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Clinical Characteristics and Outcomes of Paediatric Patients with Coronavirus Disease (COVID-19): An observational study

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Abstract
Background: Coronavirus disease 2019 (COVID-19) caused by SARS-CoV-2 has spread throughout the world and reports of children with COVID-19 are increasing. This study was conducted to assess the clinical features and outcome of COVID-19 in children.
Materials & Method: This observational study was conducted on RT-PCR positive COVID-19 admitted children up to 14 years of age from May 2020 to November 2020 at the Pediatric Department of J K hospital Bhopal MP India. Data were analysed after collection of demographic and clinical data of 14 enrolled children.
Results: The mean age was 33.86±46.34 months with a male-female ratio of 1:1. More than half (68.75%) of the children had positive blood group O and the mean hospital stay was 6.79±7.06 days. Mean duration between contact & appearance of symptom was 12.5±12.56 days. The major clinical symptom was fever (100%). Next most common presenting symptoms were loose stool, vomiting & abdominal pain (50%), and convulsion (25%). The severity classification of COVID-19 is as follows; asymptomatic [n = 0, 0%], mild [n = 7, 23%], moderate [n = 16, 50%], severe [n = 5, 15.62%], critical [n = 1, 3.12%]. Three children were admitted to high dependent unit (HDU) and one intensive care unit (ICU) respectively.
Conclusion: Symptoms of COVID-19 in children are mild, and most patients may experience gastrointestinal symptoms such as loose stools, abdominal pain, and febrile seizures. The findings of this study could help make an appropriate early diagnosis and thus control the epidemic.

Keywords: Coronavirus disease 2019, SARS-CoV-2, pediatric

Introduction

At the end of December 2019, a new type of coronavirus pneumonia has appeared in the city of Wuhan. The World Health Organization named this new coronavirus pneumonia COVID-19. This virus has spread to other parts of the country, as well as to other countries and regions of the world. The World Health Organization declared COVID-19 a pandemic on March 11, 2020 (WHO, 2020) for spreading to almost the entire world [1]. The infection rate was highest in the US (14,584,233) and death was also higher in the US (John Hopkins, 2020) [2]. In Bangladesh, a total of 475,789 cases confirmed as COVID-19, a total of 6,807 cases died, and 395,960 people recovered as of December 6, 2020. What is currently known is that children have milder symptoms and are less likely to be hospitalized compared to adults [3]. Although COVID-19, severe acute respiratory syndrome (SARS), and Middle East respiratory syndrome (MERS) are caused by the coronavirus and can manifest with severe respiratory distress, COVID-19 has its own epidemiological and clinical characteristics [4]. In adults, COVID-19 has the characteristics of a long incubation period, strong infectivity, clinical symptoms atypical and high mortality ad in the elderly [5-7]. This study was conducted to assess the clinical profiles and outcome of novel coronavirus, SARS-CoV-2 (COVID-19) among Bhopal children.

Materials and Methods

This was a prospective study conducted at the dedicated COVID hospital J K hospital of Laxmi Narayan Medical college Bhopal Madhya Pradesh of a Central Indian tertiary care referral centre. The study protocol was approved by the Institute's Ethics Committee. All consecutive children aged 14 years or younger who tested positive for SARS-CoV-2 by real-time reverse transcription polymerase chain reaction (RT-PCR) from a nasopharyngeal and

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oropharyngeal swab were included in the study. combined between April 1, 2020 and July 15, 2020. Our centre was designated as a referral centre for COVID-19 patients (both adults and children) and patients of all severity were referred for admission. Patients were received in a triage area and admitted to the isolation ward, high dependency unit (HDU), or intensive care unit (ICU) based on assessment of disease severity [10]. The severity of COVID-19 is classified as mild, moderate, severe, and critical based on clinical or radiological features [4]. Mild cases included children with upper respiratory symptoms only. Children with lower respiratory tract involvement (clinical or radiological signs of pneumonia) but no signs of severe pneumonia or hypoxemia were classified as having moderate disease. Severe disease included children with clinical features of severe pneumonia and/or hypoxemia (SpO2 < 90% on room air) and those with severe diarrhoea and dehydration. The presence of acute respiratory distress syndrome (ARDS) and/or multiple organ dysfunction was classified as critical illness. This study included all-severe children, including asymptomatic children according to current admission policy. Laboratory investigations were performed only in children with moderate to severe symptoms and/or comorbidities. Complete blood count, liver and kidney function tests, C-reactive protein, chest X-ray and RT-PCR for H1N1 influenza were the most requested tests. Antibiotics were prescribed in children with pneumonia. Steroids and other repurposed therapies were used on a case-by-case basis. Data was collected from case files and electronic records on a pre-designed case record form. Information on demographic and clinical details, including age, gender, contact history, contact type, vaccination status, comorbidities, clinical features, and laboratory investigations, was recorded. Severity of illness, respiratory involvement, chest imaging findings, type of respiratory support, use of antibiotics, steroids, and vasoactive drugs were recorded. The outcome included length of hospital stay, recovery, and deaths.

