



A COMPARATIVE STUDY OF CLINICAL MANIFESTATION OF SUSPECTED COVID-19 PAEDIATRIC PATIENTS ADMITTED IN FIRST AND SECOND WAVE IN A TERTIARY CARE CENTRE.

Medical Science

Dr. Amit Kumar*	Ex-Senior Resident, Department of Pediatrics, Anugrah Narayan Magadh Medical College & Hospital, Gaya. *Corresponding Author
Dr. Bankey Bihari Singh	Associate Professor & Head, Department of Pediatrics, Anugrah Narayan Magadh Medical College & Hospital, Gaya.
Dr. Ravindra Kumar	Associate Professor, Department of Pediatrics, Anugrah Narayan Magadh Medical College & Hospital, Gaya
Dr. Saroj Kumar	Assistant Professor, Department of Pediatrics, Nalanda Medical College & Hospital, Patna

ABSTRACT

INTRODUCTION: COVID-19 pandemic caused by severe acute respiratory syndrome corona virus 2 (SARS-CoV-2) is a major public health crisis threatening humanity at this point of time. Transmission of the infection occurs by inhalation of infected droplets or direct contact with soiled surfaces and fomites. Clinical manifestations are similar to any acute respiratory viral infection with nasal symptoms less pronounced. The clinical characteristics, progression of disease and outcome in children and young adults appear significantly milder compared to older individuals. In children's case fatality rate is low. Many countries including India have witnessed a two-wave pattern in reported cases of corona virus disease-19. Diagnosis can be confirmed by Reverse transcriptase – Polymerase chain reaction (RT-PCR) on respiratory specimen (commonly nasopharyngeal and oropharyngeal swab). Many paediatric patients presented with Covid like symptoms, but tested RTPCR (Real Time Polymerase Chain Reaction) negative for COVID-19 both in first as well as second wave. Management is mainly supportive care.

MATERIAL AND METHODS: A prospective observational study of all admitted cases of SARS-CoV in the first wave between April-June 2020 and second wave between March- May 2021 in the Department of Paediatrics in ANMMCH Gaya was done. Case records were analyzed for age and sex of the patient, the residence of hotspot area, history of contact with positive covid-19 cases, clinical manifestations, treatment and outcome were recorded. Data were collected and statistical analyses were done using SPSS statistical software version 25.

RESULTS: The number of patients admitted was 25 in the first wave and 20 in second wave. 64% of patients admitted on the basis of severe acute respiratory infection (SARI) in first wave, 30% were patients in second wave. 12% of patients had a history of contact in first wave, 15% patients in second wave. 72% of children resided in hotspot area in first wave, 75% of patients in second wave. Among the clinical characteristics, the most frequent sign and symptom in first wave was fever, difficulty in breathing, cough/cold and altered sensorium. Patients from the second wave more commonly presented with a higher frequency of gastrointestinal symptoms (loose stools, vomiting). The most relevant co-morbidity in first wave was Thalassemia.

CONCLUSION: There was a difference in the clinical manifestation in patients admitted in both waves of covid-19. The Majority of children admitted as per the testing criteria were found to be COVID negative.

KEYWORDS

Covid-19, SARS-CoV-2, SARI

INTRODUCTION :

Coronavirus disease 2019 (COVID-19) caused by severe acute respiratory syndrome coronavirus 2 (SARSCoV-2) is a major public health crisis. The virus possibly originated in bats and was transmitted to humans through yet unknown intermediary animals in Wuhan, Hubei province, China in December 2019^{1,2}. As per the WHO estimates of 16th April 2020, there were 1,991,562 cases, and 130,885 deaths³. In India, the reported cases as on 16th April were 12949 cases and 437 deaths⁴. Primary modes of transmission of disease are direct inhalation of infected droplets (produced during coughing or sneezing by infected person) and direct contact with surfaces and fomites soiled by infected respiratory secretions. Special situations associated with aerosol generation (cardiopulmonary resuscitation, endotracheal intubation, open suctioning, bronchoscopy, nebulisation and use of non-invasive ventilation) can lead to aerosol generation and spread. Virus has also been isolated from stool samples but spread of infection by the feco-oral route is not established⁵. Duration of viability of virus on objects and surfaces may be few hours to few days; the survival duration is likely to be considerably low at higher temperature and low humidity conditions⁶. The incubation period has been assessed to be 5.1 days while 101 in 10,000 patients have developed symptoms after 14 days⁷. The clinical symptoms are similar to that of any other acute respiratory viral infection and include fever, cough, cold, sore throat, breathlessness, loose stool, vomiting etc. It has been found that nasal symptoms are less pronounced in SARS-CoV-2 infection. The disease is mild in 80% of the reported cases. The disease is often severe progressing to acute respiratory distress syndrome (ARDS) and multi organ dysfunction in those with co-morbidities and elderly⁸. The case fatality rate is estimated to range from 0.25 to 3%; it is much higher in elderly and those with co-morbidities⁹.

