

CLINICAL CHARACTERISTICS AND OUTCOMES IN PEDIATRIC PATIENTS DIAGNOSED WITH COVID-19 IN A TERTIARY CARE HOSPITAL: A RETROSPECTIVE COHORT STUDY.

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Abstract

Background: Jalgaon district was one of worst hit hotspot in Covid- 19 outbreak in 2021. Pediatric patients were also affected and some of them were even hospitalized for the same. The present retrospective study was undertaken in pursuit of throwing light on clinical characteristics, laboratory findings and clinical outcomes in pediatric patients diagnosed with Covid- 19 infection. **Materials and Methods:** All children up to 12 years of age admitted to this tertiary care hospital (DCH) between period of March 19, 2021 and August 7, 2021 enrolled for the study. Their medical records were reviewed retrospectively. SARS-CoV-2 positive children were confirmed using reverse transcriptase-polymerase chain reaction (RT-PCR) or rapid antigen test. **Result:** Of the 56 patients who were diagnosed as Covid 19 positive, 32 (57%) patients were males. On age analysis, majority of the patients belonged to the age group 1 month to 5 years are 30 (54%). Amongst clinical features, fever was most commonly encountered symptom. Twenty-one (37%) patients in the present study were classified as category D of disease severity. Abnormal chest X-ray was found in 41 (73%) patients. Twenty-four (43%) patients had oxygen saturation (SpO₂) < 94% at room temperature, out of which 6 (25%) of the patients required only oxygen, 14 (58%) of the patients required non-invasive ventilation in the form of continuous positive airway pressure (CPAP) with oxygen and 4 (17%) patients required invasive ventilation. Abnormal high resolution computed tomography (HRCT) chest was found only in 1 patient. Total leucocyte count was elevated in 13 (23%) patients. C-reactive protein, serum ferritin, lactate dehydrogenase (LDH), D-dimer was abnormally elevated in 14 (32%) patients, 16 (38%) out of 42 tested and serum blood urea nitrogen (BUN)/ creatinine ratio was elevated in 14 (36%), 38 (97%) and 26 (60%) patients, respectively. Forty-eight (86%) patients had recovered from the disease and discharged, and 4 (7%) patients succumbed to the disease. **Conclusion:** The Covid- 19 epidemic has wreaked havoc on the world's health. The severity of sickness in babies and children with Covid- 19 was significantly less than that reported in adults.

INTRODUCTION

In December 2019, a new Coronavirus (SARS-CoV-2) caused pneumonia in the Chinese city of Wuhan, resulting in a rise in the number of cases and deaths globally.^[1] Data from the Chinese CDC revealed that the Covid- 19 fatality rate changes greatly depending on the patient's age, with a greater death

risk among the elderly population (>50 years) with co-morbidities. However, because to a lack of measurement of the illness in the population, the precise estimate of fatality rate may not be correct. A large amount of data from the WHO-China Joint Mission on Coronavirus Disease 2019 (Covid- 19) suggested a fatality rate of 14.8% in people aged 80, 8% in people aged 70-79, 3.6 percent in people aged

60-69, 13% in people aged 50-59, 0.2-0.4% in people aged 10-40, and no deaths in people aged 9.^[2] Coronavirus is an enclosed virus with a positive-sense single-stranded RNA that belongs to the coronaviridae family. Coronaviridae (CoVs) are divided into four genera: α , β , γ and δ Corona viruses, as well as subgenera and species.

During the epidemic of Severe Acute Respiratory Syndrome CoV (SARS-CoV-1) in China, two new viruses belonging to the n-CoV family were reported to cause severe respiratory syndrome. In the year 2002, it has expanded internationally, affecting additional Asian nations.^[3] In 2012, a massive epidemic of Middle East Severe Respiratory Syndrome (MERS-CoV) occurred in Saudi Arabia and other Middle Eastern nations, as well as in South Korea. As a result, severe instances of Coronavirus infection have only been documented on a few occasions.^[4] SARS-CoV-2, which causes severe respiratory disease and Acute Respiratory Distress Syndrome (ARDS), is a novel virus from the same genus of the coronaviridae family (β Coronavirus), with 90% genetic similarity to SARS-CoV and 50% to MERS-CoV.^[5] Covid-19, on the other hand, affects the pediatric population less often. Pediatric patients make up a small percentage of Covid-19 instances, accounting for less than 2% of all known cases, according to published statistics from various countries. Furthermore, youngsters have fewer symptoms and are less likely to die than adults. This is consistent with earlier SARS-CoV and MERS-CoV pandemic outbreaks in 2002 and 2012, respectively.^[6]

Jalgaon district was one of worst hit hotspot in Covid-19 outbreak in 2020 and 2021. Pediatric patients were also affected and some of them were even hospitalized for the same. The present retrospective study was undertaken in pursuit of throwing light on clinical characteristics, laboratory findings and clinical outcomes in pediatric patients diagnosed with Covid-19 infection.

