

# Long Term Impact on Health Status on COVID 19 Positive Hospitalized and Recovered Children at a Tertiary Care Centre of Rajasthan

Dr. Mohammed Sajid<sup>1</sup>, Dr. Kailash Kumar Meena<sup>2</sup>, Dr. Dhanraj Bagri<sup>3</sup>

Junior Resident Department of Pediatrics, SMS Hospital Jaipur  
Email: mosajid2009[at]gmail.com

Senior Professor Department of Pediatrics  
Email: drkailashmeena[at]gmail.com

Assistant Professor Department of Pediatrics SMS Hospital Jaipur  
Email: meena.drhanraj6[at]gmail.com

**Abstract:** COVID 19 has been shown to have health impacts in adults even after recovery from acute phase. Though children are affected less severely, evidence is increasing regarding long term health impact of COVID among pediatric population. Present study aimed to evaluate long term impact of health status of COVID recovered children. **Material and Methods:** This hospital - based, observational study was conducted at one of the largest tertiary care centre of Northern India. The study included a total of 150 patients of COVID - 19 in the age group of 3 months to 18 years who were treated and successfully discharge. These patients were called after 3 months of discharge from hospital, and subjected to detail history and clinical examination. **Results:** Out of 150 children, 90 (60%) had persistent or new symptom after recovery as per their guardian. Thirty seven (31.3%) children had persistent cough and 41 (45.6%) reported easy fatiguability while nine children had new onset wheeze after recovery. Abnormal ECHO findings were noted in 3 children, while MIS - C occurred in 7 (4.7%) children. Convulsions were reported in 10 (6.7%) children and Neurological weakness was found in 9 (6%) children. **Conclusion:** COVID 19 disease has significant impact on health of children even after recovery from acute illness. New onset or persistent respiratory and gastro - intestinal symptoms and abnormal behavior were observed in many children. Children who recover from acute illness should be followed up at periodic interval to find out any long term effect of COVID 19.

**Keywords:** COVID, long COVID, MIS - C, Corona

## 1. Introduction

COVID 19, caused by corona virus SARS - CoV2 was declared as a pandemic in the first quarter of the year 2020 by the World Health Organization, affecting millions of people worldwide across all age group [1]. The entire world population currently faces enormous challenges (i. e., social, environmental, health, and economic) due to the impact of COVID - 19. Various countries have reported children to comprise upto 2.4% of total COVID cases [2, 3]. Globally, children were less frequently affected by the disease. 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 years and 10- 19 years, respectively [4]. The illness severity in pediatric age group also seems to be milder as compared to adults [5 - 8].

Corona - virus disease 2019 (COVID - 19), has a wide - ranging spectrum of clinical manifestations varying from asymptomatic infection to severe respiratory symptoms, and even death [9]. Based on current observations, in children the susceptibility to COVID - 19 seems to be much lower, with less frequency of severe cases and only rare cases of fatality [10]. Although most of the people affected with COVID - 19 do not seem to live normally after acute infection, evidence is accumulating that many affected individuals do not cover completely after the acute infection period, and have long - term symptoms, such as persistent

cough, fatigue, altered taste and/or smell, and memory loss [11].

Long - COVID is a heterogeneous multi - systemic condition for which no precise definition is still available and includes signs and symptoms that persist, develop, or fluctuate after SARS - CoV - 2 infection. Many studies have shown long term effect of COVID among adults. In a systematic review by Roberta et al, studies on pediatric age group also reported common symptoms of long COVID such as fatigue, headache, muscle/joint pain, dyspnea, dizziness, concentration difficulties, sleep disorder, persistent cough, gastro - intestinal dysfunction in varying proportion. Though studies regarding long COVID in the paediatric population are accumulating, evidence on long term impact of COVID 19 on overall health and general well being in children, in term of physical & mental health and overall development is lacking. Thus present study was conducted with the aim to determine the long term health impact among children admitted and recovered from COVID 19.