Data related to follow-up RT-PCR tests were recorded when available. During the initial weeks, according to hospital policy, all children had a follow-up RT-PCR test after 4 days of asymptomatic period or 7 days after admission, whichever was later. If the follow-up test was positive, the test was repeated every 4 days, until it was negative. Patients were discharged after two consecutive negative RT-PCR tests 24 h apart. Time to RT-PCR negativity was calculated based on the duration between the first positive RT-PCR test and the first negative RT-PCR test of two consecutive negative tests. RT-PCR testing was performed on combined nasopharyngeal and oropharyngeal swabs immersed and transported in viral transport medium. RNA was extracted and RT-PCR was performed according to the standard protocol of the National Institute of Virology, Pune [11]. Collected data were analyzed using the SPSS (Statistical Package for Social Sciences) version 22.0 for Windows (SPSS Inc., Chicago, Illinois, USA). Qualitative variables were expressed as frequency, percentage and quantitative variables as mean ±standard deviation.

Results
A total of 145 children were screened for COVID-19 by RT-PCR at our centre, of which 6 tested positive for SARS-CoV-2. Another 26 children were referred from other health centres after a positive RT-PCR test. Thus, a total of 32

children admitted to the centre were included in this study. The mean age was 33.86±46.34 months with a male-female ratio of 1:1. More than half (68.75%) of the children had positive blood group O and the mean hospital stay was 6.79±7.06 days. Out of 32 (100%) children, 10 (31.25%) were between 1-12 months, 12 (37.5%) were 13-36 months, 6 (18.75%) were 37-60 months and 4 (12.5%) were of 61-177 months. Out of 100% (32 children), 68.75% (22 children) were O positive, 18.75% 96children) were A positive and 12.5% (4 children) were B positive. Out of 100% (32 children), 50% (16 children) were male and 50% (16 children) were females. Mean duration of hospital stay was 6.79±7.06 days. (Table 1) Most common symptom was fever seen in 32/32 (100%) of the patients with the mean duration of 5.09±2.02 days. Next most common symptom was GIT symptom e.g., loose stool, vomiting & abdominal pain which was 50%. Convulsion was found in 25% of the patient, cough, fatigue and myalgia in 50% patients, ascites in 15.62% patients, breathing difficulty in 50% patients, sore throat, redness and swelling of the hands and loss of taste or smell in 18.75% patients, more than one fourth (25%) of the patients had low SPO2. (Table 2). Only a little over half 18/32 (56.25%) had completed age-appropriate immunization though majority had received BCG at birth (30/32, 94%) and at least one dose of measles and rubella (MR) vaccine (n = 21, 68%). History of contact with COVID-19 patient was present in only 4/32(12.5%) cases. None of the children had a travel history or attended school or other mass gathering. (Table 3) 18.75% children had pneumonia. It was observed that 18/32(56.25%) of the COVID-19 children presented as acute gastroenteritis and followed by febrile convulsion in 8/32(25%) (Table 4). Nephrotic syndrome and Urinary tract infection were found in 2/32 (6.25%) and 2/32 (6.25%) cases respectively. Associated invasive diarrhoea was found in 5/32(15.62%) of the cases. Enteric fever, barter syndrome dengue fever was found in 3.12% cases. Acute severe asthma was seen in 6.25% cases. Recovery was found 100% without any mortality in this study. The severity classification of COVID-19 is as follows; asymptomatic [n = 0, 0%], mild [n = 7, 23%], moderate [n = 16, 50%], severe [n = 5, 15.62%], critical [n = 1, 3.12%]. Three children were admitted to high dependent unit (HDU) and one intensive care unit (ICU) respectively. Of 3 children who were invasively ventilated, one child was non-hypoxemic and required mechanical ventilation due to underlying neurodevelopmental illness and status epilepticus. Other two children had underlying congenital heart disease with pneumonia, heart failure and hypoxemia. Hypotensive shock was noted in 4 children; two in children with congenital heart disease and one in a child with severe diarrhoea and hypovolemia. Antibiotics (ceftriaxone and/or azithromycin) were used in 6 children and 2 received steroids. Empirical oseltamivir was given in 3 children until H1N1 influenza infection was excluded. None of the children in the present cohort received hydroxychloroquine or repurposed antivirals. Median (IQR) length of hospital stay in survivors was 6.79±7.06 (1-30) days. Follow-up RT-PCR before discharge was performed in 32 children and the median (IQR) duraeion to RT-PCR negativity was 16 (12–19) days.