MATERIALS AND METHODS

All children up to 12 years of age admitted to this tertiary care hospital (DCH) between period of March 19, 2021 and August 7, 2021 enrolled for the study. Their medical records reviewed retrospectively. The institutional ethics committee permission was taken prior to start of the study. SARS-CoV-2 positive children were confirmed using reverse transcriptase-polymerase chain reaction (RT-PCR) or rapid antigen test. Children who tested positive were placed in an isolation ward, which was especially built-in accordance with national norms.^[7] The illness characterization of Covid-19 was carried out according to the published criteria.^[8]

As needed, laboratory tests and imaging studies were conducted. General supportive care, fever management, respiratory assistance with oxygen

and/or ventilation as needed, vasoactive medicines for patients in shock, and ongoing assessment of organ system dysfunctions were among the therapeutic modalities. Covid-19 pneumonia was treated with Remdesivir in children only over the age of 12 in our institution. Intravenous immunoglobulin, pulse methyl-prednisolone, and low-molecular-weight heparin anticoagulation was utilized according to protocol. Repeat SARS-CoV-2 PCR testing was done and discharged after test was negative. The criteria were applied according to the standards.^[8] The length of time it took to achieve PCR negative and the length of time spent in the hospital were recorded. Outcomes were recorded as discharged, referred, DAMA, or death. Severity of the disease was classified as per study done by Shekerdhamian L. et al,^[9] as under:

1. **Asymptomatic:** class A.
2. **Mild:** class B- fever, sore throat, cough, and/or myalgia with No dyspnea.
3. **Moderate:** Class C- fever, dyspnea, and/or chest imaging consistent with SARS-CoV-2 pneumonia and no change from baseline requirements if receiving long-term respiratory support.
4. **Severe:** Class D- fever, dyspnea, and/or chest imaging consistent with SARS-CoV-2 pneumonia, with new or increased supplemental oxygen requirement and/or ventilatory support requirement.
5. **Very severe:** Class E-respiratory failure requiring mechanical ventilation, acute respiratory distress syndrome, shock or systemic inflammatory syndrome.

Statistical Analyses

Data was entered in MS Excel, and coded and analyzed in statistical software STATA, version 10.1 (Stata Corp.). Descriptive statistics were applied in the form of percentage and represented appropriately in pie chart and bar diagrams.

RESULTS

Of the 56 patients who were diagnosed as Covid 19 positive, 32 (57%) patients were males. Majority of the patients belonged to the age group 1 month to 5 years are 30 (54%). [Table 1].

Amongst clinical features, fever was most commonly encountered followed by upper respiratory tract infection. Majority of the patients experienced fever for duration of 2-3 days followed by 1 day and 4-6 days and 1 episode. The details of other clinical features are depicted in [Table 2].

Disease severity categorization data revealed that 21 (37%) patients in the present study were classified as category D of disease severity, whereas 15 (27%) patients, 15 (27%), 4 (7%), 1 (2%) patients belonged to categories B, E, A and C respectively [Table 3]. Abnormal chest X-ray was found in 41 (73%) patients. Eighteen (32%) patients had 3 to 4 lung

zones involvement, 9 (16%) patients had 1 to 2 zones and nine patients (16%) have 5 to 6 zones involvement. [Figure 1-2].

Twenty-four (43%) patients had oxygen saturation (SpO₂) < 94% at room temperature, out of which 6 (25%) of the patients required only oxygen and 14 (58%) of the patients required non-invasive ventilation in the form of continuous positive airway pressure (CPAP) with oxygen and 4 (17%) patients required invasive ventilation [Figure 3].

