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COVID-19 in children

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Abstract:

Coronavirus disease-2019 (COVID-19) has affected nearly 2 million people and caused up to 100,000 people death worldwide until today. This severe disease has seen less in children than adults. This may be due to the fact that cytokine storm in children is milder, viral load exposure is less than in adults, and angiotensin converting enzyme receptor levels are different from adults. It should be kept in mind that COVID-19 may cause severe illness in infants under 1 year old and in children with chronic diseases such as chronic kidney disease undergoing dialysis, sickle cell disease, chronic liver disease, endocrine disorders, chronic lung disease, cardiovascular disease, immune deficiency, and severe obesity. Fever and cough are the most common symptoms in COVID-19, and children can also be asymptomatic. Laboratory findings are variable in children. Ground-glass opacity, consolidation, patchy shadowing, halo sign, and interstitial anomalies can be detected in lung computed tomography, or it can be normal. In this review, the frequency of COVID-19 in children, differences between adults, the course of pregnancy and newborn, clinical and laboratory findings, and treatment options are reviewed.

Keywords:

Children, coronavirus disease-2019, newborn, pregnancy

Introduction

Coronavirus disease-2019 (COVID-19), which started in Wuhan city of Hubei Province, China, in December 2019, and was declared as a pandemic on March 11, 2020, by the World Health Organization (WHO), has high infectivity. As of April 15, the total number of detected cases is 1,996,681 and death is 127,590 worldwide.[1] The disease caused by the severe acute respiratory syndrome-coronavirus-2 (SARS-CoV-2) poses a risk by damaging vital organs such as lungs, heart, liver, and kidneys as is the case with SARS infection.[2] Pneumonia has been detected in all severe patients.[3] In China, 2.4% of all cases, and in the USA, 1.7% of all cases were under 18 years old.[4,5] It has been reported that the course of disease is milder and mortality is rare among children.[4]

Transmission and Fecal Shedding in Children

SARS-CoV-2 is transmitted via droplets. Objects contaminated with the virus (toys, door handles, etc.) may also serve as a route of transmission. The findings on the onset of the outbreak indicated that SARS-CoV-2 first transmitted from human to human within the community and especially among the adults and then started to infect elderly and children through intrafamilial transmission. The first identified pediatric case is known to be infected by intrafamilial contact.[6]

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There may be fecal viral excretion in children. A viral excretion was established in about 30% of the cases in the period from 5 days to 4–5 weeks following the onset of symptoms. The significance of this in terms of fecal transmission has yet to be clarified.[7] Zhang *et al*.[6] reported negative SARS-CoV-2 in the throat samples on days 14, 11, and 7 of three male COVID-19-positive patients aged 9, 6, and 8 years old, respectively. These patients discharged upon their second specimens were tested negative; however, all three patients were tested positive on stool samples for SARS-CoV-2 with real-time reverse transcription polymerase chain reaction (RT-PCR) on the postdischarge days 13, 11, and 10, respectively. During subsequent follow-up, the stool samples were tested negative after 4, 5, and 10 days later, respectively. This has suggested the possibility of fecal transmission for a while after the recovery of patients.[6] Children are believed to play an important role in spread of the disease during this outbreak.[8]

Risk of Severe Acute Respiratory Syndrome-Coronavirus-2 Transmission through Breastfeeding

Although there are not enough data on SARS-CoV-2 transmission through breast milk, the virus was not detected in breast milk samples of six mothers with confirmed COVID-19 during pregnancy.[9] WHO has recommended continuing breastfeeding at mother's will since virus has not been detected in breast milk and a mother with confirmed COVID-19 would transmit the virus to the baby primarily through respiratory secretions. Mothers with confirmed COVID-19 or who are symptomatic and with suspected COVID-19 are recommended washing their hands before touching their baby before breastfeeding or bottle-nursing and after breastfeeding, wearing surgical mask during breastfeeding, and disinfecting surfaces on a frequent basis. As an alternative, the breast milk can be expressed or the baby can be fed with formula by another person who is healthy and follows hygienic measures until the recovery of COVID-19 mother. COVID-19 mothers should follow the hygienic measures equally to pump their breast milk, and if possible, the pump used to express the milk should be cleaned by a healthy person.[10]

