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Original Research Paper

Radio-Diagnosis

ADROITFUL ABILITY TO DISTINGUISH AND ANALYZE ACUTE PANCREATITIS IN ADOLESCENT POPULATION USING CECT

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ABSTRACT

Background: Acute pancreatitis (AP) in adolescents is recognized as a significant clinical condition however, diagnosis remains difficult due to the nonspecific and overlapping nature of its symptoms with other causes of acute abdominal pain, such as appendicitis, mesenteric adenitis, or gastrointestinal infections, the current study aims to evaluate the diagnostic accuracy and clinical utility of contrast-enhanced computed tomography (CECT) in detecting and characterizing acute pancreatitis in adolescents, with a focus on its ability to determine the extent of pancreatic inflammation, associated complications, and guide timely clinical management **Methods:** Thirty patients with acute epigastric pain radiating to the back were evaluated for acute pancreatitis based on clinical signs, elevated amylase/lipase levels, and ultrasound findings. All underwent triphasic contrast-enhanced CT using a Philips 16-slice scanner to assess pancreatic inflammation at a Tertiary care center. **Results:** 30 adolescents with acute pancreatitis, 63% were male. Idiopathic (50%) and alcohol-related (33.3%) were the leading causes. CT revealed necrosis in severe (87.5%) and moderate (12.5%) cases, with none in mild cases, indicating a strong correlation between necrosis and higher CT severity scores.**Conclusion:** CECT is a valuable diagnostic tool in adolescents with suspected AP, offering high sensitivity in detecting inflammation and complications, and aiding early and precise management.

KEYWORDS : Acute Pancreatitis, Contrast-enhanced Computed Tomography (CECT), CT Severity Scores

INTRODUCTION

Acute pancreatitis has been recognized since antiquity. It was first described by Reginald Fitz in 1889, and its essential pathology was reported by Rich and Duff in 1936[1]. The mechanism, such as the enzyme's trypsin, which are activated within the pancreatic acinar cells, remains a major unanswered question in acute pancreatitis. Acute pancreatitis can be diagnosed on the basis of clinical and laboratory data. At times, it may be difficult to differentiate it from other acute abdominal conditions and in these patients, serum enzymes (amylase and lipase) study, imaging by ultrasonography (USG) and/or computed tomography (CT) is of immense value in arriving at a diagnosis. Contrast-enhanced CT scan (and in particular a contrast-enhanced thin-section multidetector-row CT scan) is the best imaging technique to exclude conditions that masquerade as acute pancreatitis, to diagnose the severity of acute pancreatitis and to identify complications of pancreatitis[2,3]. Along with USG and CECT, endo ultrasound, MRCP and MRI can be used with better specificity and sensitivity. This study compared the role of serum enzymes (amylase and lipase) levels with the imaging studies (US/CECT scan) in relation to early diagnosis of acute pancreatitis and to find out the most specific and sensitive diagnostic modality in order to decrease the morbidity and mortality of this fatal disease to an acceptable level[4].Acute pancreatitis (AP) is a reversible inflammatory condition of the pancreas that, while traditionally associated with adults, is increasingly recognised in the adolescent population [5]. Its clinical presentation often mimics other causes of acute abdomen, such as appendicitis or gastritis, making early and accurate diagnosis challenging yet essential. [4] When severe, AP can become a life-threatening condition in adolescents, emphasising the need for prompt recognition and management. Common symptoms—such as epigastric pain radiating to the back, nausea, and vomiting—should prompt consideration of AP in the differential diagnosis of abdominal discomfort in this age group. [5].There is ongoing debate regarding the exact triggers of acute pancreatitis. While ductal obstruction is considered a significant contributing factor, it is neither essential nor solely responsible for the condition's onset. Regardless of the initiating cause, the key pathological event is the premature activation of pancreatic enzymes within the pancreas rather than in the intestines. This abnormal activation results in inflammation, damage to small pancreatic ducts, and leakage of digestive enzymes into surrounding tissues [6] . Due to the absence of a protective capsule around the pancreas, these enzymes easily infiltrate adjacent structures. They break down fascial planes, spreading the inflammatory process across multiple anatomical compartments. [7] In this context, contrast-enhanced computed tomography (CECT) serves as a cornerstone in both confirming the diagnosis and assessing the severity of the disease. It remains the gold standard imaging modality, particularly valuable when the clinical picture is unclear[8].CECT provides crucial insights into pancreatic necrosis, peripancreatic inflammation, fluid collections, and vascular involvement. The CT Severity Index (CTSI) derived from CECT findings enables disease severity stratification into mild, moderate, or severe categories, guiding treatment decisions and prognostic evaluation. [9] In our study, CECT proved instrumental in identifying key features such as necrosis and peripancreatic involvement, directly influencing clinical management. A strong correlation was observed between higher CTSI scores and the severity of clinical presentation, reinforcing the prognostic value of CECT. Interestingly, a higher incidence of idiopathic and trauma-related pancreatitis was noted in adolescents, highlighting the necessity of a thorough clinical history along with imaging for accurate diagnosis. While ultrasonography is often the initial imaging tool due to its accessibility and safety, it is limited by operator dependency and lower sensitivity for detecting complications. In contrast, CECT offers superior spatial resolution, making it more effective for evaluating necrotic changes, pseudocyst formation, and vascular complications. However, its use must be balanced against the risk of radiation exposure, especially in younger patients, advocating for judicious application based on clinical need.

