BMJ Paediatrics Open

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Journal:	*BMJ Paediatrics Open*
Manuscript ID	bmjpo-2021-001219
Article Type:	Original research letter
Date Submitted by the Author:	05-Jul-2021
Complete List of Authors:	Alattas, Bushra; Shaikh Khalifa Medical City, Azaz, Amer; Shaikh Khalifa Medical City, Pediatric Gastroenterology Rawat, David; Shaikh Khalifa Medical City, Pediatric Gastroenterology Midday, Mohamad; Shaikh Khalifa Medical City, Pediatric Gastroenterology Bitar, Rana; Shaikh Khalifa Medical City, Pediatric Gastroenterology
Keywords:	COVID-19, Epidemiology, Gastroenterology

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Gastrointestinal manifestations in Children with COVID-19 in Abu Dhabi: A retrospective single center study

Bushra **Alattas**[1] ,Amer **Azaz**[2], David **Rawat**[2], Mohamed **Miqdady**[2], Rana **Bitar**[2]

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Abstract

COVID -19 pandemic continues to have a tremendous impact worldwide, presenting with a different spectrum of disease, severity and outcome in children compared to adults. We conducted a retrospective cross-sectional review of all patients aged 0-18 years with positive COVID-19 nasal PCR swab requiring admission to the only designated paediatric COVID-19 Hospital in Abu Dhabi from March 1st - June 1st 2020. 33.3 % of cases were asymptomatic, 35.6% had mild or moderate symptoms, 2.2% were admitted to intensive care and no mortality was reported. Symptoms at presentation were fever (46.7%), cough (34.4%) and 26.6% with gastrointestinal symptoms.

Keywords: Coronavirus infection, Pediatrics, Novel Coronavirus, Fever, COVID-19, SARS-CoV-2.

Key messages

A. What is known about the subject – followed by a maximum of 3 brief statements (no more than 25 words per statement)

- COVID -19 cases continue to rise globally, data focused on paediatric patients are needed to provide better care for our patients.
- Paediatric population may experience different clinical course of the disease compared to adults and it is not yet fully described.
- The symptoms are primarily respiratory but gastrointestinal (GI) symptoms have been reported.

B. What this study adds – followed by a maximum of 3 brief statements (no more than 25 words per statement)

- Paediatric population are more likely to have gastrointestinal symptoms and few might have only GI symptoms on presentation.
- Children with COVID-19 has favourable outcome, even those who has underlying medical condition.
- No mortality was reported in our study

Introduction:

Severe acute respiratory syndrome coronavirus 2 was the causal disease in a series of cases with severe pneumonia originating in Wuhan, China [1], which has recently been referred to as coronavirus disease 2019 (COVID-19) by WHO after the unprecedented pandemic. Only 2.1%-5% of infected patients are children[2], who typically present with respiratory illness however gastrointestinal symptoms (GI) have been recognized.

The United Arab Emirates (UAE) adopted an extensive screening and contact tracing policy performing 0.7-1.5 million tests per 1 million population, thereby enabling an accurate representation of pediatric COVID 19 infection in our cohort. Our aim was to review pediatric COVID 19 infection, presenting symptoms and outcomes in the UAE.

Method

The study was approved by the Institutional Review Board Committee for COVID 19 research in the Department of Health, Abu Dhabi. A retrospective cohort review of patients aged 0-18 years attending the only designated paediatric COVID-19 Hospital in Abu Dhabi from 1st of March till 1st of June 2020 was conducted. Data collected included patient demographics, medical background, presenting symptoms, and patient outcome.

Patient and Public Involvement statement:

• How was the development of the research question and outcome measures informed by patients' priorities, experience, and preferences? N/A
• How did you involve patients in the design of this study? N/A
• Were patients involved in the recruitment to and conduct of the study? N/A
• How will the results be disseminated to study participants? N/A
• For randomised controlled trials, was the burden of the intervention assessed by patients themselves? N/A

Results:

180 children, 51.1% (n=92) males, median age 48.67 months (range: 0.13- 206.7) were included. [Table 1] demonstrates patient demographics. The majority recruited were school aged patients (30%). All apart from 5 patients were admitted, with median duration of hospital stay being 3 days (range: 0-60 days). 52/180 patients had comorbid medical diseases; 20/52 with reactive airway disease and 8/52 patients immunocompromised with primary immunodeficiency or on immune suppression or chemotherapy.