## 2. Material and Methods

This hospital - based, observational study was conducted in the Department of Pediatric, at SMS medical college and attached Hospital Jaipur, one of the largest tertiary care centre of Northern India. The study included a total of 150 COVID - 19 patients in the age group of 3 months to 18

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years who were treated and successfully discharge from tertiary care hospital. COVID - 19 RT - PCR was considered a confirmatory test from either nasopharyngeal or oropharyngeal swabs. These patients were called and examined 3 months after discharge from hospital. Patients who could not be contacted or those who did not come for follow up were excluded from the study.

Sample size was calculated based on prevalence of long COVID symptoms, which was estimated to vary from 1.6–70% [12]. Based on this, assuming the prevalence of long COVID to be 40%, sample size was calculated to be a minimum of 144 subjects at 95% confidence interval and 20% relative allowable error, which was round to 150 subjects.

History and physical examination specifically directed to all the systems of body which include common questions pertaining to specific system was done as a common evaluation tool for all the study subjects. Developmental quotient was calculated according to age specific developmental mile stones in different domains. Anthropometry measurement was taken to evaluate the nutritional status of children. 2D echo and ECG was done in selected patients.

**Statistical analysis:** The questionnaires were initially checked for completeness, and data was cleaned for errors and missing values. The corrected data was then entered into Microsoft Excel. An independent person verified data entry of two randomly chosen forms after entry of every 10<sup>th</sup> questionnaire. Data analysis was done using SPSS software trial version 24.0 (Chicago, Illinois). Descriptive statistics were used to calculate frequencies of categorical variables, and measures of central tendencies and dispersion were used to describe continuous variables.

**Ethical aspect:** Approval from Institutional Ethical Committee of hospital was taken (letter no.575/MC/EC/2022). Written informed consent was taken from all the participants parents/guardians or legally acceptable representative (LAR) before inclusion in the study. They were explained about the purpose of the study by the investigator and were assured of complete confidentiality of information, and the option of withdrawing from the study at any point of time.

### 3. Results

**Table 1:** Socio - demographic characteristics of COVID admitted cases (N=150)

Age (mean ± SD)	7.35 ± 5.36 years
Median (range)	7 year (3 month to 18 years)
Socio economic status	
HIC	28 (18.7%)
MIC	73 (48.7%)
LIC	49 (32.6%)
Gender	
Male	81 (54%)
Female	69 (46%)
Residence	
Rural	79 (52.7%)
Urban	71 (47.3%)

Median age of COVID admitted children included in this study was 7 years, with a range of 3 month to 18 years. Male: female ratio was 1.17: 1 (Table 1).

**Table 2:** Growth and development characteristics at admission (N=150)

Growth	
Stunted	26 (17.3%)
Wasted	18 (12%)
Obese	10 (6.67%)
Normal	96 (64%)
Development Quotient (DQ)	
≥85%	141 (94%)
71 – 84%	6 (4%)
≤70%	3 (2%)

Out of 150 children, 26 (17.33%) were stunted, 18 (12%) were wasted and 10 (6.67%) were obese. Most (94%) had normal DQ, while 3 (2%) had DQ 70% or less, 6 (4%) has DQ between 71 to 84% (Table 2).

**Table 3:** COVID characteristics of admitted cases (N=150)

Duration of illness	
(mean ± SD)	5.79 ± 5.9 days
Median (range)	5 days (1 to 16 days)
Duration of hospital stay	
(mean ± SD)	5.18 ± 2.46 days
Median (range)	5 days (1 to 11 days)
Symptoms	
Fever	150 (%)
Cough	50 (33.3%)
Cold	48 (32%)
Rapid breathing	25 (16.7%)
Noisy breathing	3 (2%)
GI symptoms	44 (29.3%)
GI symptoms	
Vomiting	37 (24.7%)
Diarrhoea	24 (16%)
Pain abdomen	14 (9.3%)

Median duration of illness before admission was 5 days. Mean duration of hospital stay was 5.18 days. All admitted cases had fever, while cough was complained by 50 (33%) cases and rapid breathing by 25 (16.7%) cases. Most common GI symptom was vomiting seen in 24.7% cases (Table 3).

