

Background

SARS-CoV-2 infection, clearly does not carry the same risks in children as it does for adults. However, reports of serious illnesses in children have been described since early in the pandemic. In order to better understand the pediatric epidemiology and pathophysiology, it is imperative to describe the spectrum of disease seen in children infected with SARS-CoV-2.

Objective

Describe the clinical disease seen in children following their infection with SARS-CoV-2.

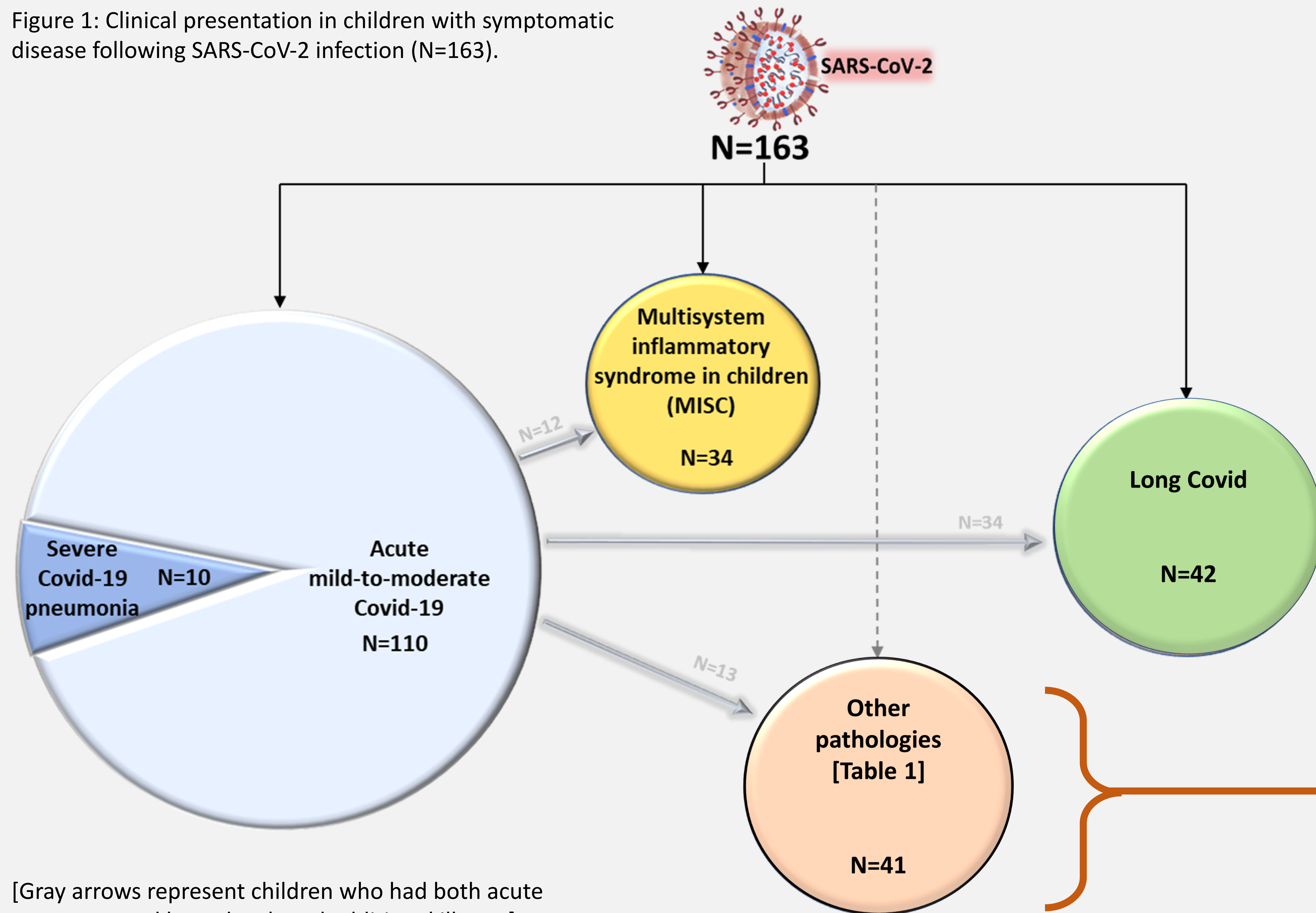
Methods

Following an IRB approved protocol, we recruited children (0-18) who presented to either the Pediatric COVID Clinic or pediatric infectious disease consult service at the University of Minnesota with confirmed infection with SARS-CoV-2 (between 4/2020 and 3/2022). Inclusion criteria were diagnosis of COVID-19, MISIC, Long COVID or new onset of otherwise unexplained acute illness. Exclusion criteria were lack of confirmed SARS-CoV-2 infection in the past 3 months or alternative etiology. We then collected clinical information to describe their disease.

Results

We identified a cohort of 163 who fulfilled the inclusion criteria. The majority were symptomatic within days of exposure, most (110) experienced mild-to-moderate viral syndrome, and few (10) had severe pneumonia. MISIC was diagnosed in 34 children, and Long Covid in 42 [Figure 1]. In addition, 41 children presented with a variety of illnesses, potentially linked to SARS-CoV-2 including autoimmune diseases, nonspecific systemic inflammation, invasive infections, and others [Table 1].

Figure 1: Clinical presentation in children with symptomatic disease following SARS-CoV-2 infection (N=163).



[Gray arrows represent children who had both acute symptoms and later developed additional illness.]

Table 1: Immune mediated and other pathologies following SARS-CoV-2 infection.

Group	Disease	N	