MATERIALS AND METHODS

Study Design: A prospective observational study was conducted on 30 adolescents aged 10–18 years, presenting

with acute, persistent, severe epigastric pain, often radiating to the back. All were referred to the Department of Radiology at a tertiary care centre serving a predominantly rural and industrial population.

Inclusion Criteria

- Acute onset of epigastric pain, with or without back radiation
- Serum amylase or lipase ≥3x upper normal limit
- Ultrasound evidence suggestive of AP

Exclusion Criteria

- Chronic pancreatitis
- Previous pancreatic surgery
- Inadequate renal function precluding contrast

Imaging Protocol

All participants underwent triphasic CECT of the abdomen and pelvis using a Philips 16-slice scanner with standard contrast dose and technique, per AP imaging protocols. Scans assessed the pancreas and peripancreatic regions.

Severity Grading

Severity grading was performed using the MCTSI, incorporating pancreatic inflammation, necrosis, and extrapancreatic complications. Findings were analysed for correlation with clinical severity and patient outcomes.

Ethics

Study approval was obtained from the Institutional Review Board [Your Institution]).

RESULTS

A total of 30 adolescent patients diagnosed with acute pancreatitis were included in the study. Among them, 63% (n=19) were males and 37% (n=11) were females. In terms of a etiology, idiopathic causes accounted for 50% (n=15) of the cases, followed by alcohol-related pancreatitis in 33.3% (n=10). Other less common causes included biliary origin (3.3%, n=1), hyperparathyroidism (3.3%, n=1), blunt abdominal trauma (3.3%, n=1), drug-induced pancreatitis (3.3%, n=1), and smoking-related pancreatitis (3.3%, n=1). Contrast-enhanced computed tomography (CECT) was used to assess the severity of pancreatitis, with necrosis being a key indicator. Based on CT grading, 14 patients (87.5%) with pancreatic necrosis fell within the severe category (CTSI score 8–10), while two patients (12.5%) with necrosis were in the moderate group (CTSI score 6). Notably, no necrosis was observed in the mild category (CTSI score 2–4), indicating a strong correlation between higher CT severity scores and the presence of necrosis

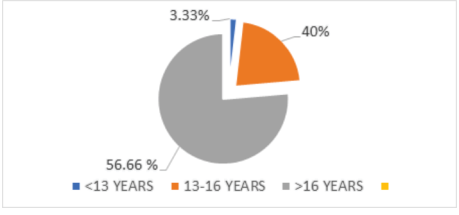

Figure no 1: Distribution of 30 Cases According to Age

Figure No. 1 shows that most acute pancreatitis cases (56.66%) occurred in adolescents over 16 years, followed by 40% in the 13–16 years group, and only 3.33% in those under 13, indicating a higher prevalence in older adolescents.