**Table 4:** Health status after COVID recovery

Observed sick by parents	90 (60%)
Growth after COVID recovery	
Stunted	31 (20.7%)
Wasted	22 (14.7%)
Obese	16 (10.7%)
Normal	81 (54%)
Development Quotient (DQ)	
≥85%	139 (92.7%)
71 – 84%	8 (5.3%)
≤70%	3 (2%)
Wheeze	
New onset of wheeze	9 (6%)
Wheeze increased after recovery	4 (2.7%)
Persistent Cough	
Short duration (<7 days)	21 (14%)
Long duration (>7 days)	26 (17.3%)
Persistent/New GI symptoms	

Frequent vomiting	8 (5.3%)
Pain abdomen	12 (8%)
Diarrhea	23 (15.3%)
Constipation	13 (8.7%)
Reduced appetite	22 (14.7%)
Dyspepsia	30 (20%)
Fatiguability	41 (45.6%)
Recurrent URTI	78 (52%)
Bluish discoloration	2 (1.3%)
Pedal edema	3 (2%)
Excessive sweating	3 (2%)
<b>Abnormal ECHO findings</b>	
DCM with myocarditis	1 (0.7%)
TR with MR	1 (0.7%)
Reduced Ejection Fraction	1 (0.7%)
MIS - C	7 (4.7%)
Convulsions	10 (6.7%)
Neurological weakness	9 (6%)
Chronic headache	3 (3.3%)
Liver abscess	2 (1.3%)
<b>Abnormal behavior</b>	
Sleep difficulties	11 (7.3%)
Reduced concentration on study	4 (2.7%)
Anger frustration	1 (0.7%)
Feeling depressed	2 (1.3%)

Out of 150 COVID-19 recovered children, 90 (60%) children were observed sick even after recovery as per their guardian. Children with stunting increased to 31 (20.7%), while those with wasting increased to 22 (14.7%) and obesity increased to 16 (10.7%). There was only slight change in DQ with 2 patients losing DQ > 85%. Nine children had new onset wheeze, while 37 (31.3%) had persistent cough and 41 (45.6%) reported easy fatiguability after recovery. recurrent URTI (3 or more episodes in 6 months duration) after recovery was reported by 78 (52%) children. Abnormal ECHO findings were noted in 3 children, while MIS - C occurred in 7 (4.7%) children. Convulsions were reported in 10 (6.7%) children, of which 5 had simple febrile seizure, 2 had Complex Febrile seizure, 1 had focal seizure and 2 had meningoencephalitis. Neurological weakness was found in 9 (6%) children of whom 4 had hemiparesis and 5 had transient ischemic attack (table 4).

#### 4. Discussion

Many studies have been designed to emphasis on details of the clinical and virological course of SARS - CoV - 2 infection. Though in children the susceptibility to COVID - 19 seems to be much lower, with less frequency of severe cases and only rare cases of fatality [11], its long term effects are not well established and are still exploring in its entire spectrum including the epidemiological and clinical profile. The study aimed to determine impact of COVID 19 on different parameters of health on hospitalized and recovered children.

In current study mean age of the patients was 7.35 years, ranging from 3 and half months to 18 years, with male: female ratio of 1.17: 1. Out of 150 covid - 19 affected children, 26 (17.33%) were stunted, 18 (12%) were wasted and 10 (6.66%) were obese during hospitalization due to COVID 19, while, 9 (6%) had DQ lower than normal.

Similar studies have reported mean age of COVID affected children ranging from 4.45 years to 11 years with males and females affected almost equally [6, 13, 14].

In our study long COVID was noted in 60% of the children. A systematic review reported the prevalence of long COVID varying from 1.6 to 70% in various studies [12]. In present study obesity after recovery increased by 4%, and decline in DQ grade after recovery was seen in 1.33%. An online survey reported increase in weight in 35% of children/adolescent affected by COVID [15]. Thomson H et al reported that more than half of children aged 6 to 16 years who get the virus have at least one symptom that lasts more than 120 days, with 42.6 percent of these symptoms interfering with everyday activities [16].

