



STUDY OF THE CLINICAL PROFILE OF COVID-19 IN CHILDREN (0-18 YEARS)

Paediatrics

Dr. Rajeshwar Dayal

MD PEDIATRICS, DCH (LONDON), MNAMS, Professor & Head, SAROJINI NAIDU Medical College, Agra.

Dr. Shobhit Upadhyay*

MBBS, Junior resident, Department of Pediatrics, SAROJINI NAIDU Medical College, Agra, Up, India. *Corresponding Author

Dr. Madhu Nayak

Associate Professor, Department of Pediatrics S.N. Medical College, Agra.

ABSTRACT

Background- The World Health Organization (WHO) stated Coronavirus disease 2019 as a pandemic on March 11, 2020. The etiology for Coronavirus disease 2019 is a newly identified virus called SARS-CoV-2. At the earlier outsets of Covid-19 pandemics, children were believed to have mild COVID-19. However, at later time children seriously affected with COVID-19 have appeared to be seen. This contradicting finding showed how far extensive research is required to enrich the body of knowledge regarding COVID-19 characteristics in children. **Materials And Methods-** We conducted cross sectional study of 116 successive pediatric patients aged 1 day of life to 18 years of age with confirmed SARS-CoV-2 infection admitted to pediatric ward and intensive care unit in S. N. Medical College, Agra. **Results-** Out of 116 children who were diagnosed as COVID positive, 64.6% were in the age group of 11-18 years. COVID-19 was graded as mild in 34.5% children, moderate in 16.4% children and severe in 9.5% children. Of all presenting symptoms of COVID-19 children, fever (56%) and cough (46.6%) were the most common. The ICU admission rates were significantly higher among younger children (≤ 10 years age) as compared to older children between 11-18 years age ($p < 0.001$). Out of those admitted in the ICU, the proportion of children with comorbidities was 40% which was more than that among non-ICU admitted children (10.5%) and this difference was statistically significant ($p < 0.001$). There were no significant differences between ICU and non-ICU admitted children in terms of proportion of anemia, leucocytosis and thrombocytopenia ($p > 0.05$). **Conclusion-** COVID-19 was graded as asymptomatic in 39.6% and mild in 34.5% children in our study. Though fever and other respiratory symptoms make up the commonest clinical presentation, many may present with gastrointestinal symptoms. The most common comorbidities reported among these children were Malnutrition.

KEYWORDS

Children, Covid-19, clinical profile, clinical outcome.

INTRODUCTION:

The World Health Organization (WHO) stated Coronavirus disease 2019 as a pandemic on March 11, 2020. The manifestation can be categorized in to five stage depending on the severity of clinical progression: (i) the initial characteristics is no apparent clinical signs, (ii) minor clinical symptoms such as cough, fever, myalgia, fatigue (iii) subclinical pneumonia, (iv) Severe pneumonia characterized with hypoxia, dyspnea and central cyanosis, and (v) Critical stage involving complication like shock, ARDS and multi-organ failure (1). The most common symptom is fever, like in adults, but the incidents of productive cough, vomiting, and diarrhea are much higher than in adults (2). Unlike adults, dry cough and phlegm are not the most common symptoms (3). This contradicting finding showed how far extensive research is required to enrich the body of knowledge regarding COVID-19 characteristics in children. Hence, we intend to contribute our experience on 121 children with SARS-CoV-2 infection, from a single dedicated COVID-19 hospital located in a metropolitan city of India.

OBJECTIVES:

1. To study the clinical profile of children infected with the 2019 novel coronavirus, SARS-CoV-2 (COVID-19).
2. To study the clinical outcome in children infected with Covid-19 (Novel Corona Virus).

MATERIALS AND METHODS:

We conducted cross sectional study of 116 successive pediatric patients aged 1 day of life to 18 years of age with confirmed SARS-CoV-2 infection admitted to pediatric ward and intensive care unit in a dedicated COVID-19 tertiary health care centre from 29th March 2020 till 26 February 2022. A clinical proforma comprising of detailed history, clinical course, investigations and treatment, was made. Age group wise stratification was done into; < 1 year, 1-6 years, 7-10 years and 11-18 years. Children were categorized into asymptomatic, mild, moderate, severe and critical cases as per the guidelines given by ministry of health and family welfare (4). Asymptomatic cases were children with SARS-CoV-2 infection but without any symptoms, admitted as per the local government isolation policy. Mild cases included children with fever, sore throat, myalgia, nasal congestion, diarrhoea or vomiting without dehydration and without dyspnoea. Moderate cases included children with symptoms and signs of