The presenting symptoms are tabulated in in [table 2]. 48/180 presented with GI symptoms. Diarrhoea was the most common GI symptom (32/180) followed by vomiting (20/180) and abdominal pain (17/180). 8/180 presented with only GI symptoms. Most children,116/180 had mild or moderate symptoms, 60/180 were asymptomatic and four required intensive care. All children were discharged home and no deaths reported.

Table 1: Demographic Characteristics

	Category	N (Percentage)
Gender (N=180)	Male	92 (51.1%)
	Female	88 (48.9%)
Age (months)	Median, range	48.67 (0.13, 206.70)
Age category	Infant (0-12 months)	41 (22.8%)
	Toddler (12-24 months)	27 (15.0%)
	Preschool (2-5 years)	36 (20.0%)
	School-aged (6-12)	54 (30.0%)
	Adolescent (13-19 years)	22 (12.2%)
Underlying Medical Disease (N=52)	Reactive airway disease	20
	Complex neurologic disease	7
	Congenital heart disease	6
	Haematology/Oncology disease	6
	Other disorders	13
Immune compromised	(Immunodeficiency, immune suppression, chemotherapy)	8

Table 2: Length of stay and Presenting symptoms

LOS	Median, range	3.00 (0.0, 60.0)
Clinical Symptom*		N (Percentage %)
	Abdominal pain	17 (9.4)
	Diarrhea	32 (17.8)
	Vomiting/Nausea	20 (11.1)
	Cough	62 (34.4)
	Fever	84 (46.7)

* A patient may have more than one symptom

Discussion:

Although children with Covid-19 typically present with respiratory illness, gastrointestinal symptoms can also occur. Paediatric patients appeared to have more gastrointestinal symptoms (24.8%) when compared to adults (16.7%)[3]. A systematic review of 93 children reported 59% (n=55) had fever, 46% (n=43) had cough and only 12% (n=11) had GI symptoms [4]. Diarrhoea has been reported in 8.1-8.8% of patients, vomiting in 6.4-7.1% and 0.5% had abdominal pain[5,6], We observed slightly less patients presenting with fever 46.7% (n=82) and cough 34.4% (n=62) but more children with GI symptoms 26.6% (48/180). Diarrhea was the most common symptom 17.8% (n-32);11.1% (n=20) had vomiting and 9.4% (n=17) had abdominal pain. GI symptoms were even observed in the absence of respiratory symptoms and fever (8/180).

Children with Covid-19 display a mild phenotype of disease compared to adults and 90-98% of children are asymptomatic or have mild or moderate disease[3,4]. 97.8% of our patients were asymptomatic or had mild or moderate disease and only 2.2% required admission to intensive care and no mortality reported. Interestingly, despite 52/180(28.89%) of our cohort having an underlying chronic medical condition and 8/180 (0.04%) patients being immunocompromised, the outcome was still good. Our data supports favorable clinical course and outcome of COVID-19 infection in children, however early identification of index paediatric cases is crucial to control spread of infection to high risk adults. Moreover, we also conclude that some children may present atypically so it is important to consider unusual presentations of COVID-19 in children including GI symptoms which may be the only presenting symptom, in order to prevent transmission of disease and promote community and healthcare staff safety.

Data Sharing Statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Author Contribution:

All authors were involved in the clinical care of the patients and data collection. All authors contributed to drafting and critically revising the manuscript, intellectual content, and approved its final version.

Declarations of interest: none

funding sources

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

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DEPARTMENT OF HEALTH

Ref : DOH/CVDC/2020/888
Date : 13th May 2020

Dr. Rana Ahmad
Paediatric Gastroenterology And Hepatology Consultant, SKMC
Sheikh Khalifa Medical City

Subject: Abu Dhabi Health COVID19 Research Ethics Committee- Approval Letter

Research Title:
"COVID and the gastrointestinal track; clinical data review in children"

Thank you for submitting all required documents to support the review process of above-mentioned study to Abu Dhabi COVID19 Research IRB Committee.
The request has been carefully reviewed by the committee and we are pleased to inform you that the committee, after deliberation, has granted you ethical approval for the research proposal submitted.

Please note that this approval is considered as an official approval and it overrides the local committee's approval; however, you need to report to the local Research Ethics Committee in the desired institutions mentioned in the study protocol in order for us to receive the following:

1. Local REC feedback in case of anything that might warrant the review of the ethical approval given
2. Any proposed changes to the research protocol/the conduct of research
3. Any information that might affect the safety of the Human Subjects
4. Annual report to Medical Research Department about the progress of the study
5. Pre-publication request

NOTE: "Retrospective studies must consider the last date the date of the study approval"

Covid-19 IRB committee wishes you all the best in your research endeavors.