Abnormal HRCT chest was found only in 1 patient. Amongst laboratory investigations 25 (45%) patients had hemoglobin in the range of 8 to 11 mg/dl, followed by 11 (37%) patients with hemoglobin >11 mg/dl. Total leucocyte count was elevated in 13 (23%) patients. Neutrophil /lymphocyte (N/L) ratio was >3 in 2 (5%) patients. Platelet count was

reduced in 8 (14%) patients. Twenty-two patients (50%), 14 (32%) and 8 (18%) patients had C-reactive protein <5, >10 and 5 to 10, respectively. Serum ferritin, serum lactate dehydrogenase (LDH), D-dimer was abnormally elevated in 16 (38%) out of 42 tested and serum blood urea nitrogen (BUN)/creatinine ratio was elevated in 14 (36%), 38 (97%) and 26 (60%) patients, respectively [Table 4].

Patients received treatment with injectable ceftriaxone, injection piperacillin + tazobactam, oral azithromycin, doxycycline, ivermectin, zinc, and vitamin C. Forty-eight (86%) patients had recovered from the disease and discharged, 3 (5%) patients were transferred to another center, 1 (2%) patients discharged against advice and 4 (7%) patients succumbed to the disease [Figure 4].

Table 1: Demographic details of patients in the present study.

Sr. No.	Category	Sub-category	Number n(%)
1	Sex	Male	32 (57%)
		Female	24 (43%)
2	Age	<1 month (neonate)	08 (14%)
		1m-1year	15 (27%)
		1 yr-5yr	15 (27%)
		6-10yr	13 (23%)
		>10yr	5 (9%)

Table 2: Clinical features of patients in the present study.

Sr. No.	Clinical feature	Sub-category	n(%)
1	Fever Total -52 (92)%	1 episode	9 (16%)
		1 day	7 (12%)
		2-3 days	23 (41%)
		4-6 days	9 (16%)
		>6 days	4 (7%)
2	Tachypnoea / Respiratory distress		18 (32%)
3	URTI symptoms		32 (57%)
4	Seizures 3 Cases (6%)	1 episode	1 (2%)
		2 episodes	1 (2%)
		3 episodes	1 (2%)
5	Lethargy/weakness		3 (5%)
6	Abdominal symptoms		3 (5%)
7	Asymptomatic		3 (5%)

Table 3: Disease severity in patients of present study.

Disease severity	n (%)
Category A	4 (7%)
Category B	15 (27%)
Category C	1 (2%)
Category D	21 (37%)
Category E	15 (27%)

Table 4: Laboratory investigation findings in patients of present study.

Sr. No.	Lab test	Test done in no. of patients	Sub-category	n (%)
1	Hb	56	5 to 8	10 (18%)
			8 to 11	25 (45%)
			>11	21 (37%)
2	TLC	56	<7500	28 (50%)
			7500-10000	15 (27%)
			>10000	13 (23%)
3	N/L ratio	40	<3	38 (95%)
			>3	2(5%)
4	Platelet	56	<1.5 lacs	8 (14%)
			>1.5 lacs	48 (86%)
5	CRP	44	<5	22 (50%)
			5 to 10	8 (18%)
			>10	14(32%)
6	Sr. ferritin	39	<140	25 (64%)
			>140	14 (36%)

7	Sr. LDH	39	<170	1 (3%)
			>170	38 (97%)
8	D-dimer	42	< 500	26 (62%)
			>500	16 (38%)
9	Sr. BUN/creatinine	43	<18/0.7	17 (40%)
			>18/0.7	26 (60%)

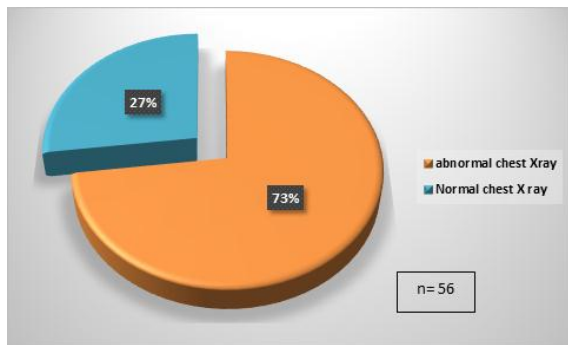


Figure 1: Abnormality of chest X-ray in patients of present study.

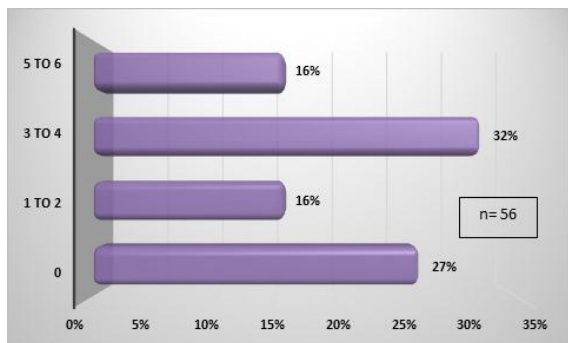


Figure 2: Number of lung zone involvement in patients of present study.

