

CLINICAL FEATURES AND SHORT-TERM OUTCOME OF COVID-19 IN PEDIATRIC PATIENTS IN A TERTIARY CARE HOSPITAL OF CENTRAL INDIA: A CROSS-SECTIONAL STUDY

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Received: 31 November 2023, Revised and Accepted: 03 February 2024

ABSTRACT

Objectives: To fill the knowledge gap and make a clinical profile (frequency, clinical features and outcome) of COVID-19 paediatric patients attending the tertiary care hospital of central India.

Methodology: This cross-sectional study was carried out in Department of Paediatrics, R.D Gardi Medical College, Ujjain, M.P among 88 age group of 0-18 years admitted consented COVID-19 positive pediatric patients over a period of one year (March 2021 to April 2022).

Results: Fever was the most common (76%) complaint, followed by fatigue/ malaise (52%), dry cough and runny nose (45%). Fever stayed for the longest duration (2.80 ± 2.30 days), followed by loss of smell (1.97 ± 2.43 days). Skin rashes stayed for the least duration (0.09 ± 0.39 days). Stunting was observed in 28% participants. Hospital acquired pneumonia was seen in many (26%), along with liver dysfunction in 19%, ARDS in 18%, meningitis/encephalitis in 16%, MIS-C in 8% and septic shock in 7%. Most of the study participants (49%) had received Azithromycin; while Ivermectin was given to very few participants (16%). Mean duration of stay in hospital was observed to be 9.01 ± 7.95 days. COVID-19 severely hampered the vulnerable section of the society, i.e., the children.

Conclusion: The prevalence was found to be more in females, and increased with advancing age. Overcrowding and under nutrition favoured its spread. Children presented with variable complications, as well.

Keywords: COVID-19, Pediatric, Clinical features, Outcome, Treatment.

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INTRODUCTION

Despite having widespread knowledge about the natural course of the disease, infectious diseases are still one of the leading causes of morbidity and mortality worldwide. The emergence and re-emergence of various pathogens have created new challenges for mankind. COVID-19 emerged as a global health crisis, first causing an epidemic in China and then a pandemic that affected the entire world [1]. As the pandemic continued, numerous reports describing the clinical presentation and hospital course of children with confirmed COVID-19 emerged. In the early stages of the pandemic, the proportion of confirmed cases among the pediatric age group was relatively small, and it was believed that children were rarely affected by COVID-19 [2-4]. The number of affected children increased dramatically in the later stages of the COVID-19 pandemic. Subsequent researches showed that although children and adolescents were susceptible to COVID-19 infection, a large percentage of children were either asymptomatic or pre-symptomatic, and therefore, the true incidence of infection was understated due to the low rate of testing in children [5]. According to national and international statistics, only 2-3% of sick children required hospitalization. Deaths in children caused by COVID-19 account for 2% of all deaths [6,7]. Fever was the most common sign at presentation, followed by cough, rhinorrhea, and a sore throat. Other common symptoms were diarrhea, headache, myalgia, rashes, and, in some cases, anosmia or ageusia too [8]. Although most children with non-severe symptoms of COVID-19 recover within 7-14 days of disease onset, clinical deterioration may occur later, so prompt urgent re-evaluation is needed [9,10]. Despite the low prevalence of COVID-19 in children, guaranteeing their protection against the virus is nevertheless a growing concern because the pediatric population constitutes a sizeable vulnerable group. There are cases of multi-system inflammatory syndrome in children (MIS-C) that appear to be associated with COVID-19 manifesting with high fever, rash, conjunctivitis, and gastrointestinal symptoms with multiple-

organ failure [7]. Being a novel disease, in India, there is a paucity of information and a lack of research on disease outcomes in the pediatric age group. Therefore, this study is an effort to fill the knowledge gap and make a clinical profile (frequency, clinical features, and outcome) of COVID-19 pediatric patients (0-18 years) attending the tertiary care hospital in central India.