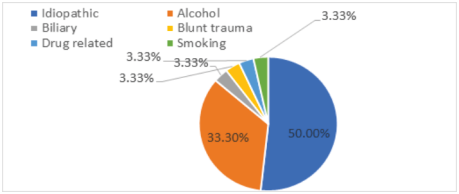

Figure no. 2: Distribution of 30 Cases According to Causes of Acute Pancreatitis

Table 1: Serum Amylase Levels in Different Etiologic Groups.

Amylase (U/L)	Idiopathic	Alcohol	Biliary	Blunt Trauma	Drug Related	Smoking
>1000	7	4	0	1	0	0
500-1000	3	5	0	0	1	1
<500	5	1	1	0	0	0

Serum amylase study: In Table, Amylase levels >1000 U/L were most common in idiopathic (n=7) and alcohol-related (n=4) cases. This shows higher pancreatic enzyme release in these groups. One episode of trauma-related pancreatitis (blunt trauma) showed amylase levels >1000 U/L, indicating a rapid mechanical damage response.

Table 2: Serum Lipase Levels in Different Etiologic Groups.

Lipase (U/L)	Idiopathic	Alcohol	Biliary	Blunt Trauma	Drug Related	Smoking
>600	6	3	1	0	0	0
200-600	5	6	0	1	1	1
<200	4	1	0	0	0	0

The table 2. illustrates the distribution of serum lipase levels among various etiological categories of acute pancreatitis. Elevated lipase levels (>600 U/L) were most frequently seen in idiopathic cases (n=6), followed by alcohol-related (n=3), and a single case from the biliary group.

Diagnostic Accuracy of CECT Scan Abdomen

Table no. 3: Distribution of CT Grades of the Patients in Acute Pancreatitis

CT Grades of The Patients	No. of Patients With Pancreatic Necrosis	Percentage (%) of Total Patients With Pancreatic Necrosis
2-4 (Mild)	0	0
6 (Moderate)	2	12.51
8-10 (Severe)	14	87.5

Table 3. Shows that pancreatic necrosis was absent in mild cases (grades 2–4), present in 12.5% of moderate cases (grade 6), and most common (87.5%) in severe cases (grades 8–10), indicating a strong correlation between higher CT grades and the presence of necrosis.

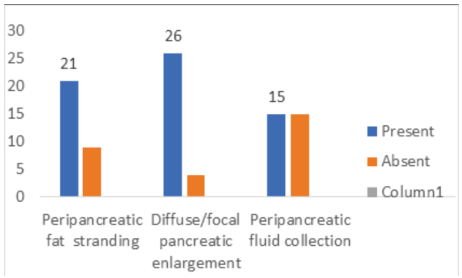

Figure no.3: CT Findings in Acute Pancreatitis

Figure No.3 shows that diffuse/focal pancreatic enlargement was the most common finding, present in most patients. Peripancreatic fat stranding was also frequently observed, while peripancreatic fluid collection was present in about half of the cases.

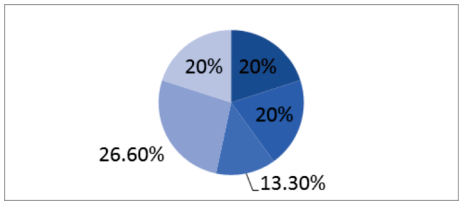

Figure 4: Distribution of Patients According to the MCCTSI Total Score.

Figure 4: shows that the highest percentage is 26.6%, and the lowest is 13.3%, indicating moderate variation among the categories.

Correlation Table 4: MCTSI Score vs. Pancreatic Necrosis

MCTSI Score	Total No. of Patients	% of Total Patients	No. with Pancreatic Necrosis	% of Total Necrosis Cases
2–4 (Mild)	12	40%	0	0%
6 (Moderate)	4	13.33%	2	12.5%
8–10 (Severe)	14	46.67%	14	87.5%
Total	30	100%	16	100%

Correlation and Clinical Implications

The results of this study highlight a strong concordance between higher CT severity scores and the presence of necrosis, affirming CECT as a valuable tool for assessing disease severity and prognosis. Additionally, the demographic and biochemical data provide important context for clinical risk assessment, with idiopathic and alcohol-related cases requiring heightened surveillance for severe complications.These findings reinforce the importance of integrating etiological classification, enzyme assays, and advanced imaging in the evaluation of adolescent pancreatitis. Not only do they aid in early diagnosis and severity assessment, but they also guide resource allocation and individualised patient management in tertiary care settings.

