



COVID-19: Infection Control and Treatment Strategy in Pediatric Age Group in Turkey

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In December 2019, the novel coronavirus (2019-nCoV) infection originating from Wuhan, China, and causing a worldwide epidemic, was named 'Coronavirus Disease 2019' (COVID-19) by the World Health Organization (WHO) (1). The novel coronavirus was defined as SARS CoV-2 due to the similarity with severe acute respiratory syndrome (SARS) coronavirus and SARS CoV-2 is the first coronavirus announced as a pandemic on 11 March 2020 (2). In Turkey, the first case was declared on 11 March 2020 and the first death was announced on 17 March 2020. While the reported deaths are relatively low, the incidence is rising rapidly in Turkey (3).

SARS CoV-2 is a highly infectious virus that can be transmitted extremely quickly. The main routes of transmission of the virus are close contact with an infected person and droplets formed by the infected person's coughing and sneezing. SARS CoV-2 can also be transmitted from contaminated environments to the nasal, oral, and eye mucosa by inoculation of the virus (4).

Despite the large number of people affected all over the world with this disease affecting all age groups, data on clinical features and prognostic factors in children and adolescents are still limited. This disease has a milder course in children than adults, and deaths from COVID-19 are less common in children. However, asymptomatic children may also play an important role in the spread of COVID-19 (5). Hence, infection control measures are of paramount importance.

This paper has been prepared using the current guidelines and it includes the strategies for infection prevention and control and the clinical experiences during the coronavirus pandemic in Turkey. The current treatment protocols recommended in children with COVID-19 were also summarized.

Treatment of Children with COVID-19

The treatment strategy for children with COVID-19 is based on the clinical classification in the World Health Organization (WHO) guidelines. A guideline for the management of children with COVID-19 has been created based on current researches and the recommendations of WHO on COVID-19 by the Turkish Ministry of Health Coronavirus Scientific Advisory Board during the COVID-19 pandemic (5). Our guideline and WHO recommend providing symptomatic treatment (antipyretics and appropriate fluid support for fever and pain) in children with mild COVID-19 (symptomatic patients) (5, 6).

Pediatric COVID-19 patients with a moderate clinical course include patients with no signs of severe pneumonia and oxygen saturation of $\geq 90\%$ at room air (6). The current guideline recommends close follow-up in terms of supportive treatment and symptoms indicating the progression of the disease, and antibiotic treatment is not recommended unless there is clinical suspicion of bacterial infection (5).

Presence of the clinical signs of pneumonia (cough or dyspnea) and central cyanosis or oxygen saturation of $< 90\%$, severe respiratory distress (tachypnea, retraction), lethargy, coma, or convulsion are classified as severe disease COVID-19 (5). In severe disease management, it is recommended to maintain oxygen saturation as $\geq 94\%$ with oxygen therapy during resuscitation and $> 90\%$ after stabilization of the patient. In this patient group, close follow-up for progressive respiratory failure and shock, close monitoring for complications of COVID-19 (such as acute respiratory distress syndrome, acute liver injury, acute kidney injury, and disseminated intravascular coagulation) are required (6).

The choice of antiviral therapy in children is recommended in the context of clinical trials on a case-by-case basis, considering the clinical condition of the disease and the underlying clinical disease that may increase the risk of progression (6, 7).

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In the treatment of COVID-19 in children, there is no proven treatment. Apart from clinical trials, antivirals are not advised for the treatment or prophylaxis in children with COVID-19 (5, 6).

Among the experimental treatments that have been investigated in this respect, remdesivir is the nucleotide analog prodrug that inhibits viral RNA polymerase (7). For remdesivir, the U.S. Food and Drug Administration (FDA) has extended authorization of its emergency use to all hospitalized children and adults with suspected or laboratory-approved COVID-19, regardless of the severity recently (8).

