

Clinical Spectrum of Covid-19 in Children: A Retrospective Study in Tertiary Care Covid Hospital

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Abstract

Introduction: Corona virus disease 2019 (Covid-19) is pandemic caused by the severe acute respiratory syndrome corona virus 2 (SARS-CoV-2). This has begun in China and had spread to other countries. On 11 March 2020 WHO declared covid-19 as pandemic. Children suffering with Covid 19 infection were increased though at the beginning of pandemic paediatric cases were less. **Materials and methods:** This study was conducted in one of the Covid-19 tertiary care hospital (designated state Covid hospital) in pediatric wing. This was a retrospective study conducted in patients admitted between May-2020 to October 2020. Clinical profile and outcomes were studied for children aged 1 month to 12 years admitted in Covid-19 tertiary care hospital with positive nasopharyngeal swab for SARS-CoV-2 infection. Diagnosis, clinical grading and treatment of covid-19 cases was done based on guidelines by Govt of India. **Results:** The median age (IQR) of children admitted were 9 (4-13 years) and male children (N=54, 55.6%) outnumber females with a male: female ratio of 1.25:1. There was no relationship between gender and incidence of COVID infection in children (p=0.12, Chi square test). **Conclusion:** Severe life-threatening illnesses in the form of ARDS, GBS, KD and other multisystem involvement are seen in these patients. Therefore, it is mandatory in current scenario to have a high degree of suspicion for COVID-19 in children admitted in pediatric intensive care units (PICUs) with an unexplained diagnosis, persistent fever and high levels of inflammatory markers.

Keywords: Corona virus disease, IQR, pediatric intensive care units.

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Introduction

Corona virus disease 2019 (Covid-19) is pandemic caused by the severe acute respiratory syndrome corona virus 2 (SARS-CoV-2). This has begun in China and had spread to other countries [1]. On 11 March 2020 WHO declared covid-19 as pandemic [2]. Children suffering with Covid 19 infection were increased though at the beginning of pandemic paediatric cases were less.

In December 2019, cluster of pneumonia cases of unknown etiology were identified in Wuhan city, China, later novel corona virus was identified on 12-January-2020 [3]. In the early stages of epidemic infection was mainly seen among the adults through these infected adults spread to the family including children.

First confirmed paediatric case of SARS-CoV-2 infection reported in Shenzhen in China [4] on 20-January-2020. First infant case was reported from Xiegan in China on 26-January-2020 [5]. Most of the children were infected via family members [6]. Main source of infection are patients infected by covid-19 either symptomatic or asymptomatic [4].

Transmission of disease was mainly by direct inhalation of infected droplets generated by coughing and sneezing by infected person.

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Another mode of transmission was through direct contact with surfaces and fomites contaminated by respiratory secretions. Though virus also been isolated from feces. Feco-oral route of transmission is not established. Incubation period in children is ranged from 2-10 days. Median incubation period was established to be 5.1 days. Very few may develop symptoms after 14 days of quarantine but 97.5% of those who develop symptoms will do so within 11.5 days of infection [6,7]. Clinical features are similar to acute viral respiratory tract infection - fever, cough, sore throat, breathlessness and other constitutional symptoms are headache and body pains. But in those with comorbidities often progress to multi organ dysfunction. Though respiratory symptoms predominate in children but symptoms of gastrointestinal system like vomiting and diarrhoea also seen. ⁸ Varied clinical presentation is seen in paediatric population and CT chest findings also different from adult population and co infection is also common in paediatric pneumonia patients [9]. Large proportion of infected children appears to be asymptomatic but may contribute to transmission. Symptomatic cases in paediatric population are less severely affected and shows better prognosis than adults, but severe cases were diagnosed in those with coexisting conditions [10,11].

Initially it was thought that children do not require hospital admission because milder course of the illness but later showed that covid-19 can cause moderate to severe respiratory illness requires hospital admission including ICU [12]. Infants were at highest risk of developing severe covid-19 infection [13].

Virus was present in bronchopulmonary lavage fluid, sputum, nasal swabs, pharyngeal swabs, feces. RT-PCR of nasopharyngeal swabs

has been used to confirm the clinical diagnosis[14]. In paediatric patients common CT-Chest findings are ground glass opacities, local bilateral shadowing, sub pleural lesions in lower and posterior segments, where as in adults-large percentage of bilateral patchy shadowing pattern is seen. But chest finding are not correlating with clinical recovery[15-17]. CT Scan can be used cautiously in children with suspected pneumonia in the view of adverse radiation.

