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Pancreatitis in Bangladeshi Children: An Experience with 72 Cases

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Abstract

Background: *Pancreatitis-related morbidity and mortality are high. Early diagnosis and prompt treatment are essential to reduce mortality and morbidity. Etiological, clinical, biochemical and imaging studies are crucial for early diagnosis and treatment.*

Objectives: *To observe the etiological, clinical, biochemical, and imaging profiles of acute, acute recurrent and chronic pancreatitis in children.*

Methods: *This cross-sectional descriptive study was conducted at the Pediatric Gastroenterology and Nutrition Department of BSMMU. A total of 72 consecutive patients aged 3 to 18 years who fulfilled the inclusion criteria of pancreatitis were enrolled in this study from June 2017 to July 2020. The diagnosis of pancreatitis was based on INSPPIRE criteria for the diagnosis of pancreatitis. The data were analyzed with the SPSS for Windows version 23.0. The variables studied were described as frequencies and percentages or as means ±SD; the p-value reached from the ANOVA test, and p< 0.05 was considered statistically significant.*

Results: *Among the cases, 52.8% were male. The frequency of pancreatitis was higher in the 5–10-year age group. The mean age was 10.27±3.71years. Among all cases, 41.7% had acute pancreatitis, 31.9% chronic pancreatitis, and 26.4% had acute recurrent pancreatitis. The etiology of pancreatitis was idiopathic (54.1%) in most cases. Obstructive and genetic causes were found to be the causes in 19.4% cases each. Characteristic abdominal pain was the presenting feature of all forms of pancreatitis. No significant difference was observed in the laboratory parameters among all three types of pancreatitis. Plain X-ray abdomen showed normal radiological findings in most cases. On ultrasonography, MRCP, and abdominal CT, swollen pancreas was the most common imaging finding in acute and acute recurrent pancreatitis whereas irregular dilatation of the major pancreatic duct in chronic pancreatitis.*

Conclusion: *Abdominal pain was the most common presenting feature of pancreatitis. The common age of pancreatitis was 5-10 years. Idiopathic pancreatitis was found to be most common cause. Imaging studies revealed swollen pancreas in acute and acute recurrent pancreatitis and irregular dilatation of the major pancreatic duct in chronic pancreatitis.*

Keywords: *Bangladesh, Children, Pancreatitis*

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Introduction

Paediatric pancreatitis is usually underestimated though it is not so uncommon. The incidence of pediatric pancreatitis has increased over the past 10–15 years.[1] The etiology of pancreatitis in children is diverse and differs significantly from that in adults.[2] However, it is difficult to identify the cause of pancreatitis in childhood and adolescence. Recurrence occurs in a significant percentage of patients, and it is most often related to anatomic or hereditary disorders, with a majority of cases being labelled as idiopathic.[3] Early detection of the underlying etiology may favor a complete resolution of the disease, as in the case of biliary stones or biliopancreatic abnormalities.[4] Pancreatitis is classified as acute (AP), acute recurrent (ARP) and chronic pancreatitis (CP) according to INSPPIRE (International Study Group of Pediatric Pancreatitis: In Search for a Cure) criteria.[5] Acute recurrent pancreatitis may evolve into chronic pancreatitis. Chronic pancreatitis is often in its early stage, sometimes clinically indistinguishable from acute pancreatitis.[5] Imaging evidence is needed for diagnosing pancreatitis. This study aimed to investigate the etiological, clinical, laboratory and radiological parameters associated with different types of pancreatitis in children.

