far to evaluate the diagnostic accuracy of serum amylase in the diagnosis of perforated appendicitis with controversial results. Therefore, the current study was done to determine the diagnostic accuracy of serum amylase level in prediction of perforated appendicitis.

METHODS

An observational study was conducted at Hi-tech medical college and hospital, Bhubaneswar, from December 2023 to February 2025. 64 patients admitted due to acute appendicitis and underwent appendectomy were included. The study protocol as approved by the college ethics committee. Patients were informed about the study objective and consent was obtained prior to venous blood sampling. Inclusion criteria were patient admitted for acute appendicitis and underwent appendectomy. Exclusion criteria consist of other causes of acute abdomen other than acute appendicitis, such as pancreatitis, cholelithiasis, hollow viscus perforation, pelvic inflammatory disease, previous history of hepatitis and haemolytic disease. The diagnosis of acute appendicitis was made by the clinical examination and radiological investigations (i.e. USG and CECT abdomen and pelvis).

Age and gender of patients was documented. Venous blood samples were obtained before surgery. Serum levels of amylase, lipase and alkaline phosphatase (ALP) were assayed. Intraoperative findings were documented, whether it was perforated appendicitis or not. After appendectomy surgical specimens were sent for histopathological examination to confirm the diagnosis. If the pathological examination didn't confirm the diagnosis of acute appendicitis, the patient was excluded. The data were analysed by SPSS software using the chi-square test, t test. The sensitivity and specificity of serum amylase was obtained by using receiving operating characteristic (ROC) curve.

RESULTS

Total 64 patients were studied. Out of 64 patients 39 were male and 25 were female (Figure 1). There were 28 patients with perforated appendicitis and 36 patients with non-perforated appendicitis. The male-to-female ratio was 17 to 11 in perforated group and 22 to 14 in non-perforated group (Figure 2). There was no statistically significant difference observed between perforated and non-perforated group regarding serum lipase and ALP. The mean serum amylase level was found to be higher in perforated group (72.1±27.3 mg/dl) than in non-perforated group (30.1±11 mg/dl); p<0.0001 (Table 1).

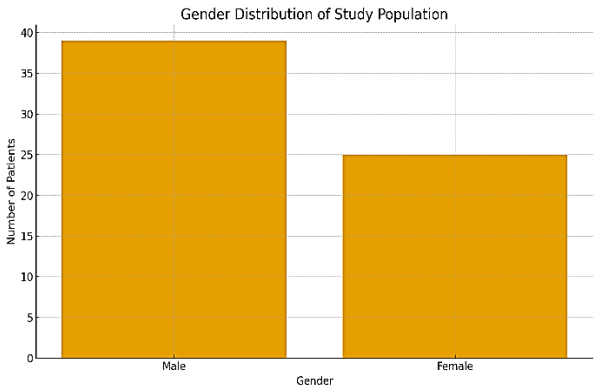

Figure 1: Gender distribution.

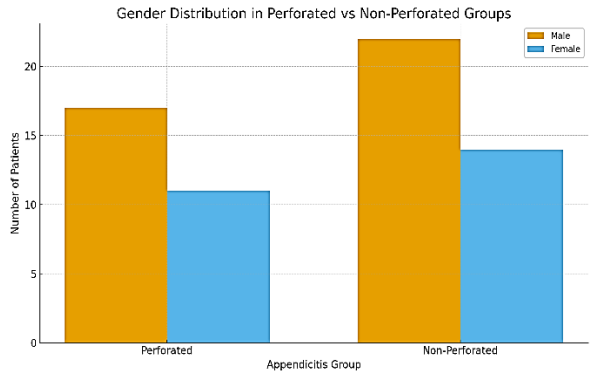

Figure 2: Gender distribution in perforated vs non-perforated groups.

Table 1: The comparison of the laboratory tests studied in children with perforated appendicitis vs. those with non-perforated appendicitis.

Laboratory assays	Perforated group, (n=28)	Non-perforated group, (n=36)	P value
Serum amylase, (mg/dl)	72.1 (±27.3)	30.1 (±11)	<0.0001
Lipase, (mg/dl)	36.4 (±21.2)	32 (±18.2)	0.693
ALP, (mg/dl)	576 (±96)	498 (±124)	0.139

DISCUSSION

In this study we decided to evaluate the diagnostic accuracy of serum amylase as a predictive factor for appendiceal perforation. The result showed that serum amylase level was higher in perforated group as compared to non-perforated group. Perforated appendicitis may led to severe complications like bacterial peritonitis, sepsis, small bowel obstruction, intra-abdominal abscess.[4] Therefore, timely diagnosis of acute appendicitis is of paramount importance to prevent further complication.

Though raised serum amylase levels suggestive of acute pancreatitis, in some conditions such as hollow viscus perforation serum amylase levels found to be elevated. Although some case reports have indicated acute appendicitis with elevated serum amylase level without acute pancreatitis, some other studies showed controversial results.[7,8] In a previous study it was reported that besides pancreatitis, elevated serum amylase was also observed in small bowel obstruction, renal parenchymal disease, hepatic failure, and choledocholithiasis.[9,10] A former case report mentioned considering acute appendicitis in patients with increased serum amylase level. The authors added that sometimes acute appendicitis may be misdiagnosed in the setting of increased serum amylase level.[11] However, other markers including ALP, serum lipase were not useful for the diagnosis of acute appendicitis.[12] If the diagnosis is made promptly, the patients are treated faster and will have better recovery period.

Limitations of this study is the small sample size. Inadvertent treatment for acute pancreatitis may be started in some cases leading to delay in surgical management. Needs further evaluation with large sample size in a multicentre study

CONCLUSION

The serum amylase level was higher in perforated group than non-perforated group in patients with acute appendicitis. Serum amylase has high diagnostic accuracy and can be used as a predictive factor for appendiceal perforation in patients with acute appendicitis. Further studies to evaluate this elevated serum amylase in patients with acute appendicitis in order to understand better the role of serum amylase is necessary.

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

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