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CLINICAL AND EPIDEMIOLOGICAL PROFILE IN INDIAN CHILD SUBJECTS DURING COVID-19 PANDEMIC

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ABSTRACT

Background: COVID-19 or coronavirus disease is caused by SARS-CoV2 and has affected a large population globally including India. It has affected subjects from all age groups including children. However, despite intensive research conducted on COVID-19, data is scarce concerning the epidemiological and clinical features and transmission pattern of COVID-19 in child subjects of India.

Aim: The present study aimed to assess the clinical features and epidemiological profile of Indian pediatric subjects during the COVID-19 pandemic.

Methods: The study assessed 100 child subjects within the age range of 1 month to 18 years with the confirmed diagnosis of COVID-19 using the nasopharyngeal swab and tested with RT-PCR (reverse transcriptase-polymerase chain reaction). In these subjects, laboratory profiles and clinical parameters were assessed and collected data were statistically analyzed.

Results: The most common symptom was fever in 34% (n=34) study subjects followed by cough in 16% (n=16) child subjects, sore throat in 135 (n=13) study subjects, malaria in 7% (n=7) children, and diarrhea and headache in 5% (n=5) children each. The severity of illness was mild, moderate, and severe in 35 9n=3), 39% (n=39), and 58% (n=58) children.

Conclusion: The present study, considering its limitations, concludes that the burden of COVID-19 disease is higher in child subjects from a low socioeconomic status with a history of positive contact from the household. COVID-19 has also been shown to have a mild pattern in subjects from the pediatric age group. The LMR (lymphocyte monocyte ratio) showed a significant association with the disease severity with p=0.02 and NLR (neutrophil-lymphocyte ratio) also had a significant correlation with COVID-19 severity with p=0.01. However, no significant correlation to disease severity was seen for CRP levels and PLR (platelet lymphocyte ratio) with p=0.06 and 0.26 respectively.

Keywords: Coronavirus, COVID-19, pediatric covid, RT-PCR, SARS-CoV-2

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INTRODUCTION

COVID-19 or coronavirus disease is caused by SARS-CoV2 and has affected a large population globally including India. It has affected subjects from all age groups including children. COVID-19 was first identified in 2019, in Wuhan, China after the emergence of a large population with severe forms of pneumonia of unknown etiology. After the investigation of these pneumonia subjects, an emerging virus was discovered and considered responsible for pneumonia affecting the large population.[1] The etiologic virus was isolated and was named novel coronavirus 2019 (2019-nCoV), and was later renamed as SARS-CoV-2 or severe acute respiratory syndrome coronavirus 2. The COVID-19 disease caused by the SARS-CoV-2 then rapidly spread across the globe and was declared a pandemic in 2020 by WHO (World Health Organization). The SARS-CoV-2 was reported to have a high fatality rate of nearly 6% globally.[2]

COVID-19 is known for 3 years now and has affected a large population globally including India and affected subjects from both genders and all age groups. With the extensive research being conducted on the various aspects of COVID-19 in various parts of the World, the confirmed cases of COVID-19 for pediatric subjects are comparatively lower compared to the adult subjects.[3] The epidemiological study has reported that nearly 2.2% of child subjects were positive for COVID-19 in China and another study done in the USA has reported that positive child subjects for SARS-CoV-2 were 1.7%. Considering this fact, most of the guidelines for COVID-19 are released considering the adult subjects and very little focus was given to the child subjects.[4]

Various meta-analyses and systematic reviews are being done for COVID-19 in child subjects with the major focus given to the clinical presentation of SARS-CoV-2 in these subjects, and little consideration was given to the treatment of pediatric subjects with COVID-19, the rate of virus co-infections, and transmissibility of the COVID-19.[5] One study reported that a major concern in controlling the COVID-19 pandemic is the asymptomatic transmission of the virus, and asymptomatic COVID infection in children remains unknown. Also, child subjects are unable to clearly describe their complaints to the healthcare subjects and cannot provide their exposure history making healthcare professionals face more challenges in diagnosing and treating COVID-19 in children.[6]

A better understanding of the clinical profiles and physiological patterns of COVID-19 in child subjects can help in the early identification and adequate treatment of COVID-19 in children. However, despite intensive research conducted on COVID-19, data is scarce concerning the epidemiological and clinical features and transmission pattern of COVID-19 in child subjects of India.[8] Hence, the present study aimed to assess the clinical features and epidemiological profile of Indian pediatric subjects during the COVID-19 pandemic.

MATERIALS AND METHODS

The present cross-sectional clinical study aimed to assess the clinical features and epidemiological profile of Indian pediatric subjects during the COVID-19 pandemic. The study was done after the concerned Ethical committee gave clearance for proceeding with the study.

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The study population was comprised of pediatric subjects reporting to the institute who were suspected to have positive COVID-19 infection.