Materials and methods

This was a cross-sectional descriptive study. This study was carried out at the department of Pediatric Gastroenterology and Nutrition in Bangabandhu Sheikh Mujib Medical University, Dhaka, Bangladesh. A total of 72 consecutive patients aged three to eighteen years who fulfilled the criteria of pancreatitis were enrolled purposively in this study from June 2017 to July 2020. The diagnosis of pancreatitis was made based on INSPPIRE (International Study Group of Pediatric Pancreatitis: In Search for a Cure) criteria. Diagnosis of acute pancreatitis (AP) was defined as requiring two of the following three criteria: a) Characteristic abdominal pain compatible with acute pancreatitis b) Serum amylase and/or lipase values e”3 times upper limits of normal c) Imaging findings of acute pancreatitis. Acute recurrent pancreatitis (ARP) was defined as more than 2 distinct episodes of acute pancreatitis with an intervening return to baseline. Chronic pancreatitis (CP) requires characteristic imaging findings suggestive of chronic pancreatic damage and at least one of the following three: a) Abdominal pain consistent with the pancreatic origin b) Evidence of exocrine pancreatic insufficiency c) Evidence of endocrine pancreatic insufficiency or surgical/pancreatic biopsy specimen demonstrating histopathologic features compatible with chronic pancreatitis.

Inclusion criteria for pancreatitis were: 1) Patients meeting the diagnostic criteria of pancreatitis according to INSPPIRE 2) Children under 18 years of age.

A detailed history, thorough physical examination and laboratory investigations were done. Clinical history, examination findings & investigation reports were recorded in a standard data sheet. The data were analyzed with the SPSS for Windows version 23.0. The variables studied were described as frequencies and percentages or as means ±SD. p-value was reached from the ANOVA test, and $p < 0.05$ was considered statistically significant.

Results

A total of 72 subjects were included in the final analysis. Among them, 52.8% were male and 47.2% female (Table I).

Table-I

Gender distribution of the study subjects (n=72)

Gender	Frequency	Percent
Male	38	52.8
Female	34	47.2
Total	72	100.0

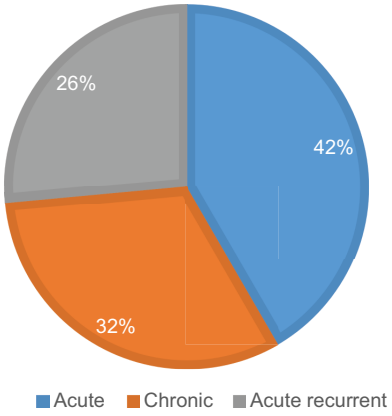
The frequency of pancreatitis was higher in the 5-10-year age group (40.3%), and lowest in the below 5-year-age group (13.9%). The mean age was 10.27±3.71 years (range 3.0 – 18.0) (Table II).

Table II

Age distribution of the study subjects (n=72)

Age group (years)	Frequency	Percent
< 5	10	13.9
5-10	29	40.3
11-15	28	38.9
>15	5	5.9
Total	72	100.0
Mean±SD Range	10.27±3.71(3.0 – 18.0)	

Among all cases, 41.7% (n=30) presented as acute pancreatitis, 31.9 (n=23) as chronic pancreatitis, and the rest 26.4% (n=19) were labelled as acute recurrent pancreatitis (Figure 1).



The etiology of pancreatitis was idiopathic (54.1%) in the studied population. Each of the obstructive disease (pancreatic stone, cholelithiasis, choledochal cyst, ascariasis) and genetic disease (SPINK1, PRSS1, CFTR) was found as a cause of pancreatitis in 19.4% of cases. Other causes of pancreatitis were infection (Mumps virus, Hepatitis A) (2.8%), hyperlipidemia (1.4%), trauma (1.4%), and drugs (1.4%). (Table-III)

Characteristic abdominal pain (100%) was one of the presenting features of pancreatitis. Besides abdominal pain, vomiting was the most recorded symptom (87.5%). Other features were- pain aggravated by fatty food (58.3%), fever (44.4%), ascites (9.7%), jaundice (8.3%), palpable mass (6.9%), and pleural effusion (5.6%) (Table IV).

Table III

Etiologies of pancreatitis in study subjects (n=72).