DISCUSSION

The study included 30 adolescent patients diagnosed with acute pancreatitis, all of whom underwent contrast-enhanced CT (CECT) of the abdomen and pelvis. Most patients (56.6%, n=17) belonged to the 16–19 years age group, suggesting a notable age correlation. 63.3% (n=19) were males and 36.6% (n=11) females mentioned in (Figure 1), although no significant association between gender and disease severity was observed. This finding is consistent with the study by Lankisch et al. which also reported no correlation between age, gender, and severity in a larger cohort of 602 acute pancreatitis cases[10].Comparing aetiology of the pancreatitis, the most common cause was idiopathic pancreatitis, which affected 50% of the adolescent patients (n = 15). Alcohol-induced pancreatitis came in second, at 33.3% (n = 10) in Figure no 2.. The prevalence of idiopathic cases may be a reflection of difficulties in determining subtle or complex triggers in the adolescent population, highlighting the necessity of a thorough metabolic and genetic assessment in this demographic. Furthermore, different social, cultural, and regional patterns of early alcohol consumption are probably related to the significant incidence of alcohol-related pancreatitis among adolescents in our study. This is a factor that becomes more significant as adolescents move toward adult health behaviours. In one patient, less common causes like smoking, biliary pathology, and blunt trauma were each found. The findings of Suzuki et al., who identified medications, infections, trauma, and anatomical abnormalities as the primary underlying causes of pediatric acute pancreatitis, significantly differ from this pattern of aetiology [11].In contrast, Garg et al.study conducted in an Indian population, reported that mild to moderate cases were more frequent, with severe cases constituting only about 20–25% of the study population. This discrepancy may be attributed to regional differences in aetiology (e.g., higher rates of alcohol-induced pancreatitis in certain populations), variation in referral patterns to tertiary centres, or differences in the criteria for performing contrast-enhanced CT [12] And another study show the most common causes were biliary tract diseases and chronic alcohol abuse responsible for 40% cases(13) .Serum pancreatic enzymes showed that elevated amylase (>1000 U/L) and lipase (>600 U/L) levels were most frequent in idiopathic and alcohol-induced cases, reflecting the greater acinar cell injury in these groups showen in table 1&2. Notably, trauma-associated pancreatitis demonstrated high amylase, likely due to abrupt mechanical disruption of pancreatic tissue.[14] The correlation between higher enzyme levels and more intensive pancreatic insult is consistent with previous studies, reinforcing the diagnostic value of these markers in acute presentations.[15]. Computed tomography is the most sensitive imaging modality, and has become the procedure of choice in the evaluation of patients suspected of having acute pancreatitis. The chief advantage is a complete cross-sectional image that permits an accurate assessment of the primary lesion and also of the extent of inflammation along various anatomical planes. According to White et. al CECT scan of pancreas in acute pancreatitis can give rise to typical CECT appearance which includes diffuse enlargement of the gland, decreased central density and a thick rim producing a sac like configuration[16]Using contrast-enhanced computed tomography (CECT), severity was objectively quantified. Pancreatic necrosis—an important determinant of prognosis—was strongly associated with higher CT severity index (CTSI) scores in Table 3: 87.5% of cases with necrosis fell in the severe CTSI category (grades 8–10), while the moderate group showed necrosis in just 12.5% of patients. Importantly, no necrosis was detected in mild cases, underscoring the reliability of CT grading in risk stratification and guiding management decisions. Radiological features such as pancreatic enlargement and peripancreatic fat stranding were common, while fluid collections appeared in about half of the patients, characteristic of evolving acute pancreatitis[17].Diffuse or focal pancreatic enlargement was the most commonly observed CT finding, present in 86.6% of cases in(Figure 3) . This is a classical early radiologic sign of acute pancreatitis, reflecting parenchymal edema and inflammation. Its high prevalence in the current study supports the role of CT in confirming the clinical suspicion of pancreatitis.The distribution of MCCTSI scores in the study population provides important insights into the severity pattern of acute pancreatitis among the patients. The Modified CTSI is a validated scoring system used to assess the severity of pancreatitis based on radiological findings, incorporating pancreatic inflammation, necrosis, and extrapancreatic complications.Our study demonstrates a strong and clinically significant association between the Modified CT Severity Index (MCTSI) scores and the presence of pancreatic necrosis in adolescent patients with acute pancreatitis. Among the cohort, none of the patients with mild CT scores (2–4) developed necrosis, reflecting low risk in this subgroup. In contrast, the vast majority of necrosis cases (87.5%) occurred in patients with severe MCTSI scores (8–10), while a small proportion (12.5%) was observed in those with moderate scores 9 mention in Table no 4. These findings reaffirm the utility of CT scoring systems in stratifying the risk and severity of pancreatic injury, consistent with published literature. Statistically, the correlation is robust and significant, highlighting CT severity grading as a key predictor for the occurrence of pancreatic necrosis.