Coronavirus Disease-2019 during Pregnancy

Pregnancy is a partial immunodeficiency state that increases susceptibility to viral infections, and this is a period with increased susceptibility to hypoxia due to physiological adaptation changes (elevation of the diaphragm, increased oxygen consumption, and edema of the respiratory tract mucosa).[9,11] There are not enough data on SARS-CoV-2 infection among pregnant women. During the outbreaks of SARS and Middle East respiratory syndrome, pregnant women and their babies were reported to have serious adverse effects such as miscarriages, premature labor, intrauterine growth restriction, and maternal mortality.[12] During the 2009 H1N1 pandemic, the rate of pregnant admission to hospitals was four times higher than normal population and pregnant women were detected to be at an increased risk of complications. During the SARS outbreak, intensive care and mechanical ventilation were required in 50% and 33% of pregnant women with infection detected, respectively, and the mortality rate was high (25%) in pregnant women.[9] A study of nine pregnant COVID-19 patients in China did not establish severe pneumonia in any of the pregnant patients, and fever, cough, and less often myalgia, fatigue, sore throat, diarrhea, and shortness of breath identified as such in general population. Laboratory findings of these pregnant women revealed lymphopenia (55.5%), elevated C-reactive protein (CRP) (66.6%) and transaminase (33.3%) levels, and typical multiple patchy ground-glass areas (88.8%) on computed tomography (CT).[9] For the avoidance of intrapartum mother-to-baby transmission, all patients had cesarean section due to reasons such as preeclampsia, history of repeated cesarean section, and fetal distress. Four of nine live-born neonates were found to have a history of preterm (<36 weeks) birth. SARS-CoV-2 PCR was tested negative for fetal infection on amniotic fluid, umbilical cord blood, and newborn's throat swab samples taken from six mothers and babies at the delivery room. In that study, all nine pregnant women under follow-up were diagnosed with COVID-19 in the third trimester, and there are no enough data on vertical transmission in the first and second trimesters.[9] There are publications suggesting cesarean section instead of vaginal delivery, early clamping of the umbilical cord, rapid separation of mother and baby, and feeding the baby with expressed milk without breastfeeding during the isolation period of the mother to minimize intrapartum transmission from COVID-19 mother to her baby.[9,12] Corticosteroids are not routinely recommended to pregnant women at gestational weeks 34–37, who are diagnosed with COVID-19. In case of additional risk factors at gestational weeks 34–37, the recommendations of guidelines about lung maturation should be followed.[10] WHO recommendations express that early clamping of the umbilical cord does not reduce the risk of mother-to-baby transmission of pathogen in case the mother has any infection, and the vernix caseosa surrounding the baby can be kept in place for the first postpartum 24 h as it contains antimicrobial peptides.[10]

The review of five papers by Schwartz[13] examined 39 newborns from 38 pregnant women in China, and all of 30 women tested for COVID-19 was found negative. Among 38 pregnant women, there was no report of severe pneumonia or mortality. It is unclear if there are more serious adverse effects on fetus in the earlier periods of pregnancy.

Coronavirus Disease-2019 in Neonatal Settings

There are limited data on the frequency and prognosis of COVID-19 in newborns, and the study by Cao *et al*.[8] identified three neonatal cases, while the total number of cases including children and adults was 80,000 in China until February 20, 2020. The first newborn case was admitted to the hospital with fever and cough during the last 3 days, while the complaints of the second case were runny nose and vomiting for the last week. The 30-h-old newborn, the youngest case identified, in turn, was reported to be born from an infected mother, having respiratory distress and normal body temperature.[8] It should be kept in mind that COVID-19 infection during pregnancy may still have outcomes such as fetal distress, preterm delivery, and respiratory distress.[14] The available data suggest that newborns are infected through postnatal transmission, and the COVID-19 cases within the first 28 days have milder symptoms than older age groups or may be asymptomatic.[15]

Why is Coronavirus Disease-2019 Milder in Children than Adults?

In children, viral infections may cause different immunological responses and serious damage to vital organs.[2] So far, COVID-19 has been found to be rarer and milder in children than adults. The reason has yet to be identified, but there are several hypotheses in this regard.[3] Some of these include the lower level of viral exposure as children spend shorter times outside and travel less often internationally, the higher level of antibodies against viruses than adults as children have frequent upper respiratory tract infections in winter, and potentially different responses to pathogens compared to adults since their immune system is still developing.[3,16] It is believed that the distinct inflammatory and immune responses observed in models of mice infected with other coronaviruses stimulate cytokine storm, epithelial cell apoptosis, vascular leak, abnormal T-cell and macrophage responses, and hence, acute lung injury or acute respiratory distress syndrome (ARDS).[17] This may explain more severe course of the disease in adults as a result of a relatively stronger immune response in adults than children.