Yours Sincerely,

Dr. Asma Al Mannaei
Committee Chairman

Cc:

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5) The results are appropriately placed in the context of prior and existing research.

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I agree with the above statements and declare that this submission follows the policies of Solid State Ionics as outlined in the Guide for Authors and in the Ethical Statement.

Date: 23/6/2021

Corresponding author's signature: Bushra Alattas

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Journal:	*BMJ Paediatrics Open*
Manuscript ID	bmjpo-2021-001219.R1
Article Type:	Original research letter
Date Submitted by the Author:	17-Sep-2021
Complete List of Authors:	Alattas, Bushra; Shaikh Khalifa Medical City, Azaz, Amer; Shaikh Khalifa Medical City, Pediatric Gastroenterology Rawat, David; Shaikh Khalifa Medical City Midday, Mohamad; Shaikh Khalifa Medical City Bitar, Rana; Shaikh Khalifa Medical City
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Title: Clinical Manifestations and outcome in Children with COVID-19 infection in Abu Dhabi: a retrospective single center study

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- **Keywords:** Coronavirus infection, Pediatrics, Novel Coronavirus, Fever, COVID-19, Cough.
- **Word count:** 968

Clinical Manifestations and outcome in Children with COVID-19 infection in Abu Dhabi: a retrospective single center study

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Abstract

COVID -19 infection presents with a different spectrum of disease severity and outcome in children compared to adults. We conducted a retrospective cohort review of 180 patients aged 0-18 years with positive COVID-19 nasal PCR swab admitted to the only designated paediatric COVID-19 Hospital in Abu Dhabi from March 1st-June 1st 2020. 60 (33%) patients were asymptomatic, 64 (36%) had mild or moderate symptoms, 4 patients required intensive care with no mortality reported. Symptoms at presentation were fever (46.7%), cough (34.4%) and gastrointestinal symptoms (26.6%). COVID infection in children not only presents with fever or cough, gastrointestinal symptoms need to be also considered as part of the screening assessment in children. Although cases among children in Abu Dhabi have not

been severe, social distancing and everyday preventive behaviors remain important to prevent disease transmission to venerable adults.

Keywords: Coronavirus infection, Pediatrics, Novel Coronavirus, Fever, Cough, Diarrhea, Vomiting, Abdominal pain, COVID-19, SARS-CoV-2.

Introduction:

Severe acute respiratory syndrome coronavirus 2 was the causal disease in a series of cases with severe pneumonia initially reported in Wuhan, China [1], declared as coronavirus disease 2019 (COVID-19) by the World Health Organization. Only 2.1%-5% of infected patients are children[2] and they typically present with respiratory or febrile illness however gastrointestinal symptoms (GI) have been recognized. The overwhelming majority of pediatric cases (over 90%) demonstrate asymptomatic, mild or moderate disease. There is still much that needs to be learned about the impact of this virus on children. Many infectious diseases affect children differently from adults and understanding those differences can yield important insight into disease pathogenesis, informing management and the development of therapeutics.

In addition to viral shedding in nasal secretions, there is evidence of fecal shedding for several weeks after diagnosis[3]. Therefore, although COVID-19 infection in children tends to be mild or asymptomatic, the viral shedding in stool and nasal secretions make children possible facilitators of viral transmission [4].

The United Arab Emirates (UAE) adopted an extensive screening and contact tracing policy performing polymerase chain reaction (PCR) nasal swab tests of 2,850 per 100,000 population per day[5] thereby enabling an accurate representation of pediatric COVID 19

infection. Our aim was to review pediatric COVID 19 with respect to presenting symptoms and outcomes in the UAE.

Method

The study was approved by the Institutional Review Board Committee for COVID 19 research in the Department of Health, Abu Dhabi. A retrospective electronic medical file review of all patients aged 0-18 years with a positive COVID-19 PCR via nasal swab attending the only designated paediatric COVID-19 hospital in Abu Dhabi, Sheikh Khalifa Medical City (SKMC) from 1st of March till 1st of June 2020 was conducted. During the months of March and April, all positive COVID-19 PCR pediatric patients were admitted to SKMC. However, during May some asymptomatic children with mild disease were quarantined in designated COVID-19 isolation hotels. Patients were discharged from hospital if they were clinically stable and had two negative COVID PCR tests within 48 hours.