Etiology	Pancreatitis		
	n (%) Acute(n=30)	n (%) Chronic (n=23)	n (%) Acute recurrent(n=19)
Idiopathic	21 (70)	12 (52.2)	6 (31.6)
Obstructive (pancreatic stone, cholelithiasis, choledochal cyst, ascariasis)	2 (6.6)	5 (21.7)	7 (36.8)
Genetic disease (SPINK1, PRSS1, CFTR)	2 (6.6)	6 (26)	6 (31.6)
Infection (Mumps virus, Hepatitis A)	2 (6.6)	0 (0)	0 (0)
Hyperlipidemia	1 (3.3)	0 (0)	0 (0)
Trauma	1 (3.3)	0 (0)	0 (0)
Drugs	1 (3.3)	0 (0)	0 (0)

Table IV

Distribution of the study subjects by clinical presentation (n=72)

Clinical presentation	Pancreatitis(n=72)		
	Acute (n=30) n (%)	Chronic (n=23) n (%)	Acute recurrent (n=19) n (%)
Abdominal pain	30 (100)	23 (100)	19 (100)
Loss of appetite	4 (13.3)	4 (17.4)	2 (10.5)
Vomiting	27 (90.0)	20 (87.0)	16 (84.2)
Pain after fatty food	15 (50.0)	12 (52.2)	15 (78.9)
Weight loss	3 (10.0)	2 (8.7)	5 (26.3)
Fever	15 (50.0)	7 (30.4)	10 (52.6)
Abdominal distension	1 (3.3)	1 (4.3)	1 (5.3)
Jaundice	4 (13.3)	1 (4.3)	1 (5.3)
Ascites	5 (16.7)	1 (4.3)	1 (5.3)
Palpable mass	3 (10.0)	0 (0)	2 (10.5)
Pleural effusion	2 (6.7)	1 (4.3)	1 (5.3)
GI bleeding	1 (3.3)	0 (0)	0 (0)

The duration of pain was variable. In this study, the pain duration was significantly prolonged in chronic pancreatitis than in acute and acute recurrent pancreatitis (Table V).

Laboratory parameters tested for diagnosis and to see complications were serum amylase & lipase, complete blood count, serum calcium and blood glucose level. There is no significant difference seen in the laboratory parameters among all three types of pancreatitis (Table VI).

Imaging studies play a vital role in the diagnosis of pancreatitis. Imaging studies were abdominal X-ray, ultrasonography, MRCP, and abdominal CT. An abdominal X-ray was done in 33 cases. Normal radiological findings were identified in most of the cases (Table VII).

Ultrasonography of the abdomen was done in all the 72 cases of pancreatitis. Swollen pancreas was the most common finding in AP (46.7%) and ARP (63.2%). Irregular dilatation of MPD and pancreatic stone was found in 17.4% of cases of CP (Table IX).

Table V

Comparison of duration of pain (in weeks) in study subjects (n=72)

Duration of pain (weeks)	Pancreatitis			*p* value
	Acute (n=30)	Chronic (n=23)	Acute recurrent(n=19)	
Mean±SD	2.6±3.5	80.9±119.1	64.4±96.2	0.003[s]

p-value reached from ANOVA test, s= significant

Table VI

Laboratory investigations of the study population (n=72)

Laboratory investigations	Pancreatitis			p-value
	Acute (n=30) Mean±SD	Chronic(n=23) Mean±SD	Acute recurrent(n=19) Mean±SD	
Hemoglobin (gm/dl)	11.6±1.5	10.8±2.9	11.3±1.6	0.497
ESR(mm in 1st hr)	63.9±103.3	40.6±23.9	33.8±12.4	0.508
Platelet count(/L)	116388±196029	180095±138640	10074±19950	0.363
White blood cells (/L)	5740±7263	6046±4525	14159±22439	0.236
Hematocrits (%)	33.9±26.0	8.8±16.8	8.2±17.7	0.086
Serum amylase (U/L)	1294.0±2119.6	556.2±882.8	1141.1±2344.1	0.478
Serum lipase (U/L)	2093.2±3034.5	1354.7±2525.5	2340.2±1902.2	0.480
Serum calcium (mg/dl)	9.1±0.8	9.3±0.6	9.2±0.8	0.733
RBS (mg/dl)	5.5±1.6	8.5±7.9	5.7±1.8	0.116