METHODS

The present cross-sectional study was carried out in the Department of Pediatrics, C.R. Gardi Hospital, R.D. Gardi Medical College, Ujjain, Madhya Pradesh, after approval by the Institutional Ethics Committee, among 88 consented COVID-19 positive (pharyngeal swab positive for viral RNA) pediatric patients (0-18 years) who were admitted here over a period of 1 year (March 2021 to April 2022).

Sample size calculation

The population size (for the finite population correction factor or fpc) (N) was taken as 1,000,000. Hypothesized % frequency of outcome factor in population (p) was taken as $5\% \pm 5$. Confidence limit as % of 100 (absolute $\pm\%$) (d) was 5%. The design effect (for cluster surveys, DEFF) was considered to be 1.

The sample size (n) for various confidence levels is as follows:

Confidence level (%)	Sample size
95	73
80	32
90	52
97	90
99	127
99.9	206
99.99	288

Sample size was calculated using the formula $(n) = [DEFF * Np(1-p)] / [d^2 / Z_{1-\alpha/2}^2 * (N-1) + p*(1-p)]$ to be 88.

A detailed history and presentation of complaints were recorded. A general and systemic examination was done following all the necessary SOPs (standard operating procedures) advised while handling COVID-19 cases.

Statistical method

Data were collected using pre-designed pro forma and later transformed into an electronic data case using Microsoft Excel R. Results were expressed as the means and standard deviation or as numbers and percentages. The data were analyzed using Stata 12 software.

OBSERVATION AND RESULTS

Table 1 depicts the distribution of study subjects on the basis of various sociodemographic characteristics. The majority of the participants (67%) were >10 years old, while 22% were between 5 and 10 years old, and the remaining 11% were <5 years old. The mean age was 11.63 ± 5.10 years. A preponderance of girls (60%) was observed. Most of the participants belonged to nuclear families (70%) and resided in urban areas (82%). Of them, 66% lived in overcrowded households. Most of the study participants (37%) were educated until primary school, while 11% of them were uneducated. The head of the family of most children (37%) had office jobs. 26% were self-employed, 18% worked on farms, 13% were laborers, and 6% were unemployed. The BCG and MMR vaccine status of the study participants was recorded as shown in Fig. 1. Only 32% of them had a BCG scar, and only 25% were found to be immunized with the MMR vaccine. 53% were cases referred from other hospitals (Fig. 2). Regarding complaints with which the patients presented (Table 2), it was observed that fever was the most common (76%), followed by fatigue or malaise (52%), dry cough and runny nose (45%), loss of smell (43%), cough with expectoration (41%), and loss of taste or altered taste (40%). Weakness of limbs/inability to walk (3%), altered consciousness/confusion (3%), and seizures (3%) were the least common symptoms. Fever stayed for the longest duration (2.80 ± 2.30 days), followed by loss of smell

(1.97 ± 2.43 days), lymphadenopathy (1.88 ± 0.31 days), pale/mottled skin (1.82 ± 0.37 days), cough with expectoration (1.81 ± 2.44 days), fatigue/malaise (1.76 ± 2.03 days), loss of taste/altered taste (1.75 ± 2.31 days), runny nose (1.71 ± 2.34 days), cold hands and feet (1.69 ± 2.04 days), dry cough (1.56 ± 1.92 days), and sore throat (1.47 ± 2.12 days). Skin rashes stayed for the least duration (0.09 ± 0.39 days). Stunting was observed in 28% of the study participants. Among the children <5 years of age, 58% were found to be wasted and 25% were underweight. The mean height was found to be 137.86 ± 28.14 cm, and the mean weight was 30.14 ± 12.26 kg. The mean mid-upper arm circumference was measured at 13.40 ± 0.82 . The comorbidities assessed in the study were hypertension, chronic cardiac disease, chronic pulmonary disease, asthma, tuberculosis, stroke, chronic neurological disease, rheumatologic illness, immunosuppressive medication, past or family history of Kawasaki disease, diabetes mellitus, obesity, chronic kidney disease, chronic liver disease, HIV infection, malignancy, chronic Hepatitis B and C infection, autoimmune disease, congenital or acquired immunodeficiency, and hematological disorder. However, no comorbidities were found in the study population. The complications developed during the hospital stay were also studied (Table 4). Hospital-acquired pneumonia was seen in many (26%), along with liver dysfunction in 19%, ARDS in 18%, meningitis/encephalitis in 16%, MIS-C in 8%, and septic shock in 7%. The treatment received by the study participants is depicted in Table 5. Most of the study participants (49%) had received azithromycin, while ivermectin was given to very few participants (16%). The mean duration of stay in the hospital was observed to be 9.01 ± 7.95 days.

