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Acute pancreatitis in children hospitalized with COVID-19

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ABSTRACT

Background: Limited data exists on the association or prevalence of pancreatitis in children with COVID-19.
Methods: This is a retrospective study of pediatric patients admitted to a large health system in New York (Northwell Health System) from March 1, 2020–June 1, 2020 during the COVID-19 pandemic.
Results: 8159 pediatric patients were admitted to our healthcare system during the study period, of which 112 were diagnosed with COVID-19 (1.37%). Thirteen were diagnosed with pancreatitis for a point prevalence of 0.16% (13/8159) for all patients admitted. Of the thirteen patients admitted with pancreatitis, two patients were COVID-19 positive for a point prevalence of 1.8% (2/112) among COVID-19 patients compared to 0.14% (11/8047) in the non-COVID-19 population.
Conclusions: This study shows that pancreatitis can occur in pediatric patients with COVID-19 and may be more common in the COVID-19 population.

Introduction

A recent study has shown adult patients with COVID-19 can present with acute pancreatitis [1]. In that study, idiopathic pancreatitis was statistically the most common etiology in COVID-19 patients and thus implicates SARS-CoV-2 in a causative role for acute pancreatitis. Although various case reports exist [2] [-3], no study to date has examined the association or prevalence of pancreatitis in children with COVID-19. Our study aimed to identify the point prevalence of acute pancreatitis within pediatric patients hospitalized in our large healthcare system in New York between March and June 2020, as well as describe the characteristics of these patients.

Methods

This is a retrospective study of patients less than 18 years old admitted to twelve hospitals within a large health system in New York (Northwell Health System) from March 1, 2020–June 1, 2020 during the COVID-19 pandemic. Institutional Review Board approval was obtained for this study.

Charts for all pediatric (age <18) admissions were searched for diagnostic lipase levels, cross sectional imaging (CT/MRI) evidence of pancreatitis, or charts ICD10 coded for pancreatitis. Charts were manually reviewed to ensure the correct diagnosis. Patients were included if they met the INSPPIRE criteria; the accepted standard definition of pediatric pancreatitis [4], which requires two of the three following: elevated amylase or lipase >3 times the upper limit of normal, imaging showing characteristic findings of pancreatitis, and characteristic abdominal pain. Each chart was manually abstracted for etiologies of pancreatitis that have been previously described in pediatric patients [4–6]. Severity of pancreatitis was classified using the NASPGHAN algorithm [7]. SAS, Version 9.4 (SAS Institute, Cary, NC) was used to perform all analysis.

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Table 1
Patient characteristics and outcomes.

Patient Characteristics	Patient 1	Patient 2	Patient 3	Patient 4[a]	Patient 5	Patient 6	Patient 7	Patient 8	Patient 9[b]	Patient 10	Patient 11	Patient 12	Patient 13
Age (years)	17	17	14	10	8	4	4	14	2	15	15	10	16
Sex	M	M	M	F	F	F	F	F	F	M	F	F	M
Race	Other[c]	Black	Other	White	White	Other	Hispanic	Hispanic	Black	Black	White	Black	Hispanic
Pancreatitis Characteristics													
Etiology	Idiopathic	Idiopathic	Gallstone	Idiopathic	Post-ERCP	Idiopathic	Idiopathic	Idiopathic	Idiopathic	Drug Induced	Idiopathic	Idiopathic/ MIS-C	Idiopathic
Diagnosis	Lipase, Abdominal Pain	Imaging, Lipase, Abdominal Pain	Lipase, Abdominal Pain	Lipase, Abdominal Pain	Lipase, Abdominal Pain	Imaging, Lipase, Abdominal Pain	Imaging, Lipase, Abdominal Pain	Lipase, Abdominal Pain	Lipase, Abdominal Pain	Imaging, Lipase, Abdominal Pain	Imaging, Lipase, Abdominal Pain	Lipase, Abdominal Pain	Lipase, Abdominal Pain
NASPGHAN acute pancreatitis classification	Mild	Severe	Moderate	Severe	Moderate	Mild	Severe	Mild	Severe	Mild	Mild	Mild	Severe
Blood Cytology (*Normal Range*)													
White Count k/UL *1*-3yr *(6–17)* *3*-5yr *(5.5-15.5)* *6*-10yr *(4.5-14.5)* *10*-15yr *(4.5-13.5)* *15*-20yr *(4.5-12.5)*	16.68	16.72	7.93	7.14	6.2	9.26	12.02	14.9	8.11	12.64	1.81	11.36	91.49
Lipase (U/L) *(12.70)*	470	2190	221.3	1078.4	2234.2	288.1	843.6	>3000	888	1246.2	420	365.7	233.3
LDH (U/L) *(140–280)*	–	–	–	682	–	–	–	–	1043	–	–	–	3552
AST (IU/L) *(5–40)*	11	30	264	354	191	23	64	18	804	41	23	75	145
BUN (mg/dL) *(7–20)*	5	97	7	16	5	10	14	13	33	18	11	14	45
COVID-19	Negative	Negative	Negative	Negative	Negative	Negative	Negative	Negative	Negative	Negative	Negative	**Positive**	**Positive**
Outcomes													
Length of stay (days)	6	3	4	13	3	3	16	2	29	9	2	5	25
Mortality (yes/no)	No	No	No	Yes	No	No	No	No	Yes	No	No	No	No
Pancreas Necrosis (yes/ no)	No	No	No	No	No	No	Yes	No	No	No	No	No	No
Mechanical Ventilation (yes/no)	No	Yes	No	Yes	No	No	Yes	No	Yes	No	No	No	Yes