Materials and Methods

This study was conducted in one of the Covid-19 tertiary care hospital (designated state Covid hospital) in pediatric wing. This was a retrospective study conducted in patients admitted between May-2020 to October 2020. Clinical profile and outcomes were studied for children aged 1 month to 12 years admitted in Covid-19 tertiary care hospital with positive nasopharyngeal swab for SARS-CoV-2 infection. Diagnosis clinical grading and treatment of covid-19 cases was done based on guidelines by Govt of India[20].

The study was conducted in accordance with the ethical standards of the institutional ethical committee. Performed literature search in pub med central, Scopus, standard reference-based search, journals. Terms used for literature search-Covid-19, SARS CoV-2, children, infants, paediatric population, SARI, PIMS.Covid-19 cases tested positive in our hospital and those positive cases referred from other health facilities in the age group of one month to 12 years were admitted and included in the study. All symptomatic children who were under taken international travel in the last 14 days or all hospitalized children with severe acute respiratory illness or asymptomatic with direct contact of confirmed case were taken as suspected cases[21]. These cases are tested and positive cases were included. Excluded cases are covid positive neonates (less than 28 days). Paediatric inflammatory multisystem syndrome (PIMS-TS) was also included in the study. Records consisting of demographic details[18,19]. Exposure history, clinical features, course in the hospital, severity and outcome. Clinical data was collected for 103 children aged between 1 month to 12 years

diagnosed with Covid-19 and admitted in PICU and isolation ward in tertiary care hospital between May 2020 to October 2020.

Initially suspected cases were detected to paediatric covid Triage where testing was done. All positive cases are admitted. Based on clinical status-asymptomatic, mild symptomatic stable cases were kept in isolation ward and severe cases were admitted in ICU. Suspected cases were ultimately confirmed by one of the following diagnostic outcomes using nasopharyngeal swab 1. RTPCR 2. RAT[22]. Swabs were analyzed in laboratories authorized by Govt of India.

According to age patients were classified as <1 year, 1.1-6 years, 6.1 to 12 years. Recorded clinical data were-fever (>38.3^oC), cough, dyspnea, Rhinorrhea, vomiting, abdominal pain, diarrhoea, conjunctivitis, irritability, headache, myalgia, arthralgia, seizures.

Based on physical examination and vital signs a severe condition was defined by the presence of tachypnea, respiratory distress, tachycardia, features of under perfusion, alteration in the state of consciousness, oxygen saturation <92% at room air and organ dysfunction.

Criteria for admission into PICU-respiratory distress/low spo₂/shock, poor peripheral perfusion/lethargy in infants and young children/sick looking /seizure, encephalopathy.

Pre-existing comorbidities were recorded in the following categories-malignancy, neurological disorders, congenital heart disease, immune compromised states, chronic pulmonary, endocrinal and renal disorders and obesity.

All data collected was analyzed. Continuous variable was presented as the median and range. Categorical variables were presented as frequency as well as in percentage. Level of statistical significance was <0.05 at confidence interval of 95%.

Results

The median age (IQR) of children admitted were 9 (4-13 years) and male children (N=54, 55.6%) outnumber females with a male: female ratio of 1.25:1. There was no relationship between gender and incidence of COVID infection in children (p=0.12, Chi square test).

Table 1: Age distribution

	Age	Asymptomatic	Mild symptoms	Unstable	Comorbidities
Total Children Tested Positive (N=103)	<1 year (N=20)	5	5	10	8
	1.1-6 year (N=40)	18	16	6	5
	6.1-12 year (N=43)	23	16	4	10

Table 2: Comorbidities and other associated conditions Outcome

Name of Comorbidities and other conditions	Number	Outcome	Duration of hospital stay
Cancer	-	-	-
Asthma	5	4-Good 1-Death	3-to-1-week days 2 days
Obesity	1	Good	5 days
Congenital heart disease	X	x	X
Seizure disorder	5	Good	1 week
Febrile Seizure	6	Good	1 week
CPMR	5	Good	1 week
Diabetes (Type I)	1	Good	10 days
Nephrotic syndrome	2	Good	7-8 days
Acute Glomerulo nephritis	1	Good	1 week
Post varicella	2	Good-1 Death-1	1 week 2 days
Appendicular perforation	1	Good	3 days
Thalassemia	2	Good	
Immuno compromised (Retroviral + ve)	1		
Musculoskeletal disorder	1	Good	1 week