Data collected included patient demographics, length of hospital stay, medical background, presenting symptoms, disease severity and patient outcome. The symptoms reviewed were fever, cough, abdominal pain, diarrhea and vomiting. Patients requiring admission to Pediatric Intensive Care Unit (PICU) were considered to have severe disease, all patients who were not asymptomatic or not admitted to PICU were considered to have mild or moderate disease.

The Statistical Package for Social Sciences version 21.0 for Windows (SPSS Inc., Chicago, IL, USA) was used. Categorical variables are presented as frequency and percentage, while numerical variables are presented as mean ± standard deviation (SD), and or median (centile) with range.

Patient and Public Involvement statement:

• How was the development of the research question and outcome measures informed by patients' priorities, experience, and preferences? N/A

• How did you involve patients in the design of this study? N/A

• Were patients involved in the recruitment to and conduct of the study? N/A

• How will the results be disseminated to study participants? N/A

• For randomised controlled trials, was the burden of the intervention assessed by patients themselves? N/A

Results:

180 children were identified, 51.1% (n=92) males, median age 48.7 months (range: 0.13-206.7). The majority recruited were school aged 54/180 followed by infants 41/180. [Table 1] demonstrates patient demographics. 52/180 patients had comorbid medical diseases; the majority 20/52 had history of bronchial asthma/chronic airway disease and 8/52 patients were immunocompromised with primary immunodeficiency or on immune suppression or chemotherapy.

All patients apart from 5 were admitted, with median duration of hospital stay was 3 days (range: 0-60 days). The presenting symptoms are tabulated in [table 2]. Fever was seen in 84/180 and cough was seen in 62/180. However, 48/180 presented with GI symptoms. Diarrhoea was the most common GI symptom (32/180) followed by vomiting (20/180) and abdominal pain (17/180). 8/180 presented with only GI symptoms. Most children 116/180 had mild or moderate symptoms, 60/180 were asymptomatic and four required intensive care. Presenting symptoms and background medical history of the patients requiring ICU admission are presented in [Table 3]. All children were discharged home and no deaths reported.

Table 1: Demographic Characteristics

	Category	N (Percentage)
Gender (N=180)	Male	92 (51.1%)
	Female	88 (48.9%)
Age (months)	Median, range	48.67 (0.13, 206.70)
Age category	Infant (0-12 months)	41 (22.8%)
	Toddler (13-24 months)	27 (15.0%)
	Preschool (3-5 years)	36 (20.0%)
	School-aged (6-12 years)	54 (30.0%)
	Adolescent (13-19 years)	22 (12.2%)
Underlying Medical Disease (N=52)	Bronchial asthma/chronic airway disease	20
	Complex neurologic disease	7
	Congenital heart disease	6
	Haematology/Oncology disease	6
	Other disorders	13
	(Immunodeficiency, immune suppression, chemotherapy)	8

Table 2: Length of stay and Presenting symptoms

Length of stay(Median, range)	3.00 days (0.0 - 60.0)
Clinical Symptom*	N (Percentage %)
Fever	84 (46.7)
Cough	62 (34.4)
Diarrhea	32 (17.8)
Vomiting/Nausea	20 (11.1)
Abdominal pain	17 (9.4)

* A patient may have more than one symptom

Table 3: Symptoms of the patients who required ICU admission

	Underlying medical background	**Presenting symptoms**
Patient 1	4 months old female patient known to have Trisomy 21 with complex congenital heart disease, was planned for semi-urgent surgical repair.	Tested positive for COVID-19 on screening upon admission, later developed fever and respiratory distress.
Patient 2	3 years old male patient known to have Neimann-pick disease type C, Oxygen dependent.	Fever, increase work of breathing and increase oxygen requirement.
Patient 3	8 years old male patient with Autism spectrum disorder and obesity.	Fever, cough and diarrhea.
Patient 4	5 years old male patient with severe hypoxic ischemic encephalopathy, tracheostomy status with seizure disorder.	Fever and increased seizure frequency.

Discussion:

Children of all ages are susceptible to COVID-19 infection, the median age of infected patients was reported to be 7 years (range: 2-13), young children particularly infants were felt to be vulnerable to infection and there was no significant gender difference [4]. 51.1% of our patients were males, the mean age was 5 years however the infection in our patients was seen more in school aged children aged 6-12 years (30%) followed by Infants (22.8%).