Clinically, this supports the use of MCTSI as a practical tool in early risk identification, guiding more intensive monitoring and management strategies for those at highest risk of complications. Table 4 data demonstrate a strong association between higher CT severity scores and the presence of pancreatic necrosis, which is a critical determinant of disease diagnosis, prognosis and clinical management. The absence of necrosis in mild cases suggests a more favourable course with minimal risk for systemic complications, which aligns with established clinical guidelines that typically recommend conservative management in such patients. In contrast, the occurrence of necrosis in 12.51% of patients with moderate CT scores highlights the need for close monitoring and possibly early intervention, especially in patients showing clinical deterioration. Most notably, the finding that 87.5% of patients with severe CT grades had pancreatic necrosis underscores the utility of CT imaging in stratifying risk. This subgroup is at the highest risk for complications such as infected necrosis, organ failure, and prolonged hospital stays. These results are

consistent with existing literature, which has validated CT severity indices as reliable predictors of morbidity and mortality in acute pancreatitis. The progression of necrosis correlates with the intensity of the inflammatory response and is often associated with elevated scores on clinical severity scales such as the APACHE II or Ranson's criteria. DeBanto et al. (2002) established one of the first pediatric-specific scoring systems for predicting the severity of AP, highlighting unique clinical parameters relevant to children and adolescents and the need for tailored severity assessment beyond adult criteria. This underscores the importance of having age-appropriate diagnostic and prognostic tools.[18]. The study highlights the adroitful ability of contrast-enhanced computed tomography (CECT) to accurately distinguish and analyze acute pancreatitis in the adolescent population. CECT proved highly effective in detecting key radiological features such as pancreatic enlargement, peripancreatic fat stranding, fluid collections, and necrosis. The Modified CT Severity Index (MCTSI) further allowed precise grading of disease severity, enabling early risk stratification and guiding clinical decision-making. Given its superior diagnostic clarity, especially in moderate to severe cases, CECT remains an invaluable tool in the comprehensive assessment and management of acute pancreatitis in adolescents, when used judiciously [18]. Overall, the distribution pattern in our study underscores the clinical utility of MCTSI in stratifying patients and predicting outcomes. The low percentage of moderate cases may also suggest either a rapid progression from mild to severe forms or a limitation in detection during the intermediate stage, warranting further prospective evaluation.

CONCLUSION

CECT is a highly effective imaging modality for diagnosing and evaluating acute pancreatitis in adolescents. It provides comprehensive information on disease severity, complications, and guides early management decisions, improving patient outcomes.The Modified CT severity index takes into account a variety of factors and helps in proper assessment of pancreatitis

Limitations

A potential limitation is the relatively small sample size and the single-centre nature of the cohort, which may limit the external validity of the findings. Additionally, rare causes of acute pancreatitis were under-represented, making it difficult to identify patterns or predictors for these etiologies.

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