Table 1: Demographic data and clinical characteristics of the children with COVID-19 (N=32)

Diagnosis	N (%)
Acute gastroenteritis	18 (56.25)
Febrile convulsion 1st attack	8 (25)
Pneumonia	6 (18.75)
Invasive diarrhoea	5 (15.62)
Nephrotic syndrome	2 (6.25)
UTI	2 (6.25)
Enteric fever	1 (3.12)
Bartter syndrome	1 (3.12)
Dengue fever	1 (3.12)
Acute severe asthma	2 (6.25)

Table 2: Distribution of the study patients by clinical findings (N=32)

Clinical features	N (%)
Fever	32 (100)
Duration of fever (in days) Mean ± SD Range (min-max)	5.09 ± 2.02 (2-10 DAYS)
Abdominal pain, vomiting, Loose motion	16 (50)
Convulsion	8 (25)
Cough	16 (50)
Edema	8 (25)
Ascites	5 (15.62)
Breathimg difficulty	16 (50)
Sore throat	6 (18.75)
Fatique, myalgia	16 (50)
Redness and swellimg of the lips And tongue	6 (18.75)
Redness and swelling of the hands And feet	6 (18.75)
Loss of taste or smell	6 (18.75)
Low SPO2 (<92%)	8 (25)

Table 3: Distribution of study patients by H/O contact (N=32)

Study patients	Frequency
H/O contact with Covid patients	4 (12.5)
H/O fever in family member	2 (6.25)
Duration between contact and appearance of Symptom Mean ± SD	12.5 ± 12.56
Range (min-max)	(2-30)

Table 4: Distribution of the study patients by disease caused after COVID-19 infection (N=32)

Diagnosis	N (%)
Acute gastroenteritis	18 (56.25)
Febrile convulsion 1st attack	8 (25)
Pneumonia	6 (18.75)
Invasive diarrhoea	5 (15.62)
Nephrotic syndrome	2 (6.25)
UTI	2 (6.25)
Enteric fever	1 (3.12)
Bartter syndrome	1 (3.12)
Dengue fever	1 (3.12)
Acute severe asthma	2 (6.25)

Discussion

Globally, children are less frequently affected by the disease. As per WHO–China joint mission report, children <18 y of age accounted for only 2.4% of 55,924 laboratory confirmed cases of COVID-19 in China, most of whom were household contacts of positive cases [8]. Similarly,