Although children with Covid-19 disease typically present with respiratory illness, gastrointestinal symptoms can also occur. Paediatric patients appeared to have more gastrointestinal symptoms (24.8%) when compared to adults (16.7%)[4]. A systematic review of 93 children reported 59% (n=55) had fever, 46% (n=43) had cough and only 12% (n=11) had GI symptoms [6]. Diarrhoea has been reported in 8.1-8.8% of patients, vomiting in 6.4-7.1% and 0.5% had abdominal pain[7], we observed slightly less patients presenting with fever 46.7% (n=82) and cough 34.4% (n=62) but more children with GI symptoms 26.6% (48/180). Diarrhoea was the most common GI symptom in our group 17.8% (n-32);11.1% (n=20) had

vomiting and 9.4% (n=17) had abdominal pain. GI symptoms were even observed in the absence of respiratory symptoms and fever (8/180).

Children with Covid-19 display a mild phenotype of disease compared to adults and 90-98% of children are asymptomatic or have mild or moderate disease[6,7]. 97.8% of our patients were asymptomatic or had mild or moderate disease and only 2.2% required admission to intensive care and no mortality was reported. Interestingly, despite 52/180(28.89%) of our cohort having an underlying chronic medical condition and 8/180 (0.04%) patients being immunocompromised, the outcome was still good.

This preliminary examination of characteristics of COVID-19 disease among children suggest that children do not always have fever or cough symptoms and GI symptoms need to be considered as part of the screening assessment in children. Our data supports favourable clinical course and outcome of COVID-19 infection in children. Social distancing and everyday preventive behaviors remain important for all age groups because patients with less serious illness and those without symptoms are likely to play an important role in disease transmission.

Data Sharing Statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Author Contribution:

All authors were involved in the clinical care of the patients and data collection. All authors contributed to drafting and critically revising the manuscript, intellectual content, and approved its final version.

Declarations of interest: none

funding sources

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BMJ Paediatrics Open

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Journal:	*BMJ Paediatrics Open*
Manuscript ID	bmjpo-2021-001219.R2
Article Type:	Original research letter
Date Submitted by the Author:	01-Nov-2021
Complete List of Authors:	Alattas, Bushra; Shaikh Khalifa Medical City, Azaz, Amer; Shaikh Khalifa Medical City, Pediatric Gastroenterology Rawat, David; Shaikh Khalifa Medical City Midday, Mohamad; Shaikh Khalifa Medical City Bitar, Rana; Shaikh Khalifa Medical City
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- **Keywords:** Coronavirus infection, Pediatrics, Novel Coronavirus, Fever, COVID-19, Cough.
- **Word count:** 657

Clinical Manifestations and outcome in Children with COVID-19 infection in Abu Dhabi: a retrospective single center study

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Abstract

We conducted a retrospective cohort review of 180 patients aged 0-18 years with positive COVID-19 nasal PCR swab admitted to the only designated paediatric COVID-19 Hospital in Abu Dhabi from March 1st-June 1st 2020. 60 (33%) patients were asymptomatic, 117 (65%) had mild or moderate symptoms, 3 patients required intensive care with no mortality reported. Symptoms at presentation were fever in 84 patient, cough in 62 and gastrointestinal symptoms in 48 patients.

Keywords: Coronavirus infection, Pediatrics, Novel Coronavirus, Fever, Cough, Diarrhea, Vomiting, Abdominal pain, COVID-19, SARS-CoV-2.

Severe acute respiratory syndrome coronavirus 2 was the causal disease in a series of cases with severe pneumonia initially reported in Wuhan, China [1], declared as coronavirus disease 2019 (COVID-19) by the World Health Organization. Only 2.1%-5% of infected patients are children[2] and they typically present with respiratory or febrile illness however gastrointestinal symptoms (GI) have been recognized. The overwhelming majority of pediatric cases (over 90%) demonstrate asymptomatic, mild or moderate disease.

The United Arab Emirates (UAE) adopted an extensive screening and contact tracing policy performing polymerase chain reaction (PCR) nasal swab tests of 2,850 per 100,000 population per day[3] thereby enabling an accurate representation of pediatric COVID 19 infection. Our aim was to review pediatric COVID 19 with respect to presenting symptoms and outcomes in the UAE.

The study was approved by the Institutional Review Board Committee for COVID 19 research in the Department of Health, Abu Dhabi. A retrospective electronic medical file review of all patients aged 0-18 years with a positive COVID-19 PCR via nasal swab attending the only designated pediatric COVID-19 hospital in Abu Dhabi, Sheikh Khalifa Medical City (SKMC) from 1st of March till 1st of June 2020 was conducted. During the months of March and April, all positive COVID-19 PCR pediatric patients were admitted to

SKMC. However, during May some asymptomatic children with mild disease were quarantined in designated COVID-19 isolation hotels. Patients were discharged from hospital if they were clinically stable and had two negative COVID PCR tests within 48 hours.