Post case of Hirsch sprung	1	Good	14 days
B/L HUN + Right Nephrectomy + Left Pyeloplasty	1	Good	1 Week
Protein Energy Malnutrition	3	Good-2 Death-1	1 week 2 days
Failure to thrive	4	Good-3 Death-1	10 days 1 Day

Table 3: Symptoms

	<1 year	1.1-6 years	6.1-12 years
Fever	7	17	16
Cough	7	8	8
Cold	4	4	5
Respiratory Distress	6	4	4
G.I Symptoms	6	3	5
Seizures	4	5	2
Sepsis ± Shock	4	2	1
UTI	-	-	2
Asymptomatic	5	18	23

Table 4: Expired cases

Name Age	Gender	Comorbidity	PIMS and other clinical status	ICU Admission (mode)	Duration of stay
C.Vinay 4 months	Male	Failure to thrive Sepsis		Ventilated	1 Day
Lakshmi Priya 4 years	Female	Post varicella syndrome	-	CPAP and ventilated	2 days
B. Kumar 5 years	Male	Wheezier PEM	PIMS	CPAP and ventilated	1 Day
Chotu 9 months	Male	GDD Microcephaly	PIMS	CPAP and ventilated	2 days
Maohomani 9 years	Female	-	PIMS	CPAP and ventilated	5 Days

No of patient's O₂ dependent after 2 weeks: 3

How many shifted from isolation ward to ICU: NIL

Table 5: Oxygen, MODS, Comorbidities

Age	Requires O ₂	Requires MV	Requires inotrope support	MODS	Comorbidities	Expired
<1 year	12	2 (2)	10	6	8	2 (2)
1.1-6 years	8	2	7	4	5	2
6.1-12 years	5	1	4	2	10	1

Discussion

Most of the COVID-19 infections are asymptomatic in children as well as adults and many of them are not reported. Therefore, we confined our study to symptomatic cases only. Pediatric observational studies published early in the spread across China reported similar clinical findings with fever being the most common symptom followed by cough and sore throat. In our study too, the main clinical features of COVID-19 in children were fever, cough, nausea, vomiting. Among critically ill children most common complaints were fever, breathing difficulty and seizures. Four patients out of 10 with severe COVID-19 in our study presented initially as viral encephalitis and therefore had seizures as a common complaint. The severe disease and critical disease (ARDS, respiratory failure, shock, myocardial failure, and multiorgan dysfunction) are less frequent in children (1-3%) as compared to adults (10-30%).

A recent meta-analysis has also shown that most of the patients have mild to moderate disease (96%) with only 1% of all the symptomatic pediatric cases being critically sick. In our study also, most patients were asymptomatic but 22% had atypical or severe disease. Since our study

is a hospital-based study, therefore we saw slightly increased number of cases with severe/critical disease. Various hypotheses have been proposed for the lesser disease severity in children, though a definite answer is still awaited. Similarly, the mortality associated with

COVID-19 is much lower in the pediatric population (less than 1%) than that reported in adults (5-15%). However, in a cross-sectional study of 46 North American pediatric intensive care units (PICUs), between March 14 and April 3, 2020, 48 children were admitted to 14 PICUs in the US and none in Canada of which 73% presented with respiratory symptoms, and 38% required invasive ventilation, and the hospital mortality rate was 4.2%.²² In our study the mortality rate was 6.6% as it was a hospital-based study and out of 10 critically ill children, almost all children required inotropic support, 9 required mechanical ventilation and other life supportive treatment.

Mortality in our study was only seen in those who died within 12 hours of admission. Co-morbidities play a major role in terms of severity of the disease especially malnutrition which is a most seen co-morbidity as a risk factor for severe COVID-19. In children, malnutrition is known to foster infections; in our study we have seen deaths in younger infants with associated malnutrition as co morbidity.

Four out of 10 patients who developed severe disease had associated malnutrition therefore can be considered as an important risk factor for severe disease. However more data is needed to clarify the association of malnutrition and other co-morbid condition with mortality in children with COVID-19.

Conclusion

Our study shows that pediatrics patients with COVID-19 have a simple transmission mode, either by close contact with infected adults or by exposure to epidemic areas. Most children are asymptomatic. Atypical or severe manifestations can be seen in 22% of children and require intensive monitoring. Severe life-threatening illnesses in the form of ARDS, GBS, KD and other multisystem involvement are seen in these patients. Therefore, it is mandatory in current scenario to have a high degree of suspicion for COVID-19 in children admitted in pediatric intensive care units (PICUs) with an unexplained diagnosis, persistent fever and high levels of inflammatory markers.

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