RESEARCH PAPER

Clinical Characteristics of Children With SARS-CoV-2 Infection During the Third Wave of the Pandemic: Single Center Experience

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Received: February 07, 2022; Initial review: February 28, 2022; Accepted: April 29, 2022

Objective: To determine the clinical presentation and outcome of children infected with severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) during the third wave of the pandemic in India. **Method**: A review of hospital records was done at a tertiary care hospital, for children seen between 1 and 25 January, 2022. **Result**: Out of total 112 SARS-CoV-2 positive patients, 17 were hospitalized and 95 were treated in the outpatient department. Among non-hospitalized children, fever was the commonest feature (72, 75.7%), followed by sneezing, and loss of appetite. The median (IQR) duration of symptoms was 2.5 (1.5) days. Among hospitalized children, 10 had co-morbidities and one-third required intensive care unit admission. MIS-C was diagnosed in four patients. Out of 4 mechanically ventilated patients, two had coronavirus disease (COVID) pneumonia. The mean (SD) length of hospital stay was 7.5 (2.5) days. One child with leukemia died during management. **Conclusion**: During the third wave of the pandemic, most children had symptomatic illnesses, but recovery was fast among non-hospitalized children.

Keywords: *COVID-19, Management, Multisystem inflammatory syndrome in children (MIS-C), Outcome*.

Published online: May 20, 2022; ***PII***: S097475591600424

With the emergence of the Omicron variant of severe acute respiratory syndrome corona virus 2 (SARS-CoV-2), preliminary reports from other countries point towards a lower rate of severe disease in terms of the emergency visit, hospitalization, respiratory support, and intensive care admission among children [1-5].

India experienced an acute surge of infections during the third wave of pandemic from first week of January, 2022 and the majority of circulating variant was Omicron. However, data regarding clinical presentation and outcome of this new variant in children are lacking [6,7]. We present preliminary data on clinical characteristics and outcomes of children who visited the outpatient department and were hospitalized due to coronavirus disease (COVID-19).

METHODS

This review of hospital records was conducted at a tertiary care teaching hospital in Eastern India. Data collection was done after obtaining approval from the institutional ethics committee. Data of children aged between 1 month and 12 year, who visited the pediatric outpatient depart-ment or were hospitalized with evidence of SARS-CoV-2 infection in their nasopharyngeal swab real-time reverse transcription-polymerase chain reaction (RT-PCR) from 1 to 25 January, 2022, were included in the study.

As per hospital protocol, we preserved a copy of the prescription of suspected SARS-CoV-2 infected patients visiting the outpatient department (OPD). We retrieved this data for the study. The average duration of illness of positive patients who were at home care was collected from established state-run telemedicine program for all these patients. Information on demographic characteristics like age, sex, weight, and contact history, presenting signs and symptoms, and comorbidities were recorded. Multi-system inflammatory syndrome in children associated with COVID-19 (MIS-C) was defined according to WHO preliminary definition criteria [8].

For hospitalized patients, initial reports of the laboratory investigations including blood count, C-reactive protein (CRP), liver profile, renal function tests and coagulation profile were extracted. Data on other inflammatory markers such as ferritin, pro-brain natriuretic peptide, and D-dimer levels were available only for selected patients who had severe diseases requiring pediatric intensive care (PICU) admission or had features of MIS-C [9]. Bedside echocardiography was carried out for cases admitted with shock, features of MIS-C and congenital heart disease, and the results were retrieved.

Septic shock, ARDS and acute kidney injury were

defined and managed as per the Surviving Sepsis campaign international guidelines for the management of septic shock in children [10], Paediatric Acute Lung Injury Consensus Conference (PALIC) definition [11] and KDIGO guidelines [12], respectively. Fever was defined as axillary temperature above 99.5 °F according to Facility Based Integrated Management of Neonatal and Childhood Illness (F-IMNCI) [13]. Treatment received in the form of respiratory support, inotropes, intravenous immunoglobulin, steroids, aspirin, and low molecular weight heparin were noted. For admitted patients, duration of PICU and hospital stay were noted. The outcome and mortality were taken into account.

Patients, who required only home care were grouped into younger children (1-59 month) and older children (60 month-12 year) and compared for clinical characteristics and outcome.