DISCUSSION

In the present study, among the 88 COVID-19-positive children enrolled, 60% were girls and 40% were boys, suggesting a female predominance.

Table 1: Distribution of study subjects on the basis of sociodemographic characteristics (n=88)

Sociodemographic characteristics	Frequency (n=88)	Percentage
Gender		
Girls	53	60
Boys	35	40
Age		
<5 years	10	11
5-10 years	19	22
>10 years	59	67
Locality		
Urban	72	82
Rural	16	18
Family type		
Nuclear	62	70
Joint	26	30
Overcrowding		
Yes	55	66
No	30	34
Education		
Uneducated	10	11
Up to Primary School	33	37
Up to Middle School	13	15
Up to High School	13	15
Up to Higher Secondary School	19	22
Occupation of head of family		
Unemployed	5	6
Self employed	23	26
Farm worker	16	18
Laborer	11	13
Office job	33	37

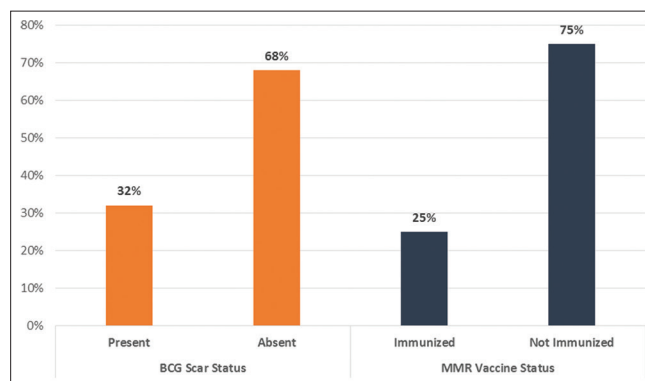


Fig. 1: Distribution of study subjects as per the BCG and MMR vaccine status

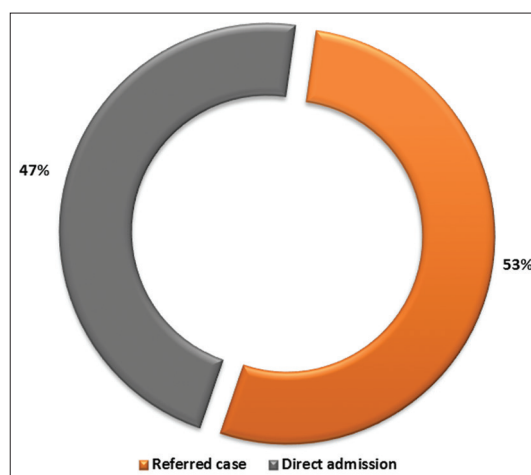


Fig. 2: Distribution of study subjects as per the admission status

Table 2: Distribution of study subjects on the basis of complaints on presentation (n=88)