The study included 100 pediatric subjects from both genders and within the age range of 1 month to 18 years and tested positive for COVID-19 on RT-PCR on the nasopharyngeal swab samples. The study also included the asymptomatic child subjects who tested positive for RT-PCR during the study period and the subjects whose parents gave verbal and written informed consent for study participation after understanding the detailed study design. The exclusion criteria were subjects whose parents were not willing to participate in the study and took discharged against the medical advice from the institute.

After final inclusion, the detailed history was recorded from the parents of all the subjects, and the subjects were categorized into various categories using the standard criteria and the degree of the disease severity. For all the subjects. Detailed data were collected including the presence of the comorbidities, symptoms, overcrowding, living conditions, contact history, travel history, and demographic data.

For all the subjects, laboratory parameters were recorded at the baseline including the C-reactive protein and complete hemogram. In all the symptomatic children, chest X-rays were taken. In these X-rays, three zones were marked on each lung. In the case of opacity in all zones, a score of zero was given for no opacity and a score of 1 for any opacity. 50% involvement was considered if a total score of 3 was noted following the Toussie D et al from 2020.[9] All the child subjects, admitted to the institute were treated following the standard protocol for COVID-19. All the pediatric subjects were daily assessed to evaluate any changes in the severity of the disease. Persons per room criteria were used to define overcrowding. [10] For discharge of the study subjects, WHO guidelines were followed that suggested the discharge of a child who is asymptomatic and were negative on the two consecutive nasopharyngeal swabs collected at 24 hours difference from each other after 14 days of their COVID-19 illness.[11]

The data gathered were analyzed statistically using the SPSS software version 21.0 (IBM, Armonk, NY). The correlation of the disease severity in the study subjects was assessed using Spearman's Rho correlation coefficient. The significance level was considered at $p<0.05$.

RESULTS

A total of 184 child subjects presented to the Institute and were suspected to have COVID-19 owing to overlapping features of the disease. On RT-PCR, 138 subjects were negative and 46 subjects were positive for COVID-19. Other 54 child participants of the study were referred from other centers with positive RT-PCR and were included in the study making a final sample size of 100 participants. The study included 59% (n=59) males and 41% (n=41) female subjects. 84% (n=84) of subjects were from contaminated zones. A positive contact history from their household was seen in 91% (n=90) of study subjects from persons having an illness of varying severity. History of travel was positive in the 2 study subjects to the contaminated zones.

The demographic and disease characteristics of the study subjects are listed in Table 1. The majority of the study subjects were within the age range of 1-5 years with 31% (n=31) study subjects followed by 23% (n=23) subjects from the age of 5-10 years, 21% (n=21) subjects from

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10-15 years of age, 19% (n=19) subjects from 1 month-1year, and least 6% (n=6) subjects from 15-18 years. Overcrowding was seen in 34% (n=34) of study subjects. The most common symptom was fever in 34% (n=34) study subjects followed by cough in 16% (n=16) child subjects, sore throat in 135 (n=13) study subjects, malaria in 7% (n=7) children, and diarrhea and headache in 5% (n=5) children each. The severity of illness was mild, moderate, and severe in 35 (n=3), 39% (n=39), and 58% (n=58) children. The socioeconomic status was upper-lower, lower-middle, and upper-middle in 11% (n=11), 43% (n=43), and 46% (n=46) child subjects of the study (Table 1).

On assessing the laboratory parameters in the study subjects, it was seen that high CRP (C reactive protein) levels were seen in 31% (n=31) of child subjects in the study. Leucopenia has also seen in 31% (n=31) subjects of the study. Absolute eosinophil counts were $154X10^9$/L in the study subjects with a range of 68.3-437.3. The mean absolute monocyte counts were 574 $X10^9$/L in study children with the range of 402.3-742. The mean counts for absolute lymphocytes were 4073 $X10^9$/L with a range of 2914-5966 and the mean absolute neutrophil counts were 2482 $X10^9$/L with a range of 1995.3-3337 as shown in Table 2. The LMR (lymphocyte monocyte ratio) showed a significant association with the disease severity with p=0.02 and NLR (neutrophil-lymphocyte ratio) also had a significant correlation with COVID-19 severity with p=0.01. However, no significant correlation to disease severity was seen for CRP levels and PLR (platelet lymphocyte ratio) with p=0.06 and 0.26 respectively.

The chest X-rays were taken for 96% (n=96) of children from the study. On the interpretation of the radiographs, bilateral zone haziness was noted in 4% (n=4) of subjects. The haziness was <50% and the normal radiographs were seen for 85% (n=85) study subjects of the study. For all the child subjects, the disease category did not change during the whole stay at the hospital. The mortality in the present study was zero with no death.