This difference is believed to be resulted from conditions, such as a less active immune system in childhood, lower exposure to smoking and air pollution than adults, and a rarer incidence of underlying diseases (hypertension, cardiovascular disease, diabetes, etc.) than adults.[3] It is also believed that the changes in distribution, maturation, and function of viral receptors in children are likely to affect the course of viral diseases among children. In infections such as SARS, SARS-CoV-2, and human coronavirus-NL63, the virus has been detected to enter into the cell through the angiotensin converting enzyme 2 (ACE2) receptor. ACE2 receptors were found to quickly decrease in the lungs with age in mice, and these findings were believed to not support the lower susceptibility in children. ACE2 also having a role in the protective mechanisms of the lungs may explain the less severe lung injury in children. Besides, ACE2 plays a protective role against sepsis, acid aspiration, and acute lung injury induced by SARS and H5N1 infections.[3] The milder course of the disease in children than adults may also be due to the distinct decrease in melatonin production with age, while melatonin decreases the inflammatory cell migration to the lungs and the oxidative stress in the lungs during viral infections.[18]

Link between Coronavirus Disease-2019 and Bacillus Calmette–Guérin Vaccination

It has been believed that Bacillus Calmette–Guérin (BCG) vaccination may be among the reasons of lower number of cases and lower mortality in some regions, despite the spread of the disease over 185 countries. The study by Miller *et al*.[19] examined middle-to-high- and high-income countries with a population over 1 million and found that the COVID-19-related mortality rate was 0.78 ± 0.40/1,000,000 in 55 countries with BCG vaccination compared to a higher rate of 16.39 ± 7.33/1,000,000 in five countries without such vaccination ever (Italy, Netherlands, Belgium, the USA, and Lebanon).[19] When compared number of cases, the mean number of COVID-19 cases was 59.54 ± 23.29/1,000,000 in 55 countries with a BCG vaccination policy compared to 264.90 ± 134.88/1,000,000 in five countries without such policy ever, which was four times higher. These findings propose that a generalized vaccination of BCG decelerates the spread of COVID-19 and reduces mortality. For the elderly, in turn, there is not enough evidence that the BCG vaccination will increase defense.[19] The BCG vaccination is known to protect against viral infections and sepsis. Upon the aforementioned study, it is believed that the BCG vaccine provides a partial protection against COVID-19, creates an immune response against COVID-19 in the body, and may reduce the number of COVID-19

carriers upon its broad use across the population.[19] Randomized controlled studies are required on this issue.

Link between Coronavirus Disease-2019 and Hepatitis A Vaccination

COVID-19 has a higher incidence and mortality in certain counties (China, the USA, Italy, Spain, France, England, the Netherlands, and Belgium). India, Pakistan, and many African countries, in turn, are not affected by the pandemic to a great extent. Differences in exposure among countries are not fully explained by the age distribution of the population, accessibility to healthcare services, diagnostic competency, the environment, and compliance with social isolation measures. Another reason of differences among countries may be the endemic nature of hepatitis A infection as is the case in Africa and Asia or the routine practice of hepatitis A vaccine. Hepatitis A is not common in countries with high socioeconomic status and hygienic level. This suggests a potential link between the decreased humoral and cellular immunity induced by hepatitis A vaccine in the elderly in developed countries and the increased COVID-19 case numbers and mortality in such countries. Hepatitis A vaccination may be protective against COVID-19 as a result of cross-reaction in adaptive immunity. The hepatitis A vaccine is believed to ensure a limited COVID19 infection on the mucosal surface, reducing its way down to the respiratory tract and mortality. The hepatitis A vaccine is believed to ensure a limited COVID19 infection on the mucosal surface, reducing its way down to the respiratory tract and mortality. The fact that large number of cases was seen later in Brazil does not support this hypothesis. It is suggested to test this association through in vitro and molecular studies.[20]

Triage and Diagnosis in Children

Children presenting at a healthcare facility with symptoms such as fever, cough, and respiratory distress should be evaluated by clinicians, who wear personal protective equipment, by having the patient wearing a surgical face mask, and in a triage room reserved for COVID-19 patients. A detailed history of contact should be taken from the patient and the family, and the patient should be physically examined. Patients with an unstable clinical condition should be transferred to proper services upon quickly providing respiratory and circulatory support.[21]