Centers for Disease Control (CDC) from USA reported 2572 patients aged <18 y amounting to 1.7% of total COVID-19 cases [9]. Data from India showed comparatively higher incidence; ICMR laboratory surveillance network reported 3.6% and 8.1% of total cases in age group 0–9 y and 10–19 y, respectively between 22 January 2020 and 30 April 2020 [10]. The illness severity in pediatric age group also seems to be milder as compared to adults [10, 11, 12, 13, 14]. Hospitalization rates for patients <18 y ranged from 5.7% to 20% in USA with only 0.6%- 2% requiring intensive care [15]. Of the 731 pediatric patients with confirmed SARS-CoV-2 infection reported from China, 12.9% were asymptomatic and 43.1% had only mild upper respiratory illness (URI). Moderate disease defined as lower respiratory tract signs in addition to URI symptoms, but without shortness of breath or hypoxemia was noted in another 41%. Only 2.5% children had severe disease with hypoxemia and 0.4% had critical illness with organ dysfunction [16]. In our centre, there were 32 confirmed cases of covid-19 in which 0% were asymptomatic, 23% were mild, 50% moderate and 15.62% were severe. Severe respiratory disease is the most concerning clinical presentation in adult patients. Initial reports during the pandemic suggested children have milder illness during acute infection [17]. In this study the mean age was 33.86±46.34 months which was near similar with the study by Hoang A *et al.* Tung Ho CL *et al.* Mustafa NM *et al.* and Guo C-X *et al.* [18-21] Male female ratio in our study was 1:1 but in other study it was 1.2:1. [18-21]. The mean duration of hospitalization was 6.79±7.06 days. Fever was the most common symptom seen in 100% of the patient which was similar with the previous study done by Sayeeda Anwar *et al.* as well as Ghosh UK *et al.* where fever was found in 89.1% and 80.28% of the patients respectively [22, 23]. Second most common symptoms were loose stool, vomiting, abdominal pain which was half (50%) of the patients. Whittaker E *et al.* and Feldstein LR *et al.* also found gastrointestinal symptom was the second most common symptom in their study [24, 25]. Convulsion was found in 25% of the patient while it was 25.4% in study by Ghosh UK *et al.* and 20% in Tan YP *et al.* [23, 24, 25, 26] In our study cough and breathing difficulty was present in 16% & 16% of patient respectively and low SPO2 was found in 8% of patients. Ghosh UK *et al.* found cough in 45.1% of the patient and breathing difficulty in 15.5% of the patient [23]. It was observed that sore throat, redness and swelling of the hands and loss of taste or smell in 18.75% patients, Ghosh UK *et al.* reported sore throat as well as anosmia in 33.8% and 2.8% respectively [23]. Mustafa NM *et al.* reported sore throat in 36% of the patients [20]. Only two (14.3%) patients had H/O fever in family member in comparison to other study like Hoang A *et al.* showed that 75.6% of patients were exposed to a family member who was diagnosed with COVID-19 [18]. The mean duration between contact & appearance of symptom was 12.5±12.56 days. Guo C-X *et al.* reported that range of incubation period was 6 to 13 days [21]. Invasive diarrhea was diagnosed in 15.62% of the patients. Similar result found in study done by Feldstein LR *et al.* where gastrointestinal symptom (90%) was most common [25]. Second most common diagnosis was febrile convulsion (28.5%). Pneumonia ware diagnosed in 18.75% of the patients, Mustafa NM *et al.* found pneumonia in 60% cases in his study [20]. It was observed that one patient need ICU care and all (100.0%) patients had recovery. The main limitations of the study are relatively smaller number of

patients and it was a single center study.

Conclusions

In the initial phase of the pandemic, most children with COVID-19 had a household contact and presented with mild and moderate illness. Severe and critical illness was observed in young infants and those with comorbidities. Majority had good outcome with recovery to hospital discharge.