ESR= Erythrocyte sedimentation rate, RBS= Random blood sugar
p-value reached from ANOVA test, s= significant

Table VII

X-ray findings in studied subjects (n=33)

X-ray findings	Pancreatitis(n=33)		
	Acute (n=11) n (%)	Chronic (n=12) n (%)	Acute recurrent (n=10) n (%)
Normal	7 (63.6)	7 (58.3)	10 (100)
Calcification	0 (0)	3 (25.0)	0 (0)
Pleural effusion	2 (18.2)	2 (16.7)	0 (0)
Ascites	2 (18.2)	0 (0)	0 (0)

CT scan of the abdomen was done in 18 cases of pancreatitis. Swollen pancreas was a common finding in AP (46.1%) and ARP (50%) (Table X).
MRCP was done in 72 cases of pancreatitis. A swollen pancreas was a common finding in AP (27.3%) and ARP (33.3%). Irregular dilatation of MPD was the most common finding in CP (30.8%). Uniform dilatation of MPD (45.5%) was found in AP (Table X).

Table VIII

Abdominal ultrasonography findings of the study population (n=72)

Abdominal ultrasonography	Pancreatitis (n=72)		
	Acute (n=30) n (%)	Chronic(n=23) n (%)	Acute recurrent (n=19) n (%)
Swollen pancreas	14 (46.7)	3 (13)	12 (63.2)
Irregular dilation of MPD	0 (0)	4 (17.4)	0 (0)
Regular dilation of MPD	3 (10)	2 (21.7)	4 (21.1)
Stone in pancreas	0 (0)	4 (17.4)	2 (10.5)
Pseudocyst	4 (13.3)	0 (0)	1 (5.3)
Biliary tree abnormality	1 (3.3)	3 (13)	0 (0)
Small pancreas	0 (0)	2 (8.7)	0 (0)

MPD=main pancreatic duct

Table IX

MRCP findings of the study population (n=72).

MRCP	Pancreatitis (n=72)		
	Acute (n=22) n (%)	Chronic (n=26) n (%)	Acute recurrent (n=24) n (%)
Swollen pancreas	6 (27.3)	4 (15.4)	8 (33.3)
Irregular dilation of MPD	0(0)	8 (30.8)	2 (8.33)
Regular dilation of MPD	10 (45.5)	4 (15.4)	8 (33.3)
Stone in pancreas	0 (0)	2 (7.7)	0 (0)
Pseudocyst	2 (9.1)	0 (0)	4 (16.7)
Biliary tree abnormality	2 (9.1)	2 (7.7)	0 (0)
Ascites	2 (9.1)	2 (7.7)	2 (8.33)
Small pancreas	0 (0)	4 (15.4)	0 (0)

MPD=main pancreatic duct

Table X

CT scan findings of the study population (n=18).

CT scan	Pancreatitis (n=18)		
	Acute(n=13) n (%)	Chronic (n=1) n (%)	Acute recurrent (n=4) n (%)
Swollen pancreas	6 (46.1)	0 (0)	2 (50)
Irregular dilation of MPD	1 (7.7)	0 (0)	1 (25)
Regular dilation of MPD	2 (15.4)	0 (0)	1 (25)
Biliary tree abnormality	0 (0)	1 (100)	0 (0)
Ascites	3 (23.1)	0 (0)	0 (0)
Small pancreas	1 (7.7)	0(0)	0 (0)

MPD= main pancreatic duct

Discussion

Previously it was thought that pancreatitis is an uncommon condition in children. However, recently we have been getting many patients of pancreatitis possibly due to the availability of investigation facilities and the presence of clean-cut diagnostic criteria of INSPPIRE. Unfortunately, a minimal number of studies have been done so far on pancreatitis in Bangladesh among children. So, the present study was conducted to observe the etiological, clinical, laboratory and imaging profiles of different types of pancreatitis in children.