In present study, 9 (6%) developed new onset wheeze while 4 (2.7%) developed increase episodes of wheeze in previously known case. Persistent cough was noted in 31.3% cases. Fatiguability and dyspnea was reported by 45.6% and 20% cases respectively. Abnormal behavior included sleep difficulties (7.3%) and reduced concentration (2.7%). Barckel C L H et al reported that 36% children experienced severe limitations in daily function, commonly fatigue (87%), dyspnea (55%), and concentration difficulties (45%) [17]. Ali A assadi et el in a similar study reported 44.8% children to have symptoms of long COVID, including fatigue (21%), shortness of breath (12%), exercise intolerance (12%), weakness in (10%), and walking intolerance (9%) [18]. Shoshana C L et el reported that patients had persistent respiratory symptoms ranging from 1.3 to 6.7 months post acute infection. Persistent dyspnea and/or exertional dyspnea were present in nearly all (96.6%) patients at the time of clinic presentation. Other reported chronic symptoms included cough (51.7%), exercise intolerance (48.3%) and Fatigue (13.8%) [19]. Carf A et al in another similar study found that 44.1% of patients had a worsening quality of life and a substantial proportion of people still reported fatigue (53.1%), dyspnea (43.4%), joint discomfort (27.3%) and chest pain (21.7%) [20].

In present study MIS C occurred in 7 (4.7%) cases. Payne et al in a cohort study used enhanced surveillance data and found that the incidence of MIS - C was 5.1 (95% CI, 4.5 - 5.8) per 1 000 000 person - months [21].

In our study, 10 (6.67%) had convulsion after recovery, 9 (6%) children had Neurological weakness of body after recovery, while depressed feeling and anger/frustration as noted in 1.3% and 0.7% respectively. Saini et el reported 18 cases with neurological sequel including status epilepticus (six), Guillain - Barré syndrome (five), stroke (two), demyelinating syndromes (three), and autoimmune encephalitis (two) [22]. Julia Meller Dias et al in a systematic review found that the proportion of emotional symptoms and behavior changes varied from 5.7% to 68.5%; anxiety 17.6% to 43.7%, depression 6.3% to 71.5%, and stress 7% to 25%. Another systematic review reported mood symptoms (16.50%), fatigue (9.66%), and sleep disorders (8.42%) to be the most prevalent clinical manifestations [23].

Older age, poorer baseline physical and mental health status, allergic disease and previous long - term conditions have been identified as possible risk factors for long COVID [12]. Recently, obesity has also been described as a potential risk factor for long COVID syndrome in paediatric age [12]. Persisting symptoms have been described also in children with previous mild or asymptomatic COVID - 19 and no correlation between the severity of acute illness and long COVID has been noted [12].

While children are not the face of this pandemic, its larger effects on children are unknown and can have long - term ramifications for communities. There is a real possibility that the impacts of this catastrophe may forever alter the lives of youngsters caught in the middle of it. Children who experience acute nutritional, protection, or stimulation deficit, or periods of extended exposure to toxic stress, during the key window of early childhood development, are more likely to face lifetime problems because their cerebral development is disrupted.

## 5. Conclusion

Study findings conclude that COVID 19 disease has significant impact on health of children even after recovery from acute illness. Growth and development is hampered in many children. Abnormal behavior, neurological symptoms, new onset or persistent respiratory and gastro - intestinal symptoms were observed in many children. Children who recover from acute illness should be followed up at periodic interval to find out any long term effect of COVID 19 so that timely and appropriate management could be done. Prospective long term studies will unravel the entire spectrum of long COVID in pediatric population.

**Conflict of interest:** Nil

## References

- [1] World Health Organization (2020). Coronavirus disease (COVID - 19) Pandemic, WHO. [Internet]. Available from <https://www.who.int/emergencies/diseases/novel-coronavirus-2019>. Assessed on 31st March 2020
- [2] WHO - China Joint Mission. Report of the WHO - China Joint Mission on Coronavirus Disease 2019 (COVID - 19).2020. [Internet] Available at: <https://www.who.int/docs/default-source/coronaviruse/who-china-joint-mission-on-covid-19-final-report.pdf>. (Accessed 6 Dec 2021)
- [3] CDC COVID - 19 Response Team. Coronavirus disease 2019 in children – United States, February 12–April 2, 2020. *Morb Mortal Wkly Rep.*2020; 69: 422–6.
- [4] 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.