pneumonia without hypoxemia, with or without evidence on chest radiograph or High Resolution Computerized Tomography (HRCT). Severe cases included children with severe pneumonia associated with either cyanosis (oxygen saturation $< 90\%$), lethargy or increased respiratory efforts and other symptoms like diarrhoea causing severe dehydration, lethargy and/or seizures. Critical cases included children with either respiratory failure requiring invasive ventilation like endotracheal intubation, Acute Respiratory Distress Syndrome (ARDS), shock with or without inotrope support, disseminated intravascular coagulation with or without sepsis and organ failure (single or multiple). ARDS, sepsis and shock were defined as per World Health Organization criteria (5). Routine Investigations Complete blood count with differential count, renal function test, liver function test, coagulation profile, urine routine, and microscopy. Advanced investigations as CRP, procalcitonin, creatine phosphokinase (CPK), lactate dehydrogenase (LDH), D-dimer and serum ferritin were recorded wherever done.

Various laboratory parameter abnormalities were defined as:

Anemia—Hemoglobin < 11 g%
Leukopenia—Total leukocyte count < 4000 mm³
Thrombocytopenia—platelet count < 1.5 lakh/mm³
Leukocytosis—Total leukocyte count $> 12,000$ mm³
Serum ferritin— > 300 ng/mL
D-dimer— > 0.5 ng/mL
CRP— > 5 mg/dL
LDH— > 450 IU

Radiological investigations like chest X-ray were collected and interpretation recorded. All the patients were managed as per the protocol given by ministry of health and family welfare (4).

RESULTS:

Out of 116 children who were diagnosed as COVID positive, 64.6% were in the age group of 11-18 years. This was followed by 7-10 years (14.7%), 1-6 years (12.1%) and the least share was among infants (8.6%). The proportion of male and female children was almost equal (50.9% males and 49.1% females). The proportion of children who had one or more comorbidities was 18.1%. COVID-19 was graded as mild in 34.5% children, moderate in 16.4% children and severe in 9.5% children. Of all presenting symptoms of COVID-19 children, fever

(56%) and cough (46.6%) were the most common, and were present in majority of the cases. Based on laboratory investigations, the proportion of children with anemia was 20.7%. Almost half of study participants were noted to have leucocytosis. Among markers of inflammation, raised CRP was present in 37.9%, raised D-dimer in 44.8%, raised LDH in 25% and elevated serum ferritin in 19% of the children. The proportion of children with abnormal CXR findings was 24.1%. The mean duration of hospital stay was 6.1 (± 5.5) days. The mortality rate among the study participants was 7.7%. The ICU admission rates were significantly higher among younger children (≤ 10 years age) as compared to older children between 11-18 years age ($p < 0.001$). Out of those admitted in the ICU, the proportion of children with comorbidities was 40% which was more than that among non-ICU admitted children (10.5%) and this difference was statistically significant ($p < 0.001$). There were no significant differences between ICU and non-ICU admitted children in terms of proportion of anemia, leucocytosis and thrombocytopenia ($p > 0.05$). All markers of inflammation were significantly higher among ICU admitted children as compared to the non-ICU counterparts ($p < 0.001$).

Table 1: Demographic Characteristic Of Children With COVID-19 (n=116)

Parameters	No. (%)	
Age at presentation		
<1 year	10 (8.6)	Mean ($\pm$ SD) – 12.8 (± 4.9)
1-6 years	14 (12.1)	Minimum – 2 days
7-10 years	17 (14.7)	Maximum – 18 years
11-18 years	75 (64.6)	
Gender		
Male	59 (50.9)	
Female	57 (49.1)	
Comorbidities		
Present*	21 (18.1)	
Absent	95 (81.9)	

Table 2: Distribution According To Severity Of Illness (n=116)

Severity of illness	No. (%)
Asymptomatic	46 (39.6)
Mild	40 (34.5)
Moderate	19 (16.4)
Severe	11 (9.5)

Table 3: Frequency Of Symptoms According To Severity Of Illness (N=116)

Symptoms	Total n (%)	Mild illness (n=40) n (%)	Moderate illness (n=19) n (%)	Severe illness (n=11) n (%)
Fever	65 (56.0)	36 (90.0)	19 (100.0)	10 (90.9)
Cough	54 (46.6)	29 (72.5)	18 (94.7)	7 (63.6)
Difficulty in breathing	28 (24.1)	0	18 (94.7)	10 (90.9)
Sore throat	23 (19.8)	15 (37.5)	8 (42.1)	0
Rhinorrhea	28 (24.1)	21 (52.5)	7 (36.8)	0
Headache	13 (11.2)	11 (27.5)	2 (10.5)	0
Nausea	12 (10.3)	8 (20.0)	3 (15.8)	1 (9.1)
Vomiting	11 (9.5)	7 (17.5)	3 (15.8)	1 (9.1)
Diarrhea	10 (8.6)	8 (20.0)	1 (5.3)	1 (9.1)
Others*	5 (4.3)	0	0	5 (45.4)