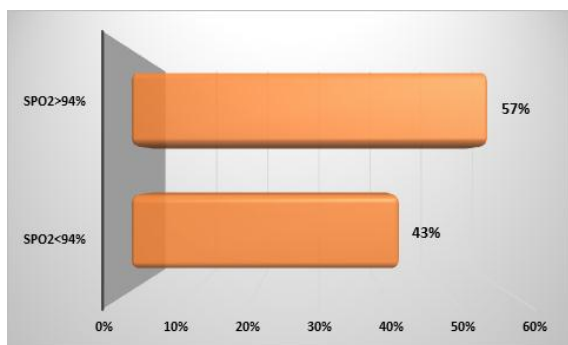


Figure 3: Oxygen saturation (SpO₂) in the patients of present study.

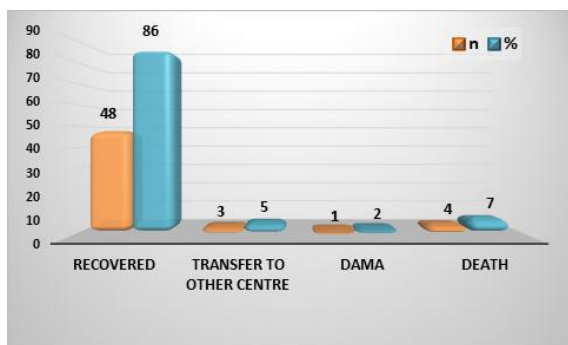


Figure 4: Outcomes in patients of the present study. [DAMA- Discharge against advice]

DISCUSSION

The present study highlights the clinical characteristics, laboratory investigations, treatment and outcomes in pediatric patients diagnosed with Covid- 19 disease in tertiary care (DCH). In the present study, majority of the patients were male. Similar findings were corroborated in a study done by Rao et al.^[10]

In the present study, majority of the patients belonged to the age group 1 month to 5 years and least in age group >10 years. This was in contrast with findings seen in a meta-analysis by Irfan et al. wherein mean age of patients was found to be >10 years.^[11]

Amongst clinical features, fever was most commonly encountered symptom, followed by upper respiratory tract infections, gastrointestinal, neurological symptoms. Majority of the patients experienced fever for 2-3 days followed by 1 episode and 4-6 days. In a global study by Duarte-Salles, most common symptom was fever that was seen in up to 28% of the patients while cough was reported in 13% of the patients.^[12] In a retrospective cohort study of 12,306 pediatric Covid 19 patients in the United States by Parcha et al., most common reported symptom was fever which was seen in 41% of the patients followed by respiratory symptoms, gastrointestinal symptoms, etc.^[13] Two studies reported few cases who were asymptomatic,^[12,13] whereas three patients in the present study were asymptomatic. However, this comparison should be done cautiously since the sample size of the present study was very small as compared to other 2 studies. Atypical symptoms like seizures were also noted in 5% of the patients of present study. The same was reported in few other studies.^[14,15,16]

In the present study, disease severity categorization data was available for all 56 patients, of which 21 (37%) patients in the present study were classified as category D of disease severity, whereas 15 (27%) patients, 15 (27%), 4 (7%), 1 (2%) patients belonged to categories B, E, A and C respectively. This was in contrast with findings of study done by Rao et al. wherein majority of the patients had mild disease.^[7] This is also confirmed on various other studies conducted globally wherein most of the pediatric patients were found to have mild intensity of disease symptoms.^[11] The difference may be because of the study is conducted in Tertiary care center declared as a Dedicated Covid Hospital (DCH) where mainly critical patients were admitted. Pediatric patients who are symptomatic encounter only milder severity of symptoms as compared to adults in the form of fever, cold, cough, diarrhea, etc.^[13]

Abnormal HRCT chest was found only in 1 patient in the present study, as there were guidelines about restricted use of this modality in pediatric age group management. This was in contrast to a cohort study done by Xia et al. wherein abnormal chest CT was reported in 72% of the pediatric patients.^[17] In the current study chest X-ray was done in 56 patients, of which abnormal chest X-ray was found in 41 (73%) patients. In a study done by Serrano et al. on pediatric chest X-ray diagnosed with Covid- 19, as high as 80% of the patients showed abnormalities on chest X-ray in the form of para-bronchial thickening, ground glass opacities, consolidation, etc.^[18]