Complaints	Yes		No		Mean±SD (duration in days)
	Frequency	Percentage	Frequency	Percentage	
Fever	67	76	21	24	2.80±2.30
Fatigue/Malaise	46	52	42	48	1.76±2.03
Chills	12	14	76	86	0.47±1.24
Cough with sputum production	36	41	52	59	1.81±2.44
Dry Cough	40	45	48	55	1.56±1.92
Bloody Sputum/Hemoptysis	9	10	79	90	0.29±0.93
Shortness of breath	15	17	73	83	0.65±1.56
Fast breathing	22	25	66	75	0.92±1.73
Wheezing	16	18	72	82	0.63±1.47
Chest Pain	9	10	79	90	0.26±0.85
Abdominal Pain	21	24	67	76	0.76±1.47
Vomiting/nausea	10	11	78	89	0.22±0.70
Diarrhea	6	7	82	93	0.23±0.94
Muscle aches/Body aches	14	16	74	84	0.50±1.34
Joint pain	16	18	72	82	0.50±1.14
Skin Rash	5	6	83	94	0.09±0.39
Cold hands/feet	12	14	76	86	1.69±2.04
Lymphadenopathy	10	11	78	89	1.88±0.31
Sore throat	33	38	55	62	1.47±2.12
Runny nose	40	45	48	55	1.71±2.34
Peripheral cutaneous inflammation	8	9	80	91	0.40±1.58
Loss of smell	38	43	50	57	1.97±2.43
Loss of taste/altered taste	35	40	53	60	1.75±2.31
Oral mucosal inflammation	5	6	83	94	0.19±0.81
Oral Ulcer	7	8	81	92	0.29±1.26
Bilateral non-purulent conjunctivitis	11	13	77	87	0.32±1.00
Headache	18	20	70	80	0.59±1.29
Altered consciousness/confusion	3	3	85	97	0.11±0.61
Seizures	3	3	85	97	-
Weakness of limbs/Inability to walk	3	3	85	97	0.36±1.11
Bleeding	7	8	81	92	0.18±0.71
Pale/mottled skin	15	17	73	83	1.82±0.37

Table 3: Distribution of study subjects on the basis of nutritional status (n=88)

Nutritional status	Yes		No	Percentage
	Frequency	Percentage		
Stunting (n=88)	25	28	63	72
Wasting (n=12;<5 years)	7	58	5	42
Underweight (n=12;<5 years)	3	25	9	75

Table 4: Distribution of study subjects on the basis of complications developed during hospital stay (n=88)

Complications	Frequency	Percentage
Septic Shock	5	7
ARDS	16	18
Hospital acquired pneumonia	23	26
Meningitis/encephalitis	14	16
Liver dysfunction	17	19
MIS-C	7	8

Dong et al. [11], Shekerdeman et al. [12], and Akkoç et al. [13] reported a higher proportion of male children (56.6%, 53%, 52%, and 50.7%, respectively) in their studies. In the present study, the majority of the children (67%) were >10 years of age, 22% were 5–10 years old, and 11% were under-5 years old. The mean age of the children was

Table 5: Distribution of study subjects on the basis of medications received (n=88)

Medication	Frequency	Percentage	Mean±SD (duration of dose in 24 h)
Hydroxychloroquine	41	47	182.68±74.33
Methyl prednisolone	15	17	30.33±12.02
Dexamethasone	29	33	1.67±0.47
Hydrocortisone	22	25	184.09±32.31
Oseltamivir	19	22	121.57±23.39
Azithromycin	43	49	150.69±66.46
Ivermectin	14	16	5.57±1.60
Doxycycline	28	32	69.82±24.96

Table 6: Distribution of study subjects on the basis of mean age, anthropometric measurements, and duration of hospital stay

Parameters	Mean±SD	95% CI	Range
Age (in years)	11.63±5.10	10.55–12.71	1–18
Height (in cm)	137.86±28.14	14.14–14.20	61–182
Weight (in kg)	30.14±12.26	27.54–32.74	5–52
Mid-upper arm circumference	13.40±0.82	12.88–13.93	12–14.3
Duration of stay in hospital (in days)	9.01±7.95	7.25–10.77	1–44

11.63±5.10 years. Hoang et al. [14], Dong et al. [11], Akkoç et al. [13], and Nallasamy et al. [15] reported the median age of children as 8.9 years, 7 years, 145 months, and 33 months, respectively. Akkoç et al. [13] reported a higher proportion of 5–15-year-old children (46.7%) in

