VOLUME - 11, ISSUE - 04, APRIL - 2022 • PRINT ISSN No. 2277 - 8160 • DOI : 10.36106/gjra

Original Research Paper

Paediatrics

CLINICAL PROFILE AND OUTCOME OF PEDIATRIC COVID-19 DURING SECOND WAVE IN GUJARAT, INDIA; A CROSS-SECTIONAL STUDY.

Ameya Naik*	Intern at Indian Institute of Public Health Gandhinagar, Gandhinagar, Gujarat, India.*Corresponding Author
Dr. Hiral Naik	DCH, DNB, Consultant pediatrician, Director of Shishoo-Care hospital, Ahmedabad, Gujarat, India.
Dr. Premal Naik	MS, DNB, Honorary Pediatric Orthopedic Surgeon NHL Municipal Medical college, Director of Rainbow superspeciality hospital, Ahmedabad, Gujarat, India.
Dr. Kranti Vora	MD, MPH, PhD, Additional Professor Indian Institute of Public Health Gandhinagar, Gandhinagar, Gujarat, India.

ABSTRACT

Objective: Compared to the adults there is paucity of literature regarding manifestation of COVID-19 in children. We decided to study the clinical manifestation of COVID-19 in children during the second wave of COVID-19 pandemic in Gujarat, India.

Method: A cross-sectional survey study was designed for children with COVID-19 infection. An online survey form was designed with demographic details, details of clinical manifestations, investigations, treatment and recovery time. The survey was filled by 573 parents of which 539 were included in the study.

Results: Of the 539 patients, 72.5 % of the patients presented in April($p<0.000$). The child was the index case in only 7.4% of cases. There was a higher incidence of cases in boys (53.2%) ($p<0.000$) and in 0-5 years age group (39.5%) ($p<0.00$). The common presenting symptoms were fever (91.9%), cough/cold (52.4%), headache (19.5%), body-ache (23.6%), and gastrointestinal symptoms (21.1%). There was an age-wise variability in symptoms. Majority of the patients (98.2%) recovered with home treatment; only 1.8% required hospitalization. Complete resolution of symptoms occurred within a week in 78% of the patients($p<0.000$). There was no mortality in our study.

Conclusion: Children affected with COVID-19 during the second wave in Gujarat had mild disease. The child was index case in only a few cases and contracted COVID-19 from adult household contact. Most children recovered with home treatment and the course of the disease was short.

KEYWORDS : COVID-19, pediatric COVID-19, COVID-19 second wave, COVID-19 in children in Gujarat, India

INTRODUCTION:

Coronavirus disease 2019 (COVID-19) is caused by novel coronaviruses SARS-CoV-2 (Severe Acute Respiratory Syndrome Coronavirus-2)[1]. World Health Organization officially classified COVID-19 as a pandemic on 11th March 2020 [1]. The virus has resulted in 288,891,248 cases and 5,455,755 deaths worldwide as of 31st December 2021. India reported a total of 34,838,804 cases and 481,080 deaths from March 2020 to December 2021[2].

To date, India has experienced two waves of COVID-19 and is undergoing the third wave[3]. The second wave of COVID-19 in India lasted from February to June 2021 and was caused by the delta variant, B.1.617.2[4]. The delta variant (B.1.617.2) emerged as a highly contagious variant, approximately twice as infectious as the previous strains[4]. This higher infectiousness and transmissibility caused a surge in cases during the second wave affecting many children[5].

In the first wave China reported only 2.2% cases in children (<19 years)[6] while USA reported 1.7% cases (<18 years)[7]. In a systematic review Ludvigsson reported that children accounted for less than 5% of COVID-19 cases between January to March 2020 and had milder symptoms compared to adults[8]. In a sero-surveillance report, India reported less than 12% incidence of COVID-19 in individuals younger than 20 years[9]. During first wave many authors found COVID-19 infection in children, mainly asymptomatic or with mild symptoms and with a short duration of the illness [8,9,10,11,12],. The risk of mortality was very low in children during first wave of COVID-19 pandemic[8,13] .

Compared to adults, there is paucity of literature for pediatric COVID-19. There are many studies about clinical presentation and severity of pediatric COVID-19 during the first wave[6,7,8,11,13], but there are very few studies on pediatric COVID-19 during the second wave. Therefore, we decided to study the manifestations of COVID-19 in children ≤ 18 years during the second wave of the pandemic in Gujarat, India. The results obtained from the study would help analyze the effects of COVID-19 in children and facilitate future planning.