Data collected included patient demographics, length of hospital stay, medical background, presenting symptoms, disease severity and patient outcome. The symptoms reviewed were fever, cough, abdominal pain, diarrhea and vomiting. The severity of COVID-19 was defined based on clinical features, laboratory testing and chest X-ray imaging, including asymptomatic infection, mild, moderate and severe cases.

1. Asymptomatic infection: no clinical symptoms and signs.
2. Mild: symptoms of viral illness or upper respiratory tract infection such as fever, cough, diarrhoea, sore throat…etc). Physical examination could show congestion of the pharynx and no auscultatory abnormalities.
3. Moderate: Signs or symptoms of pneumonia with or without oxygen requirement but no respiratory failure.
4. Severe: Patient requires ventilatory support or develops single or multiorgan failure.

Categorical variables are presented as frequency and percentage, while numerical variables are presented as mean ± standard deviation (SD), and or median (centile) with range.

180 children were identified. 52 patients had comorbid medical diseases. All patients apart from 5 were admitted, with median duration of hospital stay of 3 days (range: 0-60 days) [table 1]. Fever was seen in 84 and cough was seen in 62. However, 48 presented with GI symptoms. Diarrhea was the most common GI symptom [table 2]. 8 presented with only GI symptoms. Most children 117 had mild or moderate symptoms, 60 were asymptomatic and three were severe and required intensive care. Two patients required positive pressure

ventilation and one patient required high flow nasal cannula 15L/min. The patients requiring intensive care support included a 4 year old patient with Niemann pick type C disease with interstitial lung disease, a 6 year old with cerebral palsy who had a tracheostomy and a 10 year old patient with autistic spectrum disorder with BMI of 33 kg/m^2. All children were discharged and no deaths reported.

Table 1: Demographic Characteristics

	Category	N (Percentage)
Gender (N=180)	Male	92 (51%)
	Female	88 (49%)
Age (Years)	Median, range	4 (0.01-17)
Age category	Infant (0-12 months)	41 (23%)
	Toddler (13-24 months)	27 (15%)
	Preschool (3-5 years)	36 (20%)
	School-aged (6-12 years)	54 (30%)
	Adolescent (13-19 years)	22 (12%)
Underlying Medical Disease (N=52)	Bronchial asthma/chronic airway disease	20
	Immunodeficiency, immunesupression or chemotherapy	14
	Complex neurologic disease	7
	Congenital heart disease	6
	Other disorders	5

Table 2: Length of stay and Presenting symptoms

Length of stay(Median, range)	3.00 days (0.0 - 60.0)

Clinical Symptom*	N (Percentage %)
Fever	84 (47%)
Cough	62 (34%)
Diarrhea	32 (18%)
Vomiting/Nausea	20 (11%)
Abdominal pain	17 (9%)

* A patient may have more than one symptom

Although children with Covid-19 disease typically present with respiratory illness, gastrointestinal symptoms can also occur. Paediatric patients appeared to have more gastrointestinal symptoms (24.8%) when compared to adults (16.7%)[4]. Our findings were similar, in that 27% had gastrointestinal symptoms.

Children with Covid-19 display a mild phenotype of disease compared to adults and 90-98% of children are asymptomatic or have mild or moderate disease[4,5].

This preliminary examination of characteristics of COVID-19 disease among children suggest that children do not always have fever or cough symptoms and GI symptoms need to be considered as part of the screening assessment in children. Our data supports favourable clinical course and outcome of COVID-19 infection in children.

Data Sharing Statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Author Contribution:

All authors were involved in the clinical care of the patients and data collection. All authors contributed to drafting and critically revising the manuscript, intellectual content, and approved its final version.

Declarations of interest: none

funding sources

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Patient and Public Involvement statement:

• How was the development of the research question and outcome measures informed by patients' priorities, experience, and preferences? This is a retrospective case note review and therefore the patients were not informed of the research question and outcome measures.

• How did you involve patients in the design of this study? Patients were not involved in the design of the study mainly because the study was a retrospective study.

• Were patients involved in the recruitment to and conduct of the study? Patients were not involved in the recruitment to and conduct for the study.

• How will the results be disseminated to study participants? The results will not be disseminated to the study participants.

• For randomised controlled trials, was the burden of the intervention assessed by patients themselves? This is not a randomized controlled trial.

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