[a] Patient had Walker-Warburg congenital muscular dystrophy and congenital hydrocephalus with acute on chronic respiratory failure.
[b] Patient had history of hypoxic ischemic encephalopathy, adrenal insufficiency, chronic lymphocytic leukemia, seizure disorder.
[c] Other race was selected if patient did not identify as White, Black, or Hispanic/Latin.

Results

8159 pediatric patients were admitted to our healthcare system during the study period, of which 112 were diagnosed with COVID-19 (1.37%). All patients admitted during the study period were tested for COVID-19. 347 were tested for lipase in the non-COVID group (4.3%) and 38 were tested for lipase in the COVID group (33.9%). Thirteen patients were diagnosed with pancreatitis for a point prevalence of 0.16% (13/8159) for all patients admitted. Patient and clinical characteristics can be found in Table 1. Of the thirteen patients admitted with pancreatitis, two patients were COVID-19 positive for a point prevalence of 1.8% (2/112) among COVID-19 patients compared to 0.14% (11/8047) in the non-COVID-19 population.

The first COVID-19 patient was diagnosed with pancreatitis due to an elevated lipase level and epigastric abdominal pain. No etiology was identified and thus was classified as idiopathic. This patient required mechanical ventilation due to pulmonary involvement of COVID (computed tomography with lower lung ground glass opacities). He was intubated and extubated prior to the pancreatitis diagnosis, and his symptoms improved with supportive care. The second COVID-19 patient was a 10-year-old female who presented with fever, epigastric abdominal pain, nausea and vomiting. Her lipase was elevated to greater than three times the upper limit of normal, leading to a diagnosis of pancreatitis. Her COVID-19 IgG was positive. She was ultimately diagnosed with post-COVID Multisystem Inflammatory Syndrome in Children (MIS-C). Her symptoms improved with supportive care.

In this study a causative etiology could not be found in the majority (77%, 10/13) of patients. Idiopathic pancreatitis was diagnosed in both COVID-19 patients and in eight non-COVID-19 patients (100% vs 80%). Outcomes regarding length of stay, development of pancreas necrosis, need for mechanical ventilation, and mortality can be found in Table 1. Two patients died during the study period and both were COVID-19 negative (18% vs 0%). Both patients had significant underlying comorbidities. Four patients without COVID-19 and one with COVID-19 required mechanical ventilation during their hospital stay (36% vs 50%). One patient without COVID-19 developed pancreatic necrosis (9% vs 0%).

Discussion

In summary, our study shows that pancreatitis can occur in pediatric patients with COVID-19 and may be more common in the COVID-19 population. The mechanism for the development of pancreatitis in this population is unclear; perhaps due to a direct cytopathic effect from the COVID-19 virus, as has been implicated in other viral causes of pediatric pancreatitis [6], or as a result of the ischemic and systemic inflammatory states that can occur with MIS-C [8]. In order to better understand the role of COVID-19 in the development of pancreatitis, these potential mechanisms warrant further investigation. However, this study highlights the possible association of pancreatitis in pediatric COVID-19 patients, and this diagnosis should be entertained in patients presenting with COVID-19 and abdominal pain.

Authors contributions

Conception and design (AJT). Analysis and interpretation of the data (KS, YL, DW, KLR, AJT). Drafting of the article (KS, YL, DW, KLR, AJT). Critical revision of the article for important intellectual content (KS, YL, DW, KLR, AJT). Final approval of the article (KS, YL, DW, KLR, AJT).

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