References

1. WHO, WHO Director-General's Opening Remarks at the Media Briefing on COVID-19 on 2020 February, 21. https://www.who.int/dg/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19-on-21-february-2020.21?
2. Johns Hopkins. COVID-19 Global Cases. 2020. https://coronavirus.jhu.edu/map.html 3-6 = PIIS 6-9
3. Wang E, Brar K. COVID19 in children: an epidemiology study from China. J Allergy Clin Immunol Pract. 2020;8:2118-20.
4. Lu R, Zhao X, Li J, Niu P, Yang B, Wu H, *et al.* Genomic characterisation and epidemiology of 2019 Novel coronavirus: implications for virus origins and receptor binding. The Lancet. 2020;395:565-74.
5. Wang D, Hu B, Hu C, Zhu F, Liu X, Zhang J, *et al.* Clinical Characteristics of 138 Hospitalized Patients With 2019 Novel Coronavirus-Infected Pneumonia in Wuhan, China. JAMA. 2020;323:1061-69.
6. Guan WJ, Ni ZY, Hu Y, Liang WH, Ou CQ, He JX, *et al.* Clinical characteristics of coronavirus disease 2019 in China. N Engl J Med. 2020;382:1708-20.
7. Chen T, Wu D, Chen H, Yan W, Yang D, Chen G, *et al.* Clinical characteristics of 113 deceased patients with coronavirus disease 2019: retrospective study. BMJ. 2020; 368:m1091. doi: 10.1136/bmj.m1091.
8. WHO-China Joint Mission. Report of the WHO-China Joint Mission on Coronavirus Disease 2019 (COVID-19). 2020. Available at: https://www.who.int/docs/default-source/coronaviruse/who-china-joint-mission-on-covid-19-final-report.pdf.
9. CDC. COVID-19 Response Team. Coronavirus disease 2019 in children-United ICMR COVID Study Group, COVID Epidemiology & Data Management Team, COVID Laboratory Team, Virus Research & Diagnostic Laboratory Network (VRDLN) Team. Laboratory surveillance for SARS-CoV-2 in India: performance of testing & descriptive epidemiology of detected COVID-19, January 22-April 30, 2020. Indian J Med Res. 2020;151(5):424-37.
10. Dong Y, Mo X, Hu Y, *et al.* Epidemiology of COVID-19 among children in China. Pediatrics. 2020;145(6):e20200702. https://doi.org/10.1542/peds.2020-0702.
11. Castagnoli R, Votto M, Licari A, *et al.* Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection in children and adolescents: a systematic review. JAMA Pediatr. 2020. https://doi.org/10.1001/jamapediatrics.2020.1467
12. Patel NA. Pediatric COVID-19: systematic review of the literature. Am J Otolaryngol. 2020;41:102573.
13. Ma X, Liu S, Chen L, Zhuang L, Zhang J, Xin Y. The clinical characteristics of pediatric inpatients with SARS-CoV-2 infection: a meta-analysis and systematic review. J Med Virol. 2020. https://doi.org/10.1002/jmv.26208.
14. Raba AA, Abobaker A, Elgenaidi IS, Daoud A. Novel coronavirus infection (COVID-19) in children younger than one year: A systematic review of symptoms, management and outcomes [published online ahead of print, 2020 Jun 17]. Acta Paediatr, 2020. https://doi.org/10.1111/apa.15422.
15. Lu X, Zhang L, Du H, *et al*; Chinese Pediatric Novel Coronavirus Study Team. SARS-CoV-2 infection in children. N Engl J Med. 2020;382:1663-5.
16. Dhanalakshmi K, Venkataraman A, Balasubramanian S, Madhusudan M, Amperayani S, Putilibai S, *et al.* Epidemiological and clinical profile of pediatric inflammatory multisystem syndrome - temporally associated with SARS-CoV-2 (PIMS-TS) in Indian children. Indian Pediatr. 2020;57:1010-14.
17. Hoang A, Chorath K, Moreira A, Morton F, Burmeister F *et al.* COVID-19 in 7780 pediatric patients: a systematic review. E Clinical Medicine. 2020. DOI: https//doi.org/ 10.1016/j.eclinm.2020.100433
18. Tung Ho CL, Oligbu P, Ojubolamo O, Pervaiz M, Oligbu G. Clinical Characteristics of Children with COVID-19. AIMS Public Health. 2020;7:258-73.
19. Mustafa NM, Selim AL. Characterisation of COVID-19 pandemic in paediatric age group: a systematic review and meta-analysis. J Clin Virol. 2020. doi:10.1016/ j.jcv.2020.104395.
20. Guo CX, He L, Yin JY, Meng XG, Tan W, Yang GP, *et al.* Epidemiological and clinical features of pediatric COVID-19. BMC Med. 2020;18:250. https//doi.org/10.1186/ s12916-020-01719-2.
21. Sayeeda Anwar, Iffat Ara Shamsad, AKM Amirul Morshed, Fatema Farzana. Clinical Profile of Child COVID-19 Patients of Bangladesh. American Journal of Pediatrics. 2021;7:5-8.
22. Ghosh UK, Sultana A, Ghosh NK, Akram A, Ahmed E, Rana IH, Choudhury AM. Clinico-demographic Profile of Coronavirus Infection among Bangladeshi Children: A Tertiary Care Hospital Study. Bangladesh J Infect Dis. 2020;7:S16-S21.
23. Whittaker E, Bamford A, Kenny J, Kaforou M, Jones C, Shah P, *et al.* Clinical Characteristics of 58 Children With a Pediatric Inflammatory Multisystem Syndrome Temporally Associated With SARS-CoV-2. JAMA. 2020;324:259-69.
24. Feldstein LR, Rose EB, Horwitz SM, Collins JP, Newhams MM, Son MBF, *et al.* Multisystem Inflammatory syndrome in U.S. children and adolescents. N Eng J Med. 2020;383:334-6.
25. Tan YP, Tan BY, Pan J, Wu J, Zeng SZ, Wei HY. Epidemiologic and Clinical Characteristics of 10 Children with Coronavirus Disease 2019 in Changsha, China. J Clin Virol, 2020. DOI: 10.1016/j.jcv.2020.104353