METHOD:

The manifestations of COVID-19 in children ≤ 18years was investigated through a cross-sectional survey in August 2021.

The inclusion criteria for selecting participants were:

1. Patient should be ≤18 years old.
2. Patient should be residing in Gujarat, India.
3. Patients should have tested positive between February 2021 - June 2021 by Reverse Transcriptase-Polymerase Chain Reaction (RT-PCR) or Rapid Antigen Test (RAT).

An online survey form was created for data collection of patients. Confirmed COVID-19 positive children were sent a survey form after obtaining the consent of their treating pediatrician. As the study involved children ≤18 years, their parents were asked to fill the survey form. Patients with post-COVID Multisystem inflammatory syndrome in children (MIS-C) were excluded.

Survey forms were in English with no identifiers or personal information of the participants. The privacy and anonymity of the participants were maintained throughout the study. At the outset, the participants were informed about the study and their consent was obtained. The participants were not subjected to any adverse risks or discomfort. Ethical clearance was obtained from the Institutional Ethics Committee.

The survey form included 1) Demographic questions - age, sex, area of residence, size of family, 2) Family details - details of the index case, number of infected family members, and mortality in the family,

3) Investigations - mode of the diagnosis, and other supporting investigations, 4) Symptoms, 5) Treatment - home treatment or hospitalization, treatment details, and recovery period. The patients requiring admission also filled in the details about their hospitalization.

Total 750 survey forms were sent, of which 573 participants responded. Out of 573 responses, 34 were rejected as they did not meet inclusion criteria. Finally, 539 COVID-19 pediatric patients were included in this study.

Statistical analysis

The data was processed through the Statistical Package for the Social Sciences (SPSS) version 23. We applied the chi-square test where the value of statistical significance was set to 0.05. Descriptive analysis, namely percentage calculation, was conducted to analyze the data.

From the 539 responses, the patients were distributed into three age groups: 0-5 years (39.5%), 6-10 years (33.6%), and 11-18 years (26.9%). The incidence was found to be higher in the age group of 0-5 years which was statistically significant ($p<0.000$). There was a statistically significant (53.2%) preponderance in males ($p<0.000$). (Table I) Majority of the responders were from urban areas (95.0%), with only 5.0% from rural areas ($p<0.000$). Children infected between February to August 2021 were included in our study and divided in three groups depending on the month of infection, 1) before April (February and March), 2) April, and 3) after April (May and June). Majority of cases (72.5%) were reported in April (Table I). We found that the child was index case only in 7.4% of cases; father (36.1%), mother (21.6%) were more frequently the index cases (Table I). Grandparents were the index cases in 15.1% and siblings, house-help, and relatives were index cases in 13.2% of the cases. Index cases were not known in 6.6% cases. Comparing the child with other adult family members as the index case, the difference was found to be statistically significantly ($p<0.000$). (Table I)

Majority of the patients (97.4%) were diagnosed within three days of developing symptoms ($p<0.000$). RT-PCR was the most common diagnostic modality (91.8%). (Table I) Additional hematological investigations were ordered in 63.3% of the patients while only 3.2% underwent a CT-Scan of thorax and 2.2% had a chest X-Ray.

Table I: Demographic details

Variable	*Categories*	*Total*	*Proportion*
Age	0-5 years	213	39.5%
	6-10 years	181	33.6%
	11-18 years	145	26.9%
Sex	Male	287	53.2%
	Female	252	46.8%
Month of positive	Before April*	37	6.9%
	April	391	72.5%
	After April**	111	20.6%
Index case (n= 538)	Father	194	36.1%
	Mother	116	21.6%
	Child	40	7.4%
	Others***	188	34.9%
Diagnosis	RT-PCR	495	91.8%
	RAT	60	11.1%
Day of diagnosis (n=503)	1 day	258	51.3%
	2 days	139	27.6%
	3 days	93	18.5%
	≥ 4 days	13	2.6%

*February & March, **May & June, ***grand parents, siblings, househelp, other relatives, unknown