* Include seizure, altered sensorium and nasal bleed

Table 4: Laboratory Parameters In Children With COVID-19 (n=116)

Parameters	No. (%)	
Hemoglobin		
<11 gm/dl (anemia)	24 (20.7)	Mean ($\pm$ SD) – 12.7 (± 2.2)
≥ 11 gm/dl	92 (79.3)	Minimum – 4.5 gm/dl
		Maximum – 16.8 gm/dl
Total leucocyte count		
4000 – 12000 cells/cmm	59 (50.9)	Mean ($\pm$ SD) – 10.9 (± 4.7) $\times 10^3$
>12000 cells/cmm	57 (49.1)	Minimum – 4.3 $\times 10^3$ cells/ cmm
		Maximum – 24 $\times 10^3$ cells/ cmm
Platelet count		
< 1.5 lakhs/cmm	15 (12.9)	Mean ($\pm$ SD) – 2.8 (± 0.9)

1.5-4.5 lakhs/cmm	101 (87.1)	Minimum – 1.2 lakhs/ cmm
		Maximum – 4.5 lakhs/ cmm
CRP		
< 5 mg/l	72 (62.1)	Mean ($\pm$ SD) – 7.8 (± 10.8)
≥ 5 mg/l	44 (37.9)	Minimum – 0.59 mg/l
		Maximum – 79.51 mg/l
D-dimer		
< 0.5 mcg/ml	64 (55.2)	Mean ($\pm$ SD) – 0.9 (± 1.2)
≥ 0.5 mcg/ml	52 (44.8)	Minimum – 0.1 mcg/ml
		Maximum – 6.4 mcg/ml
LDH		
<450 units/l	87 (75.0)	Mean ($\pm$ SD) – 395.2 (± 244.3)
≥ 450 units/l	29 (25.0)	Minimum – 110 units/l
		Maximum – 1500 units/l
Serum ferritin		
<300 mcg/l	94 (81.0)	Mean ($\pm$ SD) – 215.0 (± 162.1)
≥ 300 mcg/l	22 (19.0)	Minimum – 40 mcg/l
		Maximum – 820 mcg/l
Liver function tests		
Normal	108 (93.1)	
Deranged	8 (6.9)	
Renal function tests		
Normal	111 (95.7)	
Deranged	5 (4.3)	
Chest X-ray findings (n=112)		
Normal	85 (75.9)	
Abnormal	27 (24.1)	

Table 5: Frequency Of Supportive Treatment According To Severity Of Illness (n=116)

Severity of illness	Total n (%)	Supportive treatment	
		Yes (n=92) n (%)	No (n=24) n (%)
Asymptomatic	46 (39.6)	27 (29.3)	19 (79.2)
Mild	40 (34.5)	37 (40.2)	3 (12.5)
Moderate	19 (16.4)	19 (20.6)	0
Severe	11 (9.5)	9 (9.8)	2 (8.3)

Table 6: Management Of COVID Positive Children

Management	No. (%)
Maintenance of ventilation	
Oxygen through prongs/ mask	28 (24.1)
High flow nasal oxygen	13 (11.2)
Bi-PAP	5 (4.3)
C-PAP	11 (9.5)
Invasive ventilation	9 (9.8)
Drug treatment*	
Azithromycin	44 (37.9)
Doxycycline	38 (32.7)
Ivermectin	33 (28.4)
Dexamethasone	20 (17.2)
Methylprednisolone	18 (15.5)
Hydroxychloroquine	18 (15.5)
Vasopressor	7 (6.0)
Fabiflu	3 (2.6)
Remdesivir	3 (2.6)
Enoxaparin	1 (0.9)

Table 7: Comparison Of Clinical Profile Between ICU and non-ICU admitted children (N=116)