DISCUSSION

The present cross-sectional clinical study aimed to assess the clinical features and epidemiological profile of Indian pediatric subjects during the COVID-19 pandemic. A total of 184 child subjects presented to the Institute and were suspected to have COVID-19 owing to overlapping features of the disease. On RT-PCR, 138 subjects were negative and 46 subjects were positive for COVID-19. Other 54 child participants of the study were referred from other centers with positive RT-PCR and were included in the study making a final sample size of 100 participants. The study included 59% (n=59) males and 41% (n=41) female subjects. 84% (n=84) of subjects were from contaminated zones. A positive contact history from their household was seen in 91% (n=90) of study subjects from persons having an illness of varying severity. History of travel was positive in the 2 study subjects to the contaminated zones. These data were in concordance with the previous assessment of Meena J et al[12] in 2020 and Qiu H et al[13] in 2020 where authors assessed subjects with comparable data as mentioned in the study.

The majority of the study subjects were within the age range of 1-5 years with 31% (n=31) study subjects followed by 23% (n=23) subjects from the age of 5-10 years, 21% (n=21) subjects from 10-15 years of age, 19% (n=19) subjects from 1 month-1year, and least 6% (n=6) subjects from

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Concerning the laboratory parameters in the study subjects, it was seen that high CRP (C reactive protein) levels were seen in 31% (n=31) of child subjects in the study. Leucopenia has also seen in 31% (n=31) subjects of the study. Absolute eosinophil counts were 154X10^9/L in the study subjects with a range of 68.3-437.3. The mean absolute monocyte counts were 574 X10^9/L in study children with the range of 402.3-742. The mean counts for absolute lymphocytes were 4073 X10^9/L with a range of 2914-5966 and the mean absolute neutrophil counts were 2482 X10^9/L with a range of 1995.3-3337. The LMR (lymphocyte monocyte ratio) showed a significant association with the disease severity with p=0.02 and NLR (neutrophil-lymphocyte ratio) also had a significant correlation with COVID-19 severity with p=0.01. However, no significant correlation to disease severity was seen for CRP levels and PLR (platelet lymphocyte ratio) with p=0.06 and 0.26 respectively. These results were consistent with the previous studies of Wang L[16] in 2020 and Lagunas-Rangel FA et al[17] in 2020 where authors suggested a significant correlation of NLR to the COVID-19 severity and raised CRP levels in subjects with COVID-19.

The study also reported that chest X-rays were taken for 96% (n=96) of children from the study. On the interpretation of the radiographs, bilateral zone haziness was noted in 4% (n=4) of subjects. The haziness was <50% and the normal radiographs were seen for 85% (n=85) study subjects of the study. For all the child subjects, the disease category did not change during the whole stay at the hospital. The mortality in the present study was zero with no death. These results were in agreement with the studies of Chen Y et al[18] in 2020 and Chawla D et al[19] in 2020 where authors reported similar chest radiography features in child subjects with COVID-19.

CONCLUSION

The present study, considering its limitations, concludes that the burden of COVID-19 disease is higher in child subjects from a low socioeconomic status with a history of positive contact from the household. COVID-19 has also been shown to have a mild pattern in subjects from the pediatric age group. The study had some limitations including the number of participants to validate the results of the study further study with more subjects is needed. The data for BMI and long-term assessment was not done in the present study.

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TABLES

S. No	Parameters	Percentage (%)	Number (n=100)
1.	**Age range**		
a)	1 month- 1 year	19	19
b)	1 year-5years	31	31
c)	5-10 years	23	23
d)	10-15 years	21	21
e)	15-18 years	6	6
2.	**Gender**		
a)	Males	59	59
b)	Females	41	41
3.	**Contact with COVID-19-positive subjects**	91	91
4.	**Overcrowding**	34	34
5.	**Symptoms**		
a)	Headache	5	5
b)	Diarrhea	5	5
c)	Malaria	7	7
d)	Sore throat	13	13
e)	Cough	16	16
f)	Fever	34	34

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6.	**Illness severity**		
a)	Asymptomatic	0	0
b)	Mild	3	3
c)	Moderate	39	39
d)	Severe	58	58
7.	**Socioeconomic status**		
a)	Upper lower	11	11
b)	Lower middle	43	43
c)	Upper middle	46	46

Table 1: Demographic and disease characteristics of the study subjects

S. No	Parameters	Value
1.	**High C-reactive protein n (%)**	31 (31)
2.	**Leucopenia n (%)**	31 (31)
3.	**Absolute eosinophil count (10^9/L)**	154 (68.3-437.3)
4.	**Absolute monocyte count (10^9/L)**	574 (402.3-742)
5.	**Absolute lymphocyte count (10^9/L)**	4073 (2914-5966)
6.	**Absolute neutrophil count (10^9/L)**	2482 (1995.3-3337)

Table 2: Laboratory investigations in the child subjects with COVID-19 in the present study