While analyzing clinical features, 94.2% of the patients were symptomatic and 5.8% were asymptomatic. (Table II) The asymptomatic patients were diagnosed during routine screening after exposure to COVID-19 family members. Among the symptomatic patients, five common symptoms were fever (91.9%), cough/cold (52.4%), headache (19.5%), body-ache (23.6%), and gastrointestinal symptoms (21.1%). (Table II) Gastrointestinal symptoms comprised of diarrhea, vomiting, abdominal pain, constipation, loss of appetite, and flatulence. Few patients experienced additional symptoms like loss of smell and/or taste, skin rash, conjunctivitis, oral ulceration, and breathlessness. Analysis of age-wise differences in the symptoms found that the incidence of body ache was most common in the higher age group of 11-18 years (46.7%), followed by age-group 6-10 years (35.0%), and least in patients from 0-5 years (18.3%). The symptoms of loss of smell and/or taste were also highest in the age group of 11-18 years (65.4%), followed by 6-10 years (30.8%), and least in 0-5 years (3.8%). Of the 99 children with headache, 85.9% were from the combined age group of 6-18 years.

Table II: Clinical manifestations and treatment details

Variable	*Categories*	*Total*	*Proportion*
Symptom development	Asymptomatic	31	5.8%
	Symptomatic	508	94.2%
Common symptoms (n=508)	Fever	467	91.9%
	Cough/ cold	266	52.4%
	Headache	99	19.5%
	Body ache	120	23.6%
	Gastrointestinal	107	21.1%
	Loss of taste and/or smell	52	10.2%
Treatment	Home treatment	528	98.2%
	Hospitalisation	10	1.80%
Recovery (n=528)	1-3 days	184	34.8%
	4-7 days	228	43.2%
	1-2 weeks	82	15.5%
	≥ 2 weeks	34	6.4%

Majority of the patients (98.2%) recovered with home treatment under physician monitoring. Complete resolution of symptoms occurred within a week in 78% of the patients; in 22%, recovery took two weeks or more ($p<0.000$). (Table II) Only 10 children (1.8%) required hospitalization, of which, 7 were hospitalized in the first week of diagnosis for dehydration, fever management, and parental anxiety, while 3 were hospitalized in the second week. (Table III) The three children admitted in second week had pulmonary involvement on CT scan and were given Remdesivir and steroids; two of them had desaturation and breathlessness requiring oxygen. All admitted patients recovered and there was no mortality in our study. (Table III)

Table III: Details of hospitalized patients

Age distribution	0-5	3
	6-10	3
	11-18	4
Interval between diagnosis & hospitalization	Within 1 week	7
	After 1 week	3
Type of treatment	Supportive	5
	Additional *	5
Duration of hospitalization	≤ 1 week	9
	> 1 week	1

*Remdesivir, Oxygen, Steroids

DISCUSSION:

Vaccination for children < 18 years did not start in India in the year 2021, hence they remained susceptible to COVID-19

during the second wave. The epidemiology, symptomatology, and outcome of COVID-19 disease in children during second wave is not very well reported in India. Such study will be helpful for future management strategies and formulating COVID-19 public health policy for children.

To the best of our knowledge, ours is amongst the very few studies studying the manifestation of COVID-19 in children ≤ 18 years in outpatient settings. The responders of our survey were mainly from urban area of Gujarat, India. Majority of the children (72.5%) got infected in April, which coincided with the peak of second wave in Gujarat[4,14].

We found highest involvement in the age group of 0-5 years, followed by 6-10 years ($p<0.000$). In a systematic review of 1810 patients (< 20y), Badal et al found a higher prevalence in 6-14 years age group[13], while in a study of Moroccan children El Fakiri found higher prevalence 10-14year age group[10] and Rebecca Leeb reported a higher incidence in 12-17years age group[15]. There was significant male preponderance in our study ($p<0.000$). Similarly, Mansourin et al in their meta-analysis of 32 publications found more cases in males [16]. There are varied reports regarding sex and age prevalence of COVID-19 in children, many studies found equal prevalence across all age groups and did not report any gender-based preponderance of COVID-19 infection[17,18].