their study. Dong *et al.* [11] reported a higher proportion among the 6–10-year-old age group. Cui *et al.* [16] in a systematic review reported the highest number of COVID-19 cases (38%) above 10 years of age. In the present study, majority of children were residing in urban areas (82%), and they lived in nuclear families (70%). About 66% of children lived in overcrowded households. In 37% of cases, the head of the family held an office job, 26% were self-employed, and 31% were involved in farms or were laborers. The overcrowded households make the transmission of viruses easy, resulting in the spread of the COVID-19 infection among children. Hoang *et al.* [14], Wu *et al.* [17], in a systematic review, reported that 75.6% and 95.59% of cases, respectively, in their study were household contacts of adults with COVID-19 infection. In the present study, BCG scar mark was not found in 68% of children, and about 75% of children were not immunized with the MMR vaccine. In the studies done by Escobar *et al.* [18], Kumar *et al.* [19], Klinger *et al.* [20], and Joy *et al.* [21], it was concluded that BCG-vaccination could have a protective effect against COVID-19 infection. BCG vaccinated children reported less mortality and morbidity, and BCG vaccine coverage of >70% was associated with reduced COVID-19 infection. With respect to complaints, in the present study, the majority of children reported with fever (76%) and fatigue/malaise (52%). Qi *et al.* [22], Nallasamy *et al.* [15], Irfan *et al.* [23], and Wu *et al.* [17] reported fever (48.5%, 32%, 63.3%, and 27.03%) and cough (40.6%, 19%, 33.7%, and 32.43%, respectively) as the most common symptoms. In the present study, the mean duration of disease symptoms ranged from 12 h to 3 days, with the maximum being fever (2.80 [\pm 2.30] days). Muthusamy *et al.* [24] reported mean fever duration as 1.5 days, and Nallasamy *et al.* [15] reported median duration of symptoms as 2 days (1–5.5) in their studies. Other clinical symptoms reported in the present study were sore throat (38%), chills (14%), dry cough (45%), cough with sputum (41%), runny nose (45%), anosmia (43%), ageusia (40%), shortness of breath (17%), fast breathing (25%), wheezing (18%), chest pain (10%), abdominal pain (24%), diarrhea (7%), joint pain (18%), rashes (6%), lymphadenopathy (11%), peripheral cutaneous inflammation (9%), and conjunctivitis (13%). Similarly, Nallasamy *et al.* [15] reported rapid breathing (13%), diarrhea (10%), and vomiting (10%). Alsohime *et al.* [25] reported headache (15%), diarrhea (14%), shortness of breath (16%), and sore throat (13%) in their study. About 28% children were observed to be stunted and among under-5 children, 58% reported wasting, in the present study. Nuzhat *et al.* [26] reported in their study that stunting and wasting were significantly higher in infants <6 months and those born during the pandemic than in infants in the pre-COVID-19 period ($p < 0.05$). Beside stunting and wasting, in the present study, about 25% of the children were underweight. In a study done by Muthusamy *et al.* [24], malnutrition was significantly associated with severe illness. In the present study, the mean duration of hospital stay was 9.01 ± 7.95 days. In a systematic review by Hoang *et al.* [14], the length of stay was 11.6 ± 0.3 days. Shekerdemian *et al.* [12] reported that the median PICU and hospital length of stay for discharged COVID-19 patients were 5 days (3–9 days) and 7 days (4–13 days), respectively. In the present study, during the hospital stay, hospital-acquired pneumonia, liver dysfunction, and ARDS were reported in about 26%, 19%, and 18% of the children, respectively. About 16% of children reported meningitis/encephalitis and about 8% reported having MIS-C. Muthusamy *et al.* [24] reported 68.3% of pneumonia cases in their study. Alsohime *et al.* [25] reported that 3% of patients with severe disease require O_2 supplementation. In the present study, no comorbidities were reported among COVID-19 children. Nallasamy *et al.* [15] reported 19% SARS-CoV-2-positive children with comorbidities. Shekerdemian *et al.* [12] reported 83% of children with comorbidities.

CONCLUSION

COVID-19 severely hampered the vulnerable section of society, i.e., the children, and hence, this study aimed to identify the various clinical features and outcomes of COVID-19 in children. The prevalence was found to be higher in females and increased with advancing age. Overcrowding and undernutrition favored its spread. Children presented with variable complications as well. The study was conducted on a limited number of patients. National multicentric trials can throw

better light on the different kinds of presentation of COVID-19 in the pediatric age group.

CONFLICT OF INTEREST

None declared.

FUNDING

Nil.

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