Autoimmune disease	New onset systemic juvenile idiopathic arthritis (sJIA)	4	13
	New onset p-ANCA vasculitis	1	
	New onset diabetes mellitus – type I	1	
	Autoimmune encephalitis (anti-NMDA)	1	
	Guillain-Barre syndrome	1	
	Acute disseminated encephalomyelitis (ADEM)	1	
	Autoimmune hepatitis	1	
	Autoimmune pancreatitis	1	
	Atypical hemolytic uremic syndrome (aHUS)	1	
	Toxic synovitis	1	
Systemic inflammation	Nonspecific inflammatory disease (rule-out MISIC)	9	9
Invasive infections	Pyelonephritis (E. Coli)	1	8
	Meningitis (H. influenza)	1	
	Active tuberculosis (miliary, pulmonary)	1	
	Necrotizing pneumonia (no organism identified)	2	
	Bilateral mastoiditis (no organism identified)	1	
	Hepatic abscess (no organism identified)	1	
	Shiga-toxin enteritis	1	
Intraabdominal pathology	Rupture appendicitis	3	5
	Intussusception	1	
	Gastroparesis	1	
Others	Rolandic epilepsy (new onset)	1	6
	Thrombotic stroke (new onset)	1	
	Wheezing	1	
	Neonatal fever	1	
	Neutropenic fever (ALL)	2	
			41

Discussion

Pediatric SARS-CoV-2 infection result in diverse outcomes that vary in timing and severity.

- **Mild-to-moderate COVID-19 is the most common overall presentation in children.**
- **Severe pneumonia/ARDS, [the leading cause for hospitalization in adults], is rare in children.**
- **MISIC is the most common serious acute illness seen in children following SARS-CoV-2 infection.**
- **Long Covid syndrome, a potentially debilitating and chronic disease, occurs in children.**

- **The spectrum of pediatric disease suggests a multiphasic, immune mediated contagion.**
- **This cohort may have selection and access biases and future projects with more systemic approach are needed to advance our understanding of SARS-CoV-2 infection.**
- **As we learn more about the variable disease presentation it will help us understand other diseases that involve the immune system and the impact of viral infections on human health.**