Out of 539 children, only 7.4% of children were the index cases. In 86% of cases in our study, the child got infected through an adult contact and in 57.7% of the cases, one of the parents was the source of infection. A similar finding was reported in a study involving 419 household transmission clusters in China [19]. Similarly, Gotzinger in a multinational European cohort study [20] and Bingbing Li in their meta-analysis of 7004 patients found 90% of children getting infected by adults[12]. We postulate that the closure of schools and outdoor activities due to complete lockdown reduced children's direct exposure to COVID-19 infection. This also indicates that children are susceptible to COVID-19 infection from an adult contact.

More than 50% of our cases were diagnosed on first day of development of symptoms and 97.4% were diagnosed within 3 days, which was similar to study by Dong Y[18]. Early diagnosis in our series was possibly due high index of suspicion following positive adult household contact.

Our study found manifestations of COVID-19 disease mild in children; majority of them presented with symptoms like fever, cough/cold, headache and bodyache similar to several other studies[8,11,18],.

In our study, the commonest extrapulmonary manifestations were gastrointestinal symptoms followed by loss of smell and/or taste. Other symptoms like skin manifestations and conjunctivitis were less frequent similar to study by Pousa[21]. Mansourin found gastrointestinal symptoms in 20% of children[16].

The majority of our patients were treated at home which indicates that COVID-19 disease in children was mild, as noted by many authors[8,11]. Most of the children in our study recovered within 7 days of becoming symptomatic. El Fakiri also reported an average illness duration of 7 days[10].

Our results demonstrate an age-wise variation in symptoms like headache, body-ache, and loss of smell and/or taste. Older age groups (11-18 years) reported higher incidence of headache, body-ache, and loss of smell and/or taste which is similar to that reported by Stokes [17]. A possible explanation for this could be due to inability of younger children to express symptoms properly. Some studies have suggested that differential expression of ACE 2 receptor in oral and nasal mucosa could be responsible for age-wise differentiation of loss of smell/taste in children[22]. Stokes reported higher incidence of fever in younger patients (0-9 years), and sore throat and shortness of breath in older patients (10-19 years)[17]; this was not observed in our patients.

The incidence of hospitalization was very low (1.8%) in our series; majority of children (90%) were hospitalised in April and May, which coincided with the peak of second wave in Gujarat[14]. Several studies reported low incidence of hospitalisation in children in the first wave and second waves[15][23]. Half of the admitted children required only supportive care and only 2 children required oxygen and ICU care. All children recovered fully and there was no mortality in our study. A study from Pakistan found that the majority of hospitalized children needed only supportive care[24].

In our study, we found all age groups susceptible to COVID-19 infection. There were varied clinical manifestations across all age groups with an age-dependent variation in few presenting symptoms, hence treating physicians should have a high index of suspicion to diagnose COVID-19 in children. We found that in the majority of the cases adult household contacts were the source of infection to children, thereby reinforcing the need for complete vaccination of all eligible family members. Given the current situation where a majority of adults of our country are partially or fully vaccinated[25], unvaccinated susceptible children can play a major role in the transmission of COVID-19 in future waves. This indicates an urgent need for vaccination in children < 15 years. With the reopening of schools, colleges, and universities, preventive measures like masking and social distancing should be inculcated and followed diligently to limit the disease spread.

Our study confirms that COVID-19 disease in children is mild and majority can be treated at home. This information may help in better planning of resource allocation in future waves of COVID-19 pandemic. There is a need to develop and follow a standard treatment protocol for home treatment of pediatric COVID-19.

Ours was a facility-based study and the data collection was done from patients presenting to pediatricians mainly in urban setting, thereby the results may not be fully representative of the incidence of pediatric COVID-19 in Gujarat. A community-based survey could not be conducted due to COVID-19 safety protocols. As younger children could not fill the survey form, to maintain uniformity we asked parents to fill the form in all age groups, this might have led to variation in symptom reporting. However, these limitations do not undermine the findings of our study as the sample size is adequate and the results corroborate with other global studies.

CONCLUSION:

Our results have shown that positive cases were prevalent across all age groups with a higher incidence in 0-5 years. There was significant male preponderance in our cases. The majority of the children were infected in April 2021, during the peak of the second wave of COVID-19 pandemic in Gujarat. In only 7% of the cases, the child was the index case in the house. The most common symptom of COVID-19 in children was fever followed by cough/cold, headache, body ache, and gastrointestinal symptoms in some patients. Few symptoms like headache, body ache, loss of smell/ taste, were frequently reported by older children. The majority of the patients were given home treatment and recovered within a week. There was no mortality in our series.