- [5] 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>.
- [6] Patel NA. Pediatric COVID - 19: systematic review of the literature. *Am J Otolaryngol.*2020; 41: 102573.
- [7] 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>.
- [8] 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>.
- [9] Zheng Z, Peng F, Xu B, Zhao J, Liu H, Peng J, et al. Risk factors of critical & mortal COVID - 19 cases: a systematic literature review and meta - analysis. *J Infect.* (2020) 8: e16–25. doi: 10.1016/j.jinf.2020.04.02.
- [10] H. A. Rothan, S. N. Byrareddy, The epidemiology and pathogenesis of coronavirus disease (COVID - 19) outbreak, *J. Autoimmun.*109 (2020), 102433, <https://doi.org/10.1016/j.jaut.2020.102433>.
- [11] Izquierdo - Pujol J, Moron - Lopez S, Dalmau J, Gonzalez - Aumatell A, Carreras - Abad C, Mendez M, Rodrigo C and Martinez - Picado J. Post COVID - 19 Condition in Children and Adolescents: An Emerging Problem. *Front. Pediatr.*2022; 10: 894204.
- [12] Pellegrino R, Chiappini E, Licari A, Galli L, Marseglia GL. Prevalence and clinical presentation of long COVID in children: a systematic review. *European Journal of Pediatrics.*2022; 181: 3995–4009
- [13] Singh P, Attri K, Mahto D, Kumar V, Kapoor D, Seth A, Singh V, Pemde H, Kumar P, Sodani R, Goel A. Clinical Profile of COVID - 19 Illness in Children - Experience from a Tertiary Care Hospital. *Indian J Pediatr.*2021 Jul 27: 1–7.
- [14] Han MS, Choi EH, Chang SH, Jin BL, Lee EJ, Kim BN et al. Clinical Characteristics and Viral RNA Detection in Children With Coronavirus Disease 2019 in the Republic of Korea. *JAMA Pediatr.*2021 Jan 1; 175 (1): 73 - 80.
- [15] Androustos Q, Perperidi M, Georgiou C, Chouliaras G. Lifestyle Changes and Determinants of Children's and Adolescents' Body Weight Increase during the First COVID 19 Lockdown in Greece: The COV - EAT Study. *Nutrients.*2021; 13 (3): 930.
- [16] Thomson H. Children with long covid. *New Sci.*2021 Feb 27; 249 (3323): 10 - 11.
- [17] Barckel C. L. H., Lap C. R., Buddingh E. P., Van Houten M. A., van der Sande L. J. T. M., Langereis, E. J., Ban et al. Pediatric Long COVID: An overlooked phenomenon?. *Pediatric pulmonology.*2021: 56 (8); 2495 - 2502.
- [18] Asadi - Pooya AA, Nemati H, Shahisavandi M, Akbari A, Emami A, Lotfi M et al. Long COVID in children and adolescents. *World J Pediatr.*202; 17 (5): 495 - 99.
- [19] Leftin Dobkin SC, Collaco JM, McGrath - Morrow SA. Protracted respiratory findings in children post

- SARS CoV - 2 infection. *Pediatr Pulmonol.*2021 Dec; 56 (12): 3682 - 3687.
- [20] Carfi A, Bernabei R, Landi F, for the Gemelli Against COVID - 19 Post - Acute Care Study Group. Persistent Symptoms in Patients After Acute COVID - 19. *JAMA.*2020; 324 (6): 603–605.
- [21] Payne A. B, Gilani Z, Godfred - Cato S, Belay ED, Feldstein LR, Patel MM et al. Incidence of Multisystem Inflammatory syndrome in Children Among US Persons Infected with SARS - CoV - 2. *JAMA network open.*2021; 4 (6): e2116420.
- [22] Saini L, Krishna D, Tiwari S, Goyal JP, Kumar P, Khera D., et al. Post COVID - 19 Immune Mediated Neurological Complications in Children: An Ambispective Study: *Pediatric neurology.*2022; 136: 20 - 27.
- [23] Oliveira JMD, Butini L, Pauletto P, Lekmhuhl KM, Stefani CM, Bolan M et al. Mental health effects prevalence in children and adolescents during the COVID 19 pandemic: A systematic review. *Worldviews on evidence based nursing.*2022; 19 (2), 130 - 137.