Pancreatitis can affect all age groups. This study divided patients into different age groups; 5-10-year age groups were more common. The median age at presentation was 10.27±3.71 years, and no case of pancreatitis was observed in children under the age of three years (range 3.0 – 18.0 years). A study by Musabbir et al. also found a similar age group to be more common.[6] A similar finding was found in another study.[7] In this present study male children (52.8%) were slightly higher than female children (47.2%). It was similar to that reported by Shen et al.[8]

This study showed that acute pancreatitis was more common than chronic and acute recurrent pancreatitis in children, which supports the previous reports.[9, 10] In this study, acute pancreatitis was found in 41.7% of cases.

In our study, obstructive and genetic diseases were the common causes of AP, CP, and ARP among the identified etiology. Infection, hypercalcemia, hyperlipidemia, trauma and drugs were the causes of AP, but of not CP and ARP. Similar findings were observed by some other researchers.[11, 12] Pancreatitis can occur after pancreatic ductal obstruction by a congenital anomaly, stone, worms, cholelithiasis, tumors and other mass lesions.[12] Genetic mutations causing pancreatitis were found in 19.4% of cases in the present study. The frequency of genetic pancreatitis was found to be higher in other studies.[13,14] SPINK1, PRSS1, and CFTR gene mutation can result in AP, CP, and ARP.[13] Mutation in SPINK1, PRSS1, and CFTR genes causes increased trypsinogen activation and increased ductal calcium concentration resulting in pancreatitis.[14] Idiopathic pancreatitis was found in 54% of cases in our study. In different international studies, the frequency of idiopathic pancreatitis is much lower than ours.[15] This is because of the lack of diagnostic facilities in Bangladesh and small sample size.

Pancreatitis diagnosis is usually made based on clinical, laboratory and radiological findings. The most common clinical presentation is abdominal pain. In this present study, all the patients presented with this symptom. The onset of the pain is commonly sudden in onset and severe. Pain is usually localized to the upper-to-middle abdomen, often reported as radiating to the back. The duration of pain may be variable. In the case of acute pancreatitis, pain is usually sudden in onset and of short duration, whereas, in chronic pancreatitis, the pain usually develops gradually and persists for a longer duration.[16] In this study, the duration of pain was found to be significantly prolonged in chronic pancreatitis (80.9±119.1 weeks) than in acute (2.6±3.5 weeks) and acute recurrent pancreatitis (64.4±96.2 weeks), which supports the previously mentioned statement. Abdominal pain is often associated with nausea or vomiting, and the pain may aggravate immediately following a meal.[11] Abdominal pain (100%), vomiting (87.5%) and fever (44.4%) were the common symptoms in all forms of pancreatitis. Abdominal pain usually aggravated after a fatty meal (58.3%). Ascites were found in 9.7% of cases and jaundice in 8.3% cases. Ascites and jaundice were more common in acute pancreatitis. Jaundice was an unusual sign mentioned in several reviews.[16] A study conducted by Musabbir et al. showed that abdominal pain was the most commonly associated with vomiting occurring in 72%, followed by fever in 30%. Ascites were found in 12% of patients, jaundice in 4% of patients, and palpable mass in 6% of patients in their study.[6] Abdominal pain, vomiting and growth failure were the common features of chronic pancreatitis in the present study.[17]

Regarding the diagnostic laboratory evaluation, serum amylase and/or lipase are the most common serum assays used to diagnose pancreatitis in children. In this study, there was no significant difference was found in serum amylase and/or lipase levels between acute, chronic, and acute recurrent pancreatitis. No significant differences were found in other laboratory parameters such as hemoglobin, white blood cells, platelet count, serum calcium, and blood glucose levels among acute, chronic and acute recurrent pancreatitis. These findings are similar to another study done by Ma C et al.[18] Ismail showed a higher diagnostic efficacy of lipase than amylase in acute pancreatitis.[19] Total white blood cell count may be higher in acute pancreatitis.[20] High white cell count is more common

in acute pancreatic necrosis or pancreatic abscess.[20] Musabbir et al. found hypocalcaemia in 38% cases of acute pancreatitis.[6] Both hypoglycemia and hyperglycemia can occur in acute pancreatitis. Hypoglycemia is due to decreased glucagon and hyperglycemia is due to insulin deficit.[21] In case of chronic pancreatitis hyperglycemia occur due to insulin insufficiency.