Among over 72,000 COVID-19 cases from China, only 1.2% of the patients were children 10 to 19 years of age, and 0.9% children's were under 10 years of age¹⁰. The clinical characteristics, disease

progression and outcome in children and young adults appear significantly milder compared to older individuals¹¹.

Many countries including India have faced two-wave pattern in cases of corona virus disease-19 during the 2020 pandemic, with a first wave during spring followed by the current second wave in late summer and autumn¹⁵⁻¹⁸. The characteristics of the effects of the virus do vary between the two periods¹⁹. Many paediatric patients showed Covid like symptoms, but tested RTPCR (Real Time Polymerase Chain Reaction) negative for COVID-19 both in first as well as second wave. Although the comparative characteristics of the two waves remain largely unknown, the differences in the clinical manifestation and severity of the disease have been reported in the paediatric age group [14]. Therefore this study was conducted to find the clinical manifestation of hospitalized suspected COVID-19 paediatric patients using data from two waves. The first period, between April to June 2020 corresponding to the entire first wave, and the second, between March and May 2021, corresponding to the entire second wave.

MATERIALS & METHODS

This prospective study analyzed the clinical profile of 25 children's admitted in first wave and 20 children's admitted in second wave to the Department of Pediatrics, ANMMCH Gaya from April 2020 to June 2020 & March 2021 to May 2021 respectively. Informed consent was taken from parents or relatives. Statistical comparisons between two groups were made using the chi-square test χ^2 (categorical variables) or the Student's t-test. Statistical significance was set at $p \leq 0.05$. All data were entered into an excel sheet and calculations were made using the SPSS 25.0 statistical package.

RESULTS:

During the study period, a total of 45 patients, 25 in the first wave and 20 in the second wave was admitted in the COVID suspect ward, following the ICMR guidelines and on the basis of clinical suspicion.

The first wave peaked in April 2020 and was followed by a progressive decrease with very few patients being admitted in July (2020) and August (2020) in first wave and again a sharp rise in March -April (2021) corresponding to second wave.

Male to female ratio was 1.5 in first and second wave of Covid - 19. Age group in the study was between 1- 15year, peak age in first wave was 5-7 year & 3-5 year in second wave respectively.

Table 1; ICMR criteria for suspicion & history of contact with COVID positive adults in the children's in first and second wave.

parameters	Subgroup		COVID First wave (n=25)	COVID Second wave (n= 20)	Total (n= 45)	P value
Severe Acute Respiratory infection	Yes	Number (%)	16(64%)	6(30%)	22(48.9%)	P= 0.023
	No	Number (%)	9(36%)	14(70%)	23(51.1%)	
History of contact with a COVID positive adults	Yes	Number (%)	3(12%)	3(15%)	6(13.3%)	P= 0.769
	No	Number (%)	22(88%)	17(85%)	39(86.7%)	
Resident of hotspot area	Yes	Number (%)	18(72%)	15(75%)	33(73.3%)	P= 0.821
	No	Number (%)	7(28%)	5(25%)	12(26.7%)	

A chi-square test of association showed history of contact and resident of hotspot among first and second wave of Covid -19. Higher proportion of presence of history of contact and resident of hotspot area in second wave of COVID -19 as compare to first wave (15% vs 12%) and (75% vs 72%) respectively. There was a no statistically significant association between history of contact and resident of hotspot area among first and second wave of Covid -19 $\chi^2(1) = .087, p = 0.769$ & $\chi^2(1) = 0.051, p = 0.821$. A chi-square test showed that there was a statistically significant association between SARI among first and second wave of Covid -19 $\chi^2(1) = 5.14, p = 0.02$. Higher proportion of presence of SARI in first wave of COVID -19 as compare to second wave (64% vs 30%).

A chi-square test of association was conducted between fever, cough, cold, and altered sensorium among first and second wave of Covid -19. Higher proportion of presence of fever, cough, cold, and altered sensorium in first wave of COVID -19 as compare to second wave (88% vs 60%), (52% vs 40%), (48% vs 45%) and (4% vs 0%) respectively. There was a statistically significant association between fever and first and second wave of Covid -19 $\chi^2(1) = 4.71, p = 0.03$ no statistically significant association between cough, cold, and altered sensorium among first and second wave of Covid -19 ($p < 0.05$).