Acknowledgements:

Authors acknowledge the assistance of Shahin Saiyed

(Indian Institute of Public Health Gandhinagar) for her help for statistical analysis. We acknowledge help of all the pediatricians for their help in data collection.

REFERENCES

1. Badal, S., Thapa Bajgain, K., Badal, S., Thapa, R., Bajgain, B. B., & Santana, M. J. (2021). Prevalence, clinical characteristics, and outcomes of pediatric COVID-19: A systematic review and meta-analysis. Journal of Clinical Virology, 135(January), 104715. https://doi.org/10.1016/j.jcv.2020.104715
2. Balasubramanian, S., Rao, N. M., Goenka, A., Roderick, M., & Ramanan, A. V. (2020). Coronavirus Disease 2019 (COVID-19) in Children - What We Know So Far and What We Do Not. Indian Pediatrics, 57(5), 435–442. https://doi.org/ 10.1007/s13312-020-1819-5
3. Bialek, S., Gierke, R., Hughes, M., McNamara, L. A., Pilishvili, T., & Skoff, T. (2020). Coronavirus disease 2019 in children: Current status - Morbidity and Mortality Weekly Report. CDC COVID-19 Response Team, 69(14), 422–426. https://www.cdc.gov/mmwr/volumes/69/wr/pdfs/mm6914e4-H.pdf
4. Coronavirus (COVID-19) Vaccinations - Our World in Data. (n.d.). Retrieved March 2, 2022, from https://ourworldindata.org/covid-vaccinations
5. Delahoy, M. J., Ujamaa, D., Whitaker, M., O'Halloran, A., Anglin, O., Burns, E., Cummings, C., Holstein, R., Kambhampati, A. K., Milucky, J., Patel, K., Pham, H., Taylor, C. A., Chai, S. J., Reingold, A., Alden, N. B., Kawasaki, B., Meek, J., Yousey-Hindes, K., … George, A. (2021). Hospitalizations Associated with COVID-19 Among Children and Adolescents — COVID-NET, 14 States, March 1, 2020–August 14, 2021. MMWR. Morbidity and Mortality Weekly Report, 70(36), 1255–1260. https://doi.org/10.15585/mmwr.mm7036e2
6. Delta Variant: What We Know About the Science | CDC. (n.d.). Retrieved January 24, 2022, from https://www.cdc.gov/coronavirus/2019-ncov/variants/delta-variant.html
7. Dong, Y., Mo, X., Hu, Y., Qi, X., Jiang, F., Jiang, Z., & Tong, S. (2020). Epidemiology of COVID-19 Among Children in China. Pediatrics, 145(6). https://doi.org/10.1542/peds.2020-0702
8. El Fakiri, K., Nassih, H., Ait Sab, I., Draiss, G., & Bouskraoui, M. (2020). Epidemiology and Clinical Features of Coronavirus Disease 2019 in Moroccan Children. Indian Pediatrics, 57(9), 808–810. https://doi.org/ 10.1007/s13312-020-1958-8
9. Gadepalli, R., & Thomas, M. (2021). Delta Variant SARS-CoV-2 infections in pediatric cases during the second wave in India 1*#. https:// doi.org/10.1101/2021.12.09.21266954
10. GitHub - CSSEGISandData/COVID-19: Novel Coronavirus (COVID-19) Cases, provided by JHU CSSE. (n.d.). Retrieved March 2, 2022, from https://github.com/CSSEGISandData/COVID-19
11. Götzinger, F., Santiago-García, B., Noguera-Julián, A., Lanaspa, M., Lancella, L., Calò Carducci, F. I., Gabrovska, N., Velizarova, S., Prunk, P., Osterman, V., Krivec, U., Lo Vecchio, A., Shingadia, D., Soriano-Arandes, A., Melendo, S., Lanari, M., Pierantoni, L., Wagner, N., L'Huillier, A. G., … Riordan, A. (2020). COVID-19 in children and adolescents in Europe: a multinational, multicentre cohort study. The Lancet Child & Adolescent Health, 4(9), 653–661. https://doi.org/10.1016/S2352-4642(20)30177-2
12. John Elflein. (2021). Coronavirus deaths worldwide by country. Statista. https://www.statista.com/statistics/1043366/novel-coronavirus-2019ncov-cases-worldwide-by-country/