Parameters	ICU admission (n=30) n (%)	Non-ICU admission (n=86) n (%)	p value*
Gender			
Male	10 (33.3)	49 (57.0)	0.06
Female	20 (66.7)	37 (43.0)	
Age			
<1 year	5 (16.7)	5 (5.8)	<0.001
1-6 years	3 (10.0)	11 (12.8)	
7-10 years	10 (33.3)	7 (8.1)	
11-18 years	12 (40.0)	63 (73.3)	
Comorbidities	12 (40.0)	9 (10.5)	<0.001
Anemia (<11 gm/dl)	8 (26.7)	16 (18.6)	0.348
Leucocytosis (>12000 cells/cmm)	18 (60.0)	39 (45.3)	0.167
Thrombocytopenia (< 1.5 lakhs/cmm)	5 (16.7)	10 (11.6)	0.479
Raised CRP (≥ 5 mg/l)	29 (96.7)	15 (17.4)	<0.001
Raised D-dimer (≥ 0.5 mcg/ml)	26 (86.7)	26 (30.2)	<0.001
Raised LDH (≥ 450 units/l)	20 (66.7)	9 (10.5)	<0.001
Raised ferritin (≥ 300 mcg/l)	14 (46.7)	8 (9.3)	<0.001
Deranged LFT	6 (20.0)	2 (2.3)	0.001
Deranged RFT	4 (13.3)	1 (1.2)	0.005
Abnormal chest X-ray findings	27 (96.4)	1 (1.2)	<0.001

DISCUSSION:

Out of 116 children who were diagnosed as COVID positive, 64.6% were in the age group of 11-18 years. This was followed by 7-10 years (14.7%), 1-6 years (12.1%) and the least among infants (8.6%). The mean ($\pm$ SD) age was 12.8 years ($\pm$ 4.9) which is higher than various Chinese and European studies but comparable to a study from the USA who had reported higher mean age (11 years) (6,7). The proportion of male and female children was almost equal (50.9% males and 49.1% females). There was no sex predilection in the present study like various other studies (8). The proportion of children who had one or more comorbidities was 18.1%. The most common comorbidities reported among these children were Malnutrition (n=5), pulmonary TB (n=3), Birth asphyxia (n=3), cerebral Palsy (n=2), prematurity (n=2), Asthma (n=2), Tuberculous sclerosis (n=1), CKD (n=1), Tubercular meningitis (n=1) and Type 1 DM (n=1) case respectively. Unlike ours, a study on COVID-19 in children from Lancet had observed comorbidities in 25% of children (6). Most common COVID-19 symptoms were fever in 65%, cough in 54% and difficulty in breathing in 24.1% cases. Respiratory system was most common system to be involved. Children also presented with atypical symptoms like diarrhoea in 8.6% and neurological symptoms like seizures in 4.3%. A meta-analysis of 27 studies on 4857 children showed that fever is the most common symptom of SARS-CoV-2 infection followed by respiratory symptoms but 4%-9% children had gastrointestinal manifestations (9). About 39.6% children had features of URTI while LRTI was noted only in 25.9% cases. Unlike this, in the European pediatric Covid 19 study incidence of URTI (50%) was higher and incidence of LRTI (25%) was lower than our study (6). A higher proportion of children in our study had anemia, leucocytosis, thrombocytopenia and elevated D-dimers similar to preeti et al (10). Similar to a pooled analysis and review of laboratory parameters in pediatric COVID-19 studies, our study also showed an inconsistent pattern of total leukocyte count and differential leukocyte count in mild, moderate, and severe cases (11). Higher levels i.e. >1000 g/mL of d dimer were found in ICU admitted patients compared to Non ICU patients (p value <0.001). In our study, neither age nor gender was associated with an increased likelihood of requiring ICU admission; however, the presence of other comorbid conditions and raised inflammatory markers like CRP, LDH, serum ferritin, high value of D-dimer, and abnormal chest X-ray findings were strongly associated with ICU admission.

CONCLUSION:

In our study also out of 116 children who were diagnosed as COVID positive, 64.6% were in the age group of 11-18 years. COVID-19 was graded as asymptomatic in 39.6% and mild in 34.5% children in our study. Though fever and other respiratory symptoms make up the commonest clinical presentation, many may present with gastrointestinal symptoms. The most common comorbidities reported among these children were Malnutrition. Out of those admitted in the ICU, the proportion of children with comorbidities was 40% which was more than that among non-ICU admitted children (10.5%) and this difference was statistically significant (p <0.001). Inflammatory markers correlate well with the severity of illness (p $=<0.001$) but total leukocyte count and Differential leukocyte count showed variable results and does not correlate with severity of illness (p=0.5).

LIMITATIONS:

In our study, 25.86% children required ICU admissions. Reason for this is possibly related to referral biases and higher proportion of children with comorbidities admitted at our centre.

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