Imaging studies are essential for the diagnosis of pancreatitis. Different imaging modalities are used, such as abdominal X-ray, ultrasonography, magnetic resonance cholangiopancreatography (MRCP), and computed tomography (CT) scan of the abdomen. Although abdominal X-ray findings associated with pancreatitis are not specific, they are frequently used as a modality of investigation. In the present study, plain x-ray findings were normal in most cases (72.7%). Pancreatic calcification was found only in chronic pancreatitis (25%). Ascites and pleural effusion also were found in a few instances. Other radiological features like sentinel loop, paralytic ileus, colon cut-off signs, and blurring of the left psoas margin were not found in our series. In a series by George [22], sentinel loop, pancreatic calcifications, colon cut-off sign and gas in the duodenum were the common findings. However, a plain abdominal X-ray is essential for differentiating pancreatitis from intestinal perforation or paralytic ileus.

Abdominal ultrasonography (USG) enables the identification of findings associated with pancreatitis. In the present study, abdominal ultrasonogram were carried out on all the patients. Swollen pancreas was found frequently in AP (46%) and ARP (63%). Irregular dilation of the main pancreatic duct (MPD) was found in 17.4% of cases of CP but not in AP and ARP. Pancreatic stone was found in CP and ARP but not in AP. Pancreatic pseudocyst was found in 13.3% of AP. According to Merina et al [23], USG detected acute pancreatitis in 84.2% cases. In their study, USG detected etiological factors like gall stones and extrapancreatic complications like ascites and pleural effusion even better than CT. It had a limited role in detecting mild acute pancreatic cases.[23] However, USG being readily available, cheap, and non-invasive, is a very helpful initial tool for diagnosis of acute pancreatitis, evaluating the gallbladder and biliary tract. USG criteria for CP are: hyperechoic foci with shadowing, lobularity with honeycombing, MPD calculi, irregular pancreatic duct contour, dilated side branches e" 1 mm, and hyperechoic duct wall.[24] Ultrasonography has been shown to have 80% accuracy in the diagnosis of pancreatitis.[24] It is a noninvasive imaging technique that helps diagnose of the disease & monitor its course, and identify complications of pancreatitis.

Apart from X-ray and ultrasonography, magnetic resonance cholangiopancreatography (MRCP) was performed. In MRCP, swollen pancreas and regular dilatation of MPD were the common features in AP & ARP, and irregular dilatation of MPD was the most common feature in CP (30.8%). In the present study, MRCP was done in all cases. The MRCP diagnostic criteria for chronic pancreatitis included duct dilatation, narrowing, stricture, or irregularity, irregularity of pancreatic contour, pseudocysts, and ductal filling defects due to stones, debris, or mucinous plugs.[25] MRCP in acute pancreatitis can detect pancreatic parenchymal changes, pancreatic duct integrity, pancreatic hemorrhage, and pancreatic pseudocyst. It can also detect mild acute pancreatitis.[26] MRCP is a safer technique, which can better define pancreatitis and its complications. MRCP is a non-invasive technique with no radiation hazards and can delineate the pancreatic and biliary ductal systems more definitely.

Although a CT scan of the abdomen is not routinely done in pancreatitis due to radiation hazards, 18 patients underwent a CT scan of the abdomen in our study. All the CT findings can be identified by ultrasonography and MRCP.[27]

Conclusion

Abdominal pain is the presenting feature in all forms of pancreatitis in the studied children but the duration of pancreatitis is shorter in acute pancreatitis. The common age of pancreatitis is 5-10 years in the present study. There were no statistical differences in biochemical parameters among AP, CP, and ARP. USG and MRCP were the most useful tests for diagnosing pancreatitis. Swollen pancreas was the most common finding in AP and irregular dilatation of MPD was the common finding of CP.

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