

ABSTRACT

The world is currently challenging the serious effects of the pandemic of the Coronavirus disease (COVID-19) caused by severe acute respiratory syndrome Coronavirus 2 (SARS-CoV-2). Data on pediatric COVID are rare and scattered in the literature. In this article, we presented the updated knowledge on the pediatric COVID-19 from different aspects. We hope it will increase the awareness of the pediatricians and health care professionals on this pandemic.

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From Wuhan, China, the novel Coronavirus disease 2019 (COVID-19), has arisen in late December 2019 and transmitted to different regions in the world triggering a panic attack and initiated downward escalation in different economic, social, and health aspects.¹ Its spatial distribution and serious sequelae have led the World Health Organization to declare a pandemic in March 2020. It has infected people from all age groups, gender, cultures, and religions around the world. The number of COVID-19 cases continues to rise, resulting in millions of cases and more than 500,000 deaths all over the world.

The virus affects white blood cells causing eosinopenia and lymphopenia, wide spread pneumonia, and a cytokine storm resulting in respiratory distress and multi-organ failure. While lymphopenia causes impairment in immune regulatory mechanisms and antiviral immunity, the cytokine storm triggers a wide activation of cytokine-secreting cells with innate and adaptive immune mechanisms correlating with the bad prognosis. Lymphopenia and increased acute phase reactants levels are regarded early predictors of high grade of the severity of the disease.² Type III hypersensitivity reaction has been postulated as the immunological mechanism of COVID-19 infection.³

Children are vulnerable to acquire COVID-19. It infects children in the same way as other age groups and makes children carriers of the virus and a source of spreading the virus to other individuals. Moreover, infants and neonates can get easily the virus from other

members of the family without prior exposure to the outside environment.⁴ The most common route of virus transmission among persons is through droplets and direct contact, particularly during long, unprotected contact with asymptomatic patients.⁵

The epidemiological profile and clinical picture of COVID-19 in children have been a matter of debate due to the limited number of pediatric cases and the absence of extensive large size studies. The recently published data pointed out that children have constituted 1%-5% of all diagnosed COVID-19 cases. Around, 90% of pediatric patients were found to be asymptomatic, mild, or moderate disease. Deaths were very rare. Up to 6.7% of cases might be severe that often noticed in infants and those having underlying diseases. Clinically, fever and respiratory symptoms are the most common presentations, but severe pneumonia developed in fewer children. Increased markers of inflammation were less commonly noticed in children compared to adults, while lymphocytopenia looked rare.⁶⁻⁸

Few cases of COVID-19 developing during gestation are published. There is currently no evidence of the vertical COVID-19 transmission from infected pregnant to their fetuses based on the available limited data.⁹⁻¹⁰ Perinatally acquired COVID-19 could have negative effects on newborns like premature labor, fetal distress, cyanosis, respiratory distress, thrombocytopenia, abnormal hepatic enzymes, lethargy, poor feeding, unstable body temperature, vomiting and even death.¹¹⁻¹³

The issue of whether mothers infected with COVID-19 should initiate breastfeeding is still inconclusive. Though viral nucleic acid has not been defined in breast milk, the advantages of breastfeeding versus the risk of acquiring COVID- 19 in babies must be considered. Infected mothers must continue taking suitable precautions to decrease the probability of virus transmission through close contact and droplets during breastfeeding.¹⁴⁻¹⁵

Early and precise diagnosis of COVID- 19 is fundamental to save people's lives. False negative test results could accelerate the spread of the disease in the community while false positive results could lead to starting unnecessary therapy and mental trauma to the patients and families. The diagnosis is established mainly in immunological studies. Real time RT-PCR assay is the recommended molecular test for etiologic diagnosis. Antibody-based immunological tests are used as supplementary tools for screening the whole population and confirming with the molecular assay. The rapid test kits are utilized for offering rapid diagnosis in the emergency circumstances and at the bedside to the patients.¹⁶ A case who meets any one of the following tests should be considered positive: testing positive for virus by real-time polymerase chain reaction; highly homologous genetic sequencing of blood samples or respiratory tract secretions with the well-known SARS-CoV-2; positive serum - specific IgG and IgM antibodies and; and changing from negative to positive serum-specific IgG antibody or increasing four folds or greater than that in the acute stage during the period of recovery.¹⁷ Demonstration of the typical ground glass opacities on the chest CT scan and tracing of contacts are additional tools facilitating the diagnosis.

Once COVID -19 infection is suspected, immediate measures for infection prevention control should be started,

including hand washing, hygienic waste disposal, wearing face mask and gloves, and the use of cleaning material and disinfectant. Supportive treatment remains the cornerstone in the management of affected children. It includes bed rest, sufficient fluid and caloric intake, and oxygen supplementation through a mask, nasal cannula, CPAP, or invasive mechanical

ventilation. Applying physical cooling by the various methods and antipyretics such as ibuprofen and acetaminophen can be used to control fever. Chest physiotherapy and expectorant can be utilized to prevent or reduce respiratory tract obstruction since mucus and mucus plug may occur. When a nosocomial infection is suspected, a broad-spectrum antibiotic should be given.¹⁸

The steroid is not required in the majority of children with COVID -19 who are otherwise healthy, not require respiratory, and who recover without severe sequelae. Dexamethasone might be considered in patients who require respiratory support, those with an underlying chronic condition requiring steroid therapy and in patients with an additional diagnosis where steroid therapy is appropriate.¹⁹

There is no consensus among researchers regarding the use of any antiviral or immunomodulatory therapy in pediatric patients with COVID -19 who have mild, moderate, severe, and critical illnesses. Interferon- α , lopinavir/ritonavir, Oseltamivir, ribavirin or chloroquine phosphate, are still experimental and not recommended to be administered routinely.²⁰

The development of vaccine against COVID-19 is important not just to limit the spread of the disease but also to maintain the community protection, the herd protection, the protection of those that even don't receive the vaccine. For these reasons, several organizations are working to strengthen the importance of routine vaccination during the COVID-19 pandemic.²¹

The candidate COVID-19 vaccine needs proper safety assessment for immunopotentiality which could result in eosinophilic infiltration or increased infectivity. It must target vaccinating at risk populations such as individuals over the age of 60, frontline healthcare workers, and those having debilitating chronic conditions. The vaccine technologies under assessment include recombinant protein subunit vaccines, whole virus vaccines, and nucleic acid vaccines.²²

At least ten vaccines candidates in developed countries have entered clinical trials, including phase II trials.²³ The phase I/II trial of the vaccine, known as ChAdOx1 nCoV-19 and synthesized by the University of Oxford, has revealed that the vaccine

initiates strong immune responses, safe, and has few side effects. The vaccine induced a T-cell response and antibody response at 14 days and 28 days after vaccination respectively. The trial caused minor side effects like fatigue and headache.²⁴ Russia has announced complete development of a new vaccine to be released for mass production but it has drawn major outrages worldwide over its safety, effectiveness, and fulfillment of the necessary clinical trials.²⁵ The optimum vaccine is not yet developed and the current evidence suggests that it could be released after completing the clinical trials at the end of the year 2020 or the beginning of the year 2021.

In conclusion, COVID -19 pandemic is serious and it can be regarded a once in a century worldwide disaster. Collaborative actions are needed globally to minimize its harmful effects on various aspects of living and people's lives.

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