Twenty-four (43%) patients had oxygen saturation (SpO₂) < 94% at room temperature, out of which 6 (25%) patients required only oxygen and 14 (58%) of the patients required non-invasive ventilation in the form of continuous positive airway pressure (CPAP) and oxygen, 4 (17%) patients required invasive ventilation. Rao et al. in their study reported that 16% of the patients had required only oxygen, 5% of the patients had required non-invasive ventilation. The same study reported that 11% of the patients had required invasive ventilation.^[10] Similar findings were reported by Shekerdemian et al. in their study on pediatric patients diagnosed with Covid- 19 and admitted to hospital in United States and Canada.^[9]

Twenty-five (45%) patients had hemoglobin in the range of 8 to 11 mg/dl, followed by 11 (37%) patients with hemoglobin >11 mg/dl. Total leucocyte count was elevated in 13 (23%) patients. Platelet count was reduced in 8 (14%) patients. Twenty-two patients (50%), 14 (32%) and 8 (18%) patients had C-reactive protein <5, >10 and 5 to 10, respectively. Serum ferritin, serum lactate dehydrogenase (LDH) was elevated in 14(36%),38(97%) respectively. D-dimer was abnormally elevated in 16 (38%) out of 42 tested and serum blood urea nitrogen (BUN)/ creatinine ratio was elevated in 14 (36%), 38 (97%) and 26 (60%) patients, respectively. Similar findings were reported in a recently published systematic review and meta-analysis done by Irfan et al. wherein majority of the pediatric patients diagnosed with Covid- 19 encountered elevated leucocytes, neutrophils, C-reactive protein, lactate dehydrogenase, blood urea nitrogen and serum creatinine values.^[11]

Neutrophil/lymphocyte (N/L) ratio was >3 in 2 (5%) patients and remaining majority had value <3 in the present study. This was corroborated in a study done by Wu et al., wherein majority of the patients had N/L ratio <3.^[19]

On searching published literature for outcomes in pediatric patients diagnosed with Covid- 19, there were heterogeneous results. Some studies reported mortality rate as high as 17%.^[10,11] Many other studies showed very less mortality rate in children ranging from 0.19 to 4%.^[9] In the present study mortality rate was found to be 7%. The present

study findings are in accordance with most of other global reports on outcomes of pediatric patients of Covid- 19, where disease in vast majority has been cited as mild in nature.

To our knowledge, this is the first cohort research of its sort in this part of the country, and it contributes to the growing body of evidence on Covid- 19 infected newborns and children in India.

The present study was not without limitations. Firstly, the sample size of the present study was small, so findings of present can be generalized only when other such studies with large sample size are carried out in different geographical location. Secondly, co-morbidities are known to affect the outcome on pediatric Covid- 19 disease. The data regarding co-morbidities was not available in the present study. Lastly, due to retrospective study design chances of bias cannot be ruled out.

CONCLUSION

The Covid- 19 epidemic has wreaked havoc on the world's health. The severity of sickness in babies and children with Covid- 19 was significantly less than that reported in adults.