Statistical analysis: SPSS 26.0 was used for statistical analysis. Quantitative continuous variables were compared between groups using Mann-Whitney's nonparametric tests or unpaired *t*-test. Qualitative variables were compared by the chi-square test and Fischer exact test. A two-sided *P* value <0.05 was considered statistically significant.

RESULTS

Of the 95 children in the OPD who were positive for SARS-CoV-2, none required hospitalization. Among 112 patients who required emergency hospitalization during the same period, 17 were positive for SARS-CoV-2 by RT-PCR (**Fig. 1**).

Analysis of clinical presentation of children who visited OPD revealed that fever was the most common clinical presentation (75.7%); fever >102° F was more common in children older than 5 years [OR (95% CI) 5.57(1.62, 17.74); *P*=0.001). Median (IQR) duration of symptoms was comparable between the two groups [2.5 (1.5,3) vs 2.5 (2,3), *P*=0.078]. Symptoms like rigor, sore throat, and headache were more in older children, whereas under-five children had significantly higher gastrointestinal manifestations (*P*<0.05) (**Table I**).

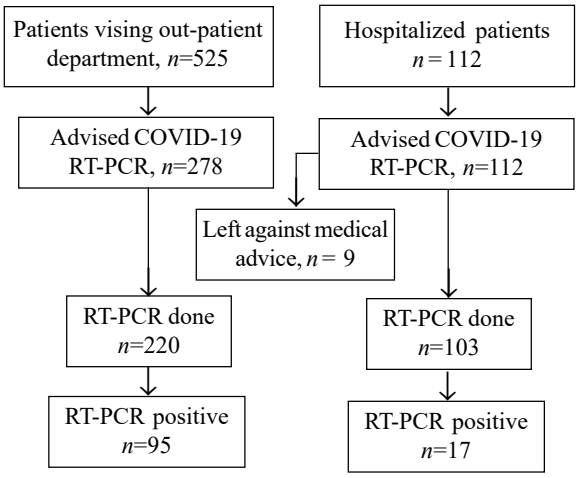

Fig. 1 Flow diagram of patients with COVID-19 attending the hospital during the study period.

Among the 17 hospitalized patients, the predominant clinical presentation was fever (*n*=14, 82.3%). Nine children (52.9%) had respiratory distress as the presenting symptom. Four children (23.5%) fulfilled the diagnostic criteria of MIS-C and all had severe disease. Ten children had co-morbidity (58.8%) (**Web Table I**). Echocardiography of four patients with MIS-C revealed ejection fraction (EF) less than 40%, and one had a coronary aneurysm (**Web Table I**).

Among 14 children who required respiratory support, four needed mechanical ventilation. Indications for mechanical ventilation were refractory shock, altered sensorium and pneumonia. Seven (41.1%) children received fluid boluses, and four needed inotropes (23.5%). Intravenous immunoglobulin (2 g/kg) and methylprednisolone (2 mg/kg/day) were administered to four children with MIS-C.

Table I Characteristic of Children With SARS-COV-2 Infection Treated in the Outpatient Department During the Third Wave of Pandemic, Kolkata, January, 2022 (*n*=95)

Clinical Presentation	*1mo -5 y (n = 54)*	*5-12 y (n = 41)*	*OD (95%CI)*[d]
Fever[c]	43 (79.6)	39 (95.1)	4.99 (0.98-48.4)
Temperature >102°F[a]	6 (11.1)	16 (41)	5.57 (1.62-17.74)
Fever > 3 d	16 (29.6)	6 (14.6)	2.46 (0.65-7.16)
Rigor[a]	14 (25.9)	31 (75.6)	8.86 (3.18-25.33)
Sneezing[c]	33 (61.1)	14 (34.1)	3.03 (1.20-7.73)
Stuffy nose[e]	22 (40.7)	20 (48.7)	0.72 (0.29-1.77)
Sore throat[e]	11 (20.3)	17 (43.5)	3.02 (1.07-3.86)
Cough	19 (35.1)	08 (19.5)	2.24 (0.79-6.71)
Myalgia[e]	23 (42.5)	24 (58.4)	0.53 (0.21-1.29)
Headache[c]	04 (7.4)	11 (26.2)	4.44 (1.20-21.19)
Irritability	12	0	
Diarrhea[c]	17 (31.4)	05 (12.2)	3.31 (1.02-12.56)
Loss of appetite[b]	35 (64.8)	14 (34.1)	3.55 (1.40-9.14)
Pain abdomen	10 (18.5)	7 (17.7)	1.1 (0.34-3.8)
Vomiting	12 (22.2)	4 (9.7)	2.64 (0.79-6.55)

Data in no. (%). [a]P=0.001, [b]P<0.005, [c]P<0.05. [d]Reciprocal odds ratio; [e]subjective symptoms, that were documented for children above 3 years of age.