Upper respiratory tract swab samples are taken from patients considered as a potential case for COVID-19 and tested by RT-PCR for SARS-CoV-2. Besides, testing immunoglobulin (Ig) M/Ig G in the blood with serological methods is helpful for diagnosis.[21] SARS-CoV-2 can be detected in the upper respiratory tract samples within 1–2 days following the onset of symptoms. The PCR positivity has been observed to present until 7–12 days in moderate cases and until 2 weeks in severe cases.[22]

For babies delivered by a mother with suspected or confirmed COVID-19, it is recommended taking the first swab sample within 12–24 h of birth. It is appropriate to take nasopharyngeal and oropharyngeal samples with the same swab, and if the patient is intubated, endotracheal aspirate could be taken for sampling. The recommendation is not to take the samples before 12–24 h as it may reflect maternal infection. Nevertheless, it should not be forgotten that the samples taken at a later period may also show postnatal transmission. The test can be repeated depending on the clinical status at the follow-up of the baby.[23]

For pediatric patients, a thin swab should be used to take the swab sample due to narrow nasal passage. RT-PCR-positive tests are suggested to be confirmed through repetition. It should be kept in mind that negative tests (especially swab samples from upper respiratory tract) may also not exclude SARS-CoV-2.[22] Previous studies established the highest possibility of a positive RT-PCR result in the swab samples taken as soon as the symptoms started. Taking multiple swab samples can help confirm the diagnosis.[24]

Clinical Symptoms of Coronavirus Disease-2019 in Children and the Differences from Adults

Clinical symptoms of COVID-19 are not specific in children and usually milder than adults. In children, COVID-19 may be either asymptomatic or present itself with upper respiratory tract infection such as fever, dry cough, weakness, and runny nose. Some children may experience gastrointestinal system symptoms such as abdominal pain, nausea, vomiting, and diarrhea. Most of the infected children have mild course with good prognosis. Most of pediatric patients recover within 1–2 weeks following the onset of symptoms. Lower respiratory tract infection is very rare among children.[25] The data on adults reveal ARDS, septic shock, metabolic acidosis, and coagulation disorders within the 1st week, following the disease onset in severe cases, whereas such severe course is rare in children. The first pediatric case with severe disease was published from Wuhan Pediatric Hospital on February 11, 2020; a 1year old male patient, who was admitted to the hospital with vomiting and diarrhea for the last 6 days and fever and respiratory distress for the last 12 h, observed to

have pneumonic infiltration in the right lung on chest Xray. He was intubated due to respiratory distress, and successfully extubated after 10 days of follow-up. The patient's samples of day 1 and day 7 were negative for SARS-CoV-2 by RT-PCR, while the sample of day 8 was found positive. This case showed that there might be severe pediatric cases, even though it is rare.[26]

The largest case series from China is done by Dong *et al*.,[16] which included 2143 children with suspected and confirmed COVID-19 diagnosis by February 8, 2020. Among the patients, 34.1% were COVID-19 confirmed by laboratory tests and 65.9% were suspected COVID-19. 56.6% of the patients were male and the mean age of diagnosis for all patients was 7 (2–13) years. Among the study children, 4.4% were asymptomatic, 50.9% had mild, and 38.8% had moderate disease. Distribution of children with severe and critical disease by age groups indicated that 10.6% were aged < 1 year, 7.3% were aged 1–5 years, 4.2% were aged 6–10 years, 4.1% were aged 11–15 years, and 3% were aged > 15. Based on these data, the risk of severe disease was found higher in younger age groups.[16] It should be kept in mind that COVID-19 may be severe also in pediatric cases with underlying pulmonary disease and immunodeficiency in younger age groups.[27]

The largest case series published to date included 2572 children from the USA. The average age of the patients was 11 (0–17) years, and 57% were male, which was found consistent with the data from China. The age distribution showed that 15% of the pediatric cases were aged <1 year, 11% were aged 1–4 years, 15% were aged 5–9 years, 27% were aged 10–14 years, and 32% were aged 15–17 years. Although the study found that 15% of the pediatric cases aged <1 year, the rate of cases aged <1 year within all cases was found lower (0.27%).[4] Data on symptoms were available for 11% of the patients; 93% of adults had symptoms of fever, cough, and shortness of breath compared with 76% of pediatric cases. In addition, other accompanying symptoms identified in children were myalgia, sore throat, headache, runny nose, nausea, vomiting, abdominal pain, and diarrhea, and 1 (1.3%) patient was asymptomatic. The study found that hospitalization and intensive care need higher in adult patients than pediatric age group. Besides, the rates of hospitalization and intensive care need were higher in children aged <1 year than children aged 1–17 years. Comorbidities of children were questioned in 345 of 2572 patients, revealing the presence of at least one of chronic pulmonary disease including asthma, cardiovascular disease, and immunosuppression (malignancy, chemotherapy, radiotherapy, hematopoietic stem cell, or solid organ transplantation or high-dose corticosteroid use) in 23%.[4] In addition, the risk for severe disease is considered to be increased in patients with sickle cell anemia, chronic liver disease, endocrine disorder, morbid obesity, and chronic kidney disease undergoing dialysis.[28] In the USA, three of 2572 patients died from COVID-19 and the presence of underlying diseases was unknown for these patients.[4]