REFERENCES

- Li Q, Guan X, Wu P, Wang X, Zhou L, Tong Y, et al. Early Transmission Dynamics in Wuhan, China, of Novel Coronavirus-Infected Pneumonia. *N Engl J Med.* 2020;382(13):1199-1207. doi: 10.1056/NEJMoa2001316.
- Jiang S, Xia S, Ying T, Lu L. A novel coronavirus (2019-nCoV) causing pneumonia-associated respiratory syndrome. *Cell Mol Immunol.* 2020;17(5):554. doi: 10.1038/s41423-020-0372-4.
- Peiris JS, Lai ST, Poon LL, Guan Y, Yam LY, Lim W, et al. Coronavirus as a possible cause of severe acute respiratory syndrome. *Lancet.* 2003;361(9366):1319-25. doi: 10.1016/s0140-6736(03)13077-2.
- Al-Ahdal MN, Al-Qahtani AA, Rubino S. Coronavirus respiratory illness in Saudi Arabia. *J Infect Dev Ctries.* 2012;6(10):692-4. doi: 10.3855/jidc.3084.
- 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. *Lancet.* 2020;395(10224):565-574. doi: 10.1016/S0140-6736(20)30251-8.
- Wu Z, McGoogan JM. Characteristics of and Important Lessons From the Coronavirus Disease 2019 (COVID- 19) Outbreak in China: Summary of a Report of 72 314 Cases From the Chinese Center for Disease Control and Prevention. *JAMA.* 2020;323(13):1239-1242. doi: 10.1001/jama.2020.2648.
- Ceulemans D, Thijs I, Schreurs A, Vercammen J, Lannoo L, Deprest J, et al. Screening for COVID- 19 at childbirth: is it effective? *Ultrasound Obstet Gynecol.* 2020;56(1):113-114. doi: 10.1002/uog.22099.
- Erzse A, Fraser H, Levitt N, Hofman K. Prioritising action on diabetes during COVID- 19. *S Afr Med J.* 2020;110(8):719-720.
- Alfraj A, Bin Alamir AA, Al-Otaibi AM, Alsharrah D, Aldaithan A, Kamel AM, et al. Characteristics and outcomes of coronavirus disease 2019 (COVID- 19) in critically ill pediatric patients admitted to the intensive care unit: A multicenter retrospective cohort study. *J Infect Public Health.* 2021;14(2):193-200. doi: 10.1016/j.jiph.2020.12.010.
- Rao S, Gavali V, Prabhu SS, Mathur R, Dabre LR, Prabhu SB, et al. Outcome of Children Admitted With SARS-CoV-2 Infection: Experiences From a Pediatric Public Hospital.

- Indian Pediatr. 2021;58(4):358-362. doi: 10.1007/s13312-021-2196-4.
11. Irfan O, Muttalib F, Tang K, Jiang L, Lassi ZS, Bhutta Z. Clinical characteristics, treatment and outcomes of paediatric COVID- 19: a systematic review and meta-analysis. Arch Dis Child. 2021;106(5):440–8. doi: 10.1136/archdischild-2020-321385.
 12. Duarte-Salles T, Vizcaya D, Pistillo A, Casajust P, Sena AG, Lai LYH, et al. Thirty-Day Outcomes of Children and Adolescents With COVID- 19: An International Experience. Pediatrics. 2021;148(3):e2020042929. doi: 10.1542/peds.2020-042929.
 13. Parcha V, Booker KS, Kalra R, Kuranz S, Berra L, Arora G, et al. A retrospective cohort study of 12,306 pediatric COVID- 19 patients in the United States. Sci Rep. 2021;11(1):10231. doi: 10.1038/s41598-021-89553-1.
 14. De Luca CD, Esposito E, Cristiani L, Mancino E, Nenna R, Cortis E, et al. Covid- 19 in children: A brief overview after three months experience. Paediatr Respir Rev. 2020;35:9-14. doi: 10.1016/j.prrv.2020.05.006.
 15. Sarangi B, Reddy VS, Oswal JS, Malshe N, Patil A, Chakraborty M, et al. Epidemiological and Clinical Characteristics of COVID- 19 in Indian Children in the Initial Phase of the Pandemic. Indian Pediatr. 2020;57(10):914-917. doi: 10.1007/s13312-020-1994-4.
 16. Götzinger F, Santiago-García B, Noguera-Julián A, Lanaspá M, Lancellata L, Calò Carducci FI, et al. COVID- 19 in children and adolescents in Europe: a multinational, multicentre cohort study. Lancet Child Adolesc Health. 2020;4(9):653-661. doi: 10.1016/S2352-4642(20)30177-2.
 17. Xia W, Guo Y, Tian Z, Luo Y, Hu D, Shao J, et al. Clinical Features and Temporal Changes of RT-PCR and Chest CT in COVID- 19 Pediatric Patients. Front Pediatr. 2020; 8:579512.
 18. Oterino Serrano C, Alonso E, Andrés M, Buitrago NM, Pérez Vigara A, Parrón Pajares M, et al. Pediatric chest x-ray in Covid- 19 infection. Eur J Radiol. 2020;131:109236. doi: 10.1016/j.ejrad.2020.109236.
 19. Wu H, Zhu H, Yuan C, Yao C, Luo W, Shen X, et al. Clinical and Immune Features of Hospitalized Pediatric Patients With Coronavirus Disease 2019 (COVID- 19) in Wuhan, China. JAMA Netw Open. 2020;3(6):e2010895. doi: 10.1001/jamanetworkopen.2020.10895.