13. Kumar, L., Kahlon, N., Jain, A., Kaur, J., Singh, M., & Pandey, A. K. (2021). Loss of smell and taste in COVID-19 infection in adolescents. International Journal of Pediatric Otorhinolaryngology, 142(January), 110626. https://doi.org/ 10.1016/ zj.ijporl.2021.110626
14. Leeb, R. T., Price, S., Sliwa, S., Kimball, A., Szucs, L., Caruso, E., Goodfred-Cato, S., & Lozier, M. (2020). COVID-19 trends among school-aged children — United States. In Morbidity and Mortality Weekly Report (Vol. 69, Issue 39). https://doi.org/10.15585/mmwr.mm6939e2external icon
15. Li, B., Zhang, S., Zhang, R., Chen, X., Wang, Y., & Zhu, C. (2020). Epidemiological and Clinical Characteristics of COVID-19 in Children: A Systematic Review and Meta-Analysis. Frontiers in Pediatrics, 8(November), 1–12. https://doi.org/10.3389/fped.2020.591132
16. Ludvigsson, J. F. (2020). Systematic review of COVID‐19 in children shows milder cases and a better prognosis than adults. Acta Paediatrica, 109(6), 1088–1095. https://doi.org/10.1111/apa.15270
17. Mansourian, M., Ghandi, Y., Habibi, D., & Mehrabi, S. (2021). COVID-19 infection in children: A systematic review and meta-analysis of clinical features and laboratory findings. Archives de Pédiatrie, 28(3), 242–248. https://doi.org/10.1016/j.arcped.2020.12.008
18. Ministry of Health and Family Welfare. (2021). Guidelines on operatio nalization of COVID care services for children & adolescents. https://www.mohfw. gov.in/pdf/ Guidelineson Operationalization of CoVID CareServicesforChildrenandAdolescents14062021.pdf
19. Pandey, V., & Nazmi, S. (2021). COVID-19 in India: Why second coronavirus wave is devastating - BBC News. BBC News. https://www. bbc.com/news/world-asia-india-56811315
20. Pousa, P. A., Mendonça, T. S. C., Oliveira, E. A., & Simões-e-Silva, A. C. (2021). Extrapulmonary manifestations of COVID-19 in children: a comprehensive review and pathophysiological considerations. Jornal de Pediatria, 97(2), 116–139. https://doi.org/10.1016/j.jped.2020.08.007
21. Shahid, S., Raza, M., Junejo, S., & Maqsood, S. (2021). Clinical features and outcome of COVID‐19 positive children from a tertiary healthcare hospital in Karachi. Journal of Medical Virology, 93(10), 5988–5997. https:// doi. org/ 10.1002/jmv.27178
22. Stokes, E. K., Zambrano, L. D., Anderson, K. N., Marder, E. P., Raz, K. M., El Burai Felix, S., Tie, Y., & Fullerton, K. E. (2020). Coronavirus Disease 2019 Case Surveillance — United States, January 22–May 30, 2020. MMWR. Morbidity and Mortality Weekly Report, 69(24), 759–765. https://doi.org/10.15585/ mmwr.mm6924e2
23. World Health Organization. (2021). WHO Coronavirus (COVID-19) Dashboard. WHO Coronavirus (COVID-19) Dashboard With Vaccination Data. In WHO (pp. 1–5). https://covid19.who.int/
24. Wu, Z., & McGoogan, J. M. (2020). Characteristics of and Important Lessons From the Coronavirus Disease 2019 (COVID-19) Outbreak in China. JAMA, 323(13), 1239. https://doi.org/10.1001/jama.2020.2648
25. Zhu, Y., Bloxham, C. J., Hulme, K. D., Sinclair, J. E., Tong, Z. W. M., Steele, L. E., Noye, E. C., Lu, J., Xia, Y., Chew, K. Y., Pickering, J., Gilks, C., Bowen, A. C., & Short, K. R. (2021). A Meta-analysis on the Role of Children in Severe Acute Respiratory Syndrome Coronavirus 2 in Household Transmission Clusters. Clinical Infectious Diseases, 72(12), e1146–e1153. https://doi.org/10.1093/cid/ciaa1825