Test of association between difficulty in breathing among first and second wave of Covid -19. Higher proportion of presence of difficulty in breathing in first wave as compare to second wave of covid-19 (44% vs 15%). There was a statistically significant association between difficulty in breathing among first and second wave of Covid -19 $\chi^2(1) = 4.3, p = 0.03$

A chi-square test of association was conducted between loose stools and vomiting among first and second wave of Covid -19. Higher proportion of presence of loose stools and vomiting in second wave as compared to first wave of covid-19 (40% vs 12%) and (45% vs 16%) respectively. There was a statistically significant association between loose stools & vomiting among first and second wave of Covid -19 (p -value < 0.05). The most relevant co-morbidity in 1st wave was thalassemia with 4 case in 1st wave and no thalassemia patient was admitted in 2nd wave $\chi^2(1) = 3.51, p = 0.061$

DISCUSSION :

In the present study, a total of 45 patients, 25 in the first wave and 20 in the second wave was admitted to the COVID suspect ward, following the ICMR guidelines and on the basis of clinical suspicion. All the children's admitted was tested Covid RTPCR ((Real Time Polymerase Chain Reaction) negative. In the first wave 64% & in second wave 30% were admitted on the basis of SARI criteria, 15% having a history of contact with Covid positive adults and in first wave and 12% having a history of contact with Covid positive adults in second wave.

72% of patients resided in the hotspot area in first wave, 75% in second wave. In our study, most frequent sign & symptoms in first wave was fever, respiratory symptoms (cough, cold, difficulty in breathing) and seizures, whereas in second wave gastrointestinal symptoms (loose stools, vomiting) were most common. The majority of children were asymptomatic or had mild illnesses²¹⁻²³. Besides the most commonly reported symptoms of fever, cough, and breathlessness²³⁻²⁴, studies have also reported various other symptoms in children which include gastrointestinal symptoms²⁵. Less expression of the ACE-2 receptors (primary target receptors of SARS CoV-2), strong innate immune response due to different vaccinations, and relative lack of co-morbid conditions, smoking and obesity^{26,27} explain low incidence of Covid 19 in children's. Recently it has been investigated that, MMR (Measles, Mumps, Rubella) vaccine has a protective role against the infection^{27,28}. Thalassemia was most common co-morbid condition in first wave.

CONCLUSION

The present study shows that Respiratory symptoms (fever, difficulty in breathing, cough, cold) and altered sensorium were more frequent in the first wave and gastrointestinal symptoms (vomiting, loose stools) were more frequently found in second wave.