WHAT THIS STUDY ADDS?

- Clinical characteristics and outcomes of SARS-CoV-2 infected children during the third wave of pandemic in India are presented.

Another four children with pneumonia or ARDS were treated with dexamethasone (0.15 mg/kg/day). ICU care was required in 6 (35.2%) patients. The mean (SD) length of hospital stay was 7.5 (2.5) days. One patient died due to complications related to comorbid acute myeloid leukemia.

DISCUSSION

In this review of hospital records, we present preliminary data on clinical characteristics of pediatric patients with confirmed SARS-CoV-2 infection during the third wave of the pandemic. Among the 95 patients who required home care predominant clinical features were fever, coryza, and anorexia. Gastrointestinal manifestations were more common in younger children. High-grade fever was noted more frequently in older children. Among hospitalized patients, two-thirds had comorbidity, one-third required ICU and four required mechanical ventilation.

Pediatric data from South Africa during Omicron surge revealed that young children (0-4 years) were the most affected (62%) [14]. Mean hospital stay was longer in our study cohort than South African children (6.5 vs 3.2 days). It may be because half of the children had comorbidity and four patients had MIS-C. The prevalence of MIS-C during the Omicron surge has not been described in literature yet. The ICU admission rate was also more frequent in our study (35% vs 8%) [14]; though, the requirement for oxygen therapy and need of mechanical ventilation were similar. Like our findings, all deaths were related to complex underlying comorbidity.

Among under-5 children in USA, the Omicron cohort had significantly lower emergency visits, hospitalizations, ICU admissions, and mechanical ventilation than those in the Delta cohort [3]. Similar trends were observed for other pediatric age groups (5-11 and 12-17 years) [3]. Being a hospital-based study, we were unable to delineate true incidence of hospitalization, and need for ICU care and mechanical ventilation.

During the initial phase of pandemic, irrespective of age, headache and fatigue were the two commonest presentations [15]. Contrary to the previous waves, fever and upper respiratory tract symptoms were more common and none of our children complained about anosmia during the third wave. The median illness duration was longer and 4·4% of children had illness duration of at least 28 days [15]. Duration of illness among children who required home care was 2.5 days during the third wave of the pandemic. It indicates that although a higher number of children are symptomatic, they recover fast compared to previous waves. But we could not ascertain whether the Omicron variant leads to long-term sequelae.

Single center retrospective nature of this study could introduce case selection biases, over representation of symptomatic patients, and reporting and follow-up issues. Many children in the age group of 1 month to 5 year could not express subjective symptoms. We did not carry out genome sequencing to confirm the presence of Omicron variant in the patients.

Our analysis showed that during the third wave, COVID-19 infections in children were associated with symptomatic illness, but fast recovery among non-hospitalized children. There is an early indication of substantial need for ICU care and organ support among hospitalized children. The study findings might be helpful for primary care physicians, pediatricians, and parents for early identification, isolation, and appropriate management of children.

Note: Additional material related to this study is available with the online version at *www.indianpediatrics.net*

Ethics clearance: IEC; No. MC/KOL/IEC/NON-SPON/1363/1/33 dated Jan 24, 2022.

Contributors: MS: conceptualization, design of the study, drafting, analysis of data, preparing manuscript, final approval; AG: design of the study, analysis and interpretation of data, review and editing of manuscript; MCK,OR: conceptualization, acquisition of data, drafting of manuscript, analysis of data; MKM: design of the study, analysis and interpretation of data, administrative work and statistical analysis; MN: conceptualization, design of the study, statistical analysis, review and editing, administrative work, final approval. All authors approved the final version of manuscript, and are accountable for all aspects related to the study.

Funding: None; *Competing interests*: None stated.

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