Laboratory Findings in Children

There are limited laboratory data on children diagnosed with COVID-19. Early laboratory tests of adult patients revealed anemia, lymphopenia, and elevated levels of liver enzymes, sedimentation, CRP, and procalcitonin, and occasionally hyperglycemia.[14] The review by Henry *et al*.[29] examined the data of 66 pediatric patients and revealed that the leukocyte count was normal in 69.2%, increased in 15.2%, and decreased in 15.5%. Among the patients, 4.6% had neutrophilia, 6% had neutropenia, 3% had lymphopenia, 13.6% had elevated CRP, and 10.6% had high levels of procalcitonin. Lymphopenia was detected in 25% and 80% of adult patients with mild and severe disease, respectively, and this suggested a possible link between lymphopenia and disease severity. It should not be forgotten that lymphopenia may not be observed in infants as their immune system is relatively immature compared to adults and they may have different immune responses. The 1-year-old COVID-19 patient who had severe disease from China did not have a distinct change in his leukocyte count; however, there were a reduction in natural killer cell count and an increased level of interleukin-6 between days 1 and 5 of hospitalization. This is proposed to be associated with coexistence of severe pneumonia requiring mechanical ventilation in children under 5 years of age.[26] The study by Lu *et al*.[30] identified lymphopenia in 3.5% of 171 pediatric patients at laboratory examination. The study by Qiu *et al*.[2] examined 36 pediatric patients and found leukopenia, lymphopenia, and myocardial enzyme elevation similar to those in adults. The CRP level was higher in adults than children, which was believed to results from the milder immune response and less immune damage in children. It should be kept in mind that some pediatric patients may have altered levels of transaminase, creatinine, creatinine kinase, lactate dehydrogenase, D-dimer, urea, and platelets.[29] Children may present with various laboratory findings and have normal laboratory values on admission. Laboratory tests can also be repeated based on the progression of patient's clinical symptoms.

Radiological Findings in Children

Children may have normal chest X-rays in the early period of the disease. Severe cases may have unilateral/bilateral multifocal patchy ground-glass opacities on the chest X-ray.[21] When examined the chest CT scan findings, Lu *et al*.[30] established ground-glass appearance in 56 (32.7%) of 171 pediatric cases. Among the patients,

18.7% had local and 12.3% had bilateral patchy appearance. Two (1.2%) patients had interstitial changes on CT and 64.9% of the patients were clinically diagnosed with pneumonia. Another review of five pediatric cases identified mild patchy ground-glass appearance on CT in three patients.[31] Xia *et al*.[32] examined 20 pediatric patients and established abnormality on CT in 16 (80%) patients and combination of ground-glass appearance and halo sign in 12 (60%) patients. Yang *et al*.[33] established findings consistent with viral pneumonia in 70.4% of 134 patients on pulmonary imaging (direct radiography and/or CT). In conclusion, the most common CT findings in children can be listed as ground-glass appearance, unilateral/bilateral patch appearance, consolidation, interlobular septal thickening, halo sign, and subpleural findings. The ground-glass appearance observed at the onset of disease may turn into consolidation later. Lymphadenopathy and pleural effusion are rare in children.[21] Adults have peripherally-located lesions more often, while this is rarer in children.[34] It should be kept in mind that children may have normal lung images in early periods, and CT scan should not be performed routinely to minimize the side effects of radiation. CT scan can be performed if required after pediatric cases are evaluated thoroughly with clinical and laboratory findings and chest X-ray.