REFERENCES

- Singhal T. A review of coronavirus disease-2019 (COVID-19). *Indian J Pediatr.* 2020; 87:281–6.
- Zhu N, Zhang D, Wang W, et al. A novel coronavirus from patients with pneumonia in China, 2019. *N Engl J Med.* 2020; 382:727–33.
- Coronavirus disease (COVID-19) outbreak situation. Available at: <http://www.who.int/emergencies/diseases/novel-coronavirus-2019>. Accessed 17 April 2020.
- COVID-19 Available at: <http://mygov.in/covid-19/>. Accessed 17 April 2020.
- Wang W, Xu Y, Gao R, et al. Detection of SARS-CoV-2 in different types of clinical specimens. *JAMA.* 2020. <https://doi.org/10.1001/jama.2020.3786>.
- van Doremalen N, Bushmaker T, Morris DH, et al. Aerosol and surface stability of SARS-CoV-2 as compared with SARS-CoV-1. *N Engl J Med.* 2020. <https://doi.org/10.1056/NEJMc2004973>.
- Lauer SA, Grantz KH, Bi Q, et al. The incubation period of coronavirus disease 2019 (COVID-19) from publicly reported confirmed cases: estimation and application. *Ann Intern Med.* 2020. <https://doi.org/10.7326/M20-0504>.
- Guan W-J, Ni Z-Y, Hu Y, et al. Clinical characteristics of coronavirus disease 2019 in China. *N Engl J Med.* 2020. <https://doi.org/10.1056/NEJMoa2002032>.
- Wilson N, Kvalsvig A, Barnard LT, Baker MG. Case-fatality risk estimates for COVID-19 calculated by using a lag time for fatality. *Emerg Infect Dis.* 2020. <https://doi.org/10.3201/eid2606.200320>.
- Wu, Z. & McGoogan, J. M. Characteristics of and important lessons from the Coronavirus disease 2019 (COVID-19) outbreak in China: summary of a report Of 72314 cases from the Chinese centre for disease control and prevention. *JAMA* (2020).
- Balasubramanian S, Rao NM, Goenka A, Roderick M, Ramanan AV. Coronavirus Disease 2019 (COVID-19) in Children - What We Know So Far and What We Do Not. *Indian Pediatr.* 2020 May 15; 57(5):435-442. Doi: 10.1007/s13312-020-1819-5. Epub 2020 Apr 9. PMID: 32273490; PMCID: PMC7240240.
- Vahidy FS, Drews AL, Masud FN, Schwartz RL, Boom ML, Phillips RA, et al. Characteristics and outcomes of COVID-19 patients during initial peak and Resurgence in the Houston metropolitan area. *JAMA.* 2020; 324: 998-1000. <https://doi.org/10.1001/jama.2020.15301>.
- Fan G, Yang Z, Lin Q, Zhao S, Yang L, He D. Decreased case fatality rate of COVID-19 in the second wave: a study in 53 countries or regions. *Transbound Emerg Dis.* 2020; <https://doi.org/10.1111/tbed.13819>. Epub ahead of print.
- Saito S, Asai Y, Matsunaga N, Hayakawa K, Terada M, Ohtsu H, et al. First and second COVID-19 waves in Japan: A comparison of disease severity and Characteristics: Comparison of the two COVID-19 waves in Japan. *J Infect.* 2020; S0163-4453(20)30693-9. <https://doi.org/10.1016/j.jinf.2020.10.033>.
- Renardy M, Eisenberg M, Kirschner D. Predicting the second wave of COVID-19 in Washtenaw County, MI. *J Theor Biol.* 2020; 507: 110461. <https://doi.org/10.1016/j.jtbi.2020.110461>.
- Looi MK. Covid-19: Is a second wave hitting Europe? *BMJ.* 2020; 371: m4113. <https://doi.org/10.1136/bmj.m4113>.
- Win A. Rapid Rise of COVID-19 second wave in Myanmar and implications for the Western Pacific Region. *QJM.* 2020; hcaa290. <https://doi.org/10.1093/qjmed/hcaa290>.
- Ballester-Arnal R, Gil-Llario MD. The virus that changed Spain: Impact of COVID-19 on people with HIV. *AIDS Behav.* 2020; 1-5. <https://doi.org/10.1007/s10461-020-02877-3>.
- Long SW, Olsen RJ, Christensen PA, Bernard DW, Davis JI, Shukla M, et al. Molecular architecture of early dissemination and massive second wave of the SARS-CoV-2 virus in a major metropolitan area. *mBio.* 2020; 11:e02707-20. <https://doi.org/10.1128/mBio.02707-20>.
- Ifimie S, López-Azcona AF, Vallverdú I, Hernández-Flix S, de Febrer G, Parra S, et al. First and second waves of coronavirus disease-19: A comparative study in hospitalized patients in Reus, Spain. *PLoS One.* 2021 Mar 31; 16(3): e0248029. doi: 10.1371/journal.pone.0248029. PMID: 33788866; PMCID: PMC8011765.
- Yuki K, Fujiogi M, Koutsogiannaki S. COVID-19 Pathophysiology- A Review. *Clin Immunol.* 2020; 215: 108427.
- Pokorska-Spiwak, M., Talarek, E., Popielska, J. et al. Comparison of clinical severity and epidemiological spectrum between coronavirus disease 2019 and influenza in children. *Sci Rep* 11, 5760 (2021). <https://doi.org/10.1038/s41598-021-85340-0>
- Eleanor Bird. MMR vaccine could prevent worst symptoms of COVID-19. *Medical NewsToday*. July 4, 2020. Available at [Article: <https://www.medicalnewstoday.com/articles/mmr-vaccine-could-prevent-worst-symptoms-of-covid-19#training-the-immune-system>]
- Qiu H, Wu J, Hong L, Luo Y, Song Q, Chen D. Clinical and Epidemiological Features of 36 Children with Coronavirus Disease 2019 (COVID-19) in Zhejiang, China- An Observational Cohort Study. *Lancet Infect Dis.* 2020; 20(6):689-696.
- Chiotos K, Bassiri H, Behrens EM, Blatz AM, Chang J, Diorio C, et al. Multisystem Inflammatory Syndrome in Children during the COVID-19 Pandemic- a case series. *J Pediatr Infect Dis Soc.* 2020; 9(3):393-398.
- Tian Y, Rong L, Nian W, He Y. Review Article. Gastrointestinal Features in COVID-19 and the Possibility of Faecal Transmission. *Aliment Pharmacol Ther.* 2020; 51(9):843-851.
- Dr. Surabhi Chandra, Dr. Gunjan Kochar, Dr. Lahar Sahai, Dr. Rahul Jaiswal, & Dr. Akansha Bajwa. (2020). Clinical profile and outcome of suspect pediatric COVID-19 patients: Experience from a COVID hospital. *Pediatric Review:International Journal of Pediatric Research.* 7(6), 237-241.
- Zimmermann, P. & Curtis, N. Corona virus infections in children including COVID-19. An overview of the epidemiology, clinical features, diagnosis, Treatment and prevention options in children. *Pediatr. Infect. Dis. J.* 39, 355–368, 2020; 39(6):469-477. (2020).