Treatment Methods in Children

There are not any certain treatment recommendations for children. Supportive therapy can be administered as oxygen therapy in children with respiratory distress or hypoxia and antibiotic treatment in children with bacterial superinfection suspicion. Some publications report the use of antiviral therapies on severe cases but did not exactly mention their efficacy on children.[14] Republic of Turkey, Ministry of Health COVID19 Guideline presents hydroxychloroquine, lopinavirritonavir and favipravir therapies as treatment options for pediatric cases based on age and weight. Oseltamivir is suggested for patients who have clinical symptoms consistent with influenza, have positive influenza diagnostic test, or cannot be excluded for influenza.[21] Table 1 provides the treatment options recommended for children in the Republic of Turkey, Ministry of Health COVID19 Guideline updated June 3, 2020. Hydroxychloroquine is not approved for use in children under 6 years of age, and if it is used, an "Informed Consent Form" must be completed.[21] For patients receiving hydroxychloroquine, clinicians should be careful about side effects such as cardiomyopathy, prolonged QT interval, nausea, vomiting, diarrhea, abdominal pain, corneal changes, and tinnitus.[35] When favipiravir is planned to use in children older than 15 years old, patients should be evaluated about side effects such as decreased appetite, diarrhea, nausea, vomiting, hyperuricemia, decreased neutrophil count and increased serum transaminases.[36] When lopinavir/ritonavir is planned to use, patients should be carefully evaluated about side effects such as anxiety, fatigue, elevated transaminase levels, changes in blood sodium levels, abdominal pain, nausea, vomiting, diarrhea, and susceptibility to the upper respiratory tract infections.[37] The safety, efficacy, and pharmacokinetic effects of lopinavir/ritonavir on newborns under 14 days of age are not fully known, and there are no enough data on its use in newborns under 14 days of age.[26] Children usually have a mild course of disease, and medication should be planned in selected cases.

Table 1: Treatment options for children in Republic of Turkey Ministry of Health COVID-19 Guideline updated June 3, 2020[21]

Drug name	Daily dosage in children	Treatment duration (day)
	First choice	
Hydroxychloroquine 200 mg pill ± Azithromycin 200 mg/5 ml suspension 500 mg pill	On the 1st day 6.5 mg/kg/dosage (maximum 400 mg/dosage) followed by 3.25 mg/kg/dosage (maximum 200 mg/dosage) between 2 and days twice daily per oral ± Azithromycin For 1-5-month-old infants: 10 mg/kg/dosage (maximum 500 mg/dosage) Children older than 6 months and adolescents: On the first day 10 mg/kg/dosage single dosage (maximum 500 mg/dosage) Followed by 5 mg/kg/dosage single dosage (maximum 250 mg/dosage) per oral between 2 and 5 days	5 days
	In progress or alternatively treatment option	
Lopinavir 250 mg/ ritonavir 50 mg pill	For 14 days to 6 months old infants based on lopinavir component 16 mg/kg per oral For 6 months to 18 years old children Between 15-25 kg: 200-50 mg per oral Between 26-35 kg: 300-75 mg per oral Above 35 kg: 400-100 mg per oral	10-14 days

Discharge Criteria for Hospitalized Patients

Pediatric patients treated in hospital can be discharged upon they have no fever for the last 3 days, respiratory distress is recovered, pulmonary imaging findings regress, and negative RT-PCR-negative results of two separate samples taken at least 1 day apart.[6] Children should be followed up after discharge and 14-day in-house isolation after discharge is recommended.[2,21]

Conclusion

COVID-19 has a milder course in childhood than adults. Children have lower rates of hospitalization, intensive care need and mortality. Although clinical symptoms are common in adults, severe pneumonia is rare in childhood. Laboratory tests may reveal lymphopenia, lymphocytosis, rarely neutropenia, myocardial enzyme, and transaminase elevation. Studies on adults found higher CRP levels than children. CT has a limited place and a high level of radiation side effect for children. Most common CT findings in children include local or diffuse patchy ground-glass appearance, consolidation, and halo sign. Severe pneumonia is also rare in pregnant women and newborns than in general population. Yet, there are still no data on whether an infection during first and second trimesters causes a severe disease in pregnant women and result in prematurity, fetal distress, and respiratory distress in newborn. In case of babies delivered by mothers with confirmed COVID-19, proper hand hygiene and surgical face mask wearing are recommended while breastfeeding. Regarding children, first nutritional and respiratory support needs should be evaluated, and symptomatic treatment options such as hydroxychloroquine or lopinavir/ritonavir or favipiravir (in children older than 15 years old) therapies could be given on a patientspecific basis.

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Conflicts of interest

There are no conflicts of interest.

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