The current guideline recommends use of hydroxychloroquine in the treatment of hospitalized pediatric patients diagnosed with COVID 19 on a case-by-case basis (5). The FDA has abolished the emergency use authorization of this drug in COVID-19 treatment outside of the hospital setting or a clinical trial. Adult patients have been included in the most of clinical studies of hydroxychloroquine (9). There are insufficient data about safety of hydroxychloroquine in the treatment of pediatric patients with COVID-19. Thus, the decision of use of this drug should be made carefully on a case-by-case basis for hospitalized children with COVID-19 (5). Although the optimal duration of treatment is unclear, it is five days and should only be used in the context of clinical trials for hospitalized patients (7).

Lopinavir and Ritonavir, which are anti-retroviral agents, observed to be useful in COVID-19 treatment. Lopinavir-ritonavir could be considered as an option for children when remdesivir or hydroxychloroquine were not available (7). A dose scheme has been shown for children over 14 days of age with COVID-19 in our guideline (5).

Favipiravir is another drug that is being investigated in this respect. Favipiravir, an RNA-dependent RNA polymerase inhibitor, shown to be effective in Ebola and influenza epidemics, was found to be associated with faster viral clearance and higher recovery rate than lopinavir/ritonavir (LPV / RTV) in a study conducted on patients over 16 years of age with COVID 19 (10). Clinical trials on this experimental drug are ongoing.

Infection Control Strategies and Clinical Experiences in Children with COVID-19

Clinical Triage of Suspected Pediatric COVID-19 Patients and Isolation in the Hospital

A guideline on infection control principles of COVID-19 in hospitals has been prepared by the Turkish Ministry of Health Coronavirus Scientific Advisory Board based on the recommendations of WHO and the European Centre for Disease Prevention and Control (ECDC) during the COVID-19 pandemic. This guideline includes the management of the COVID-19 outbreak in Turkey (11).

During the COVID-19 pandemic in Turkey, an appropriate triage was organized to reduce the number of healthcare workers exposed to probable or confirmed pediatric COVID-19 patients in hospitals and to prevent the spread of COVID-19 among patients. Clinical triage was created to include outpatient evaluation at the time of first admission, pediatric emergency admissions and referrals from other hospitals. For outpatient admissions, a triage room was organized outside the hospital in which the temperatures of the child and parents were measured, a mask was given, the symptoms were screened concerning COVID-19, and the contacts were

questioned. Possible COVID-19 patients were evaluated by pediatricians and pediatric infection disease specialists. Nasopharyngeal sampling was provided in inpatient sampling cabins for COVID-19 testing. COVID-19 patients requiring hospitalization were referred to emergency units, and patients requiring temporary monitoring were transferred to isolation rooms in the emergency department. The pediatric emergency department was divided into two separate sections according to possible COVID-19 positive or negative patients. After the first examination of children with COVID-19 who required hospitalization, the parents and the children were placed in an isolation room with a separate bathroom. Private or disposable medical devices were placed in each patient room. Visits to the patient were minimally limited. Children who needed high-flow nasal cannula or oxygen therapy were taken to negative pressure rooms. When a child with suspected or confirmed COVID-19 was discharged from the ward, the patient rooms and the frequently touched surfaces were disinfected, followed by regular cleaning. Procedures, such as tracheal intubation, bronchial aspiration and bronchoscopy, that lead to aerosol cause an increase in the risk of coronavirus contamination and require to use of personal protective equipment; hence, these procedures were performed in a negative pressure isolation room and all people in the room were equipped with an N95 mask, eye goggles, protective impermeable gowns and gloves and face shield. Healthcare workers were allowed to wear surgical masks when managing patients without COVID-19. The personnel assigned to treat COVID-19 patients were educated on the appropriate use of personal protective equipment and hand washing, and training was provided with videos (11, 12).

Infection Prevention and Control in Community and Schools

Various strategies have been implemented to reduce the risk of SARS-CoV-2 transmission in the community. These include social distancing, the use of face masks, frequent hand washing, and quarantine (isolation of sick people who have been exposed to COVID-19) (11). WHO and the United Nations Children's Fund (UNICEF) recommend using surgical masks to prevent and control the transmission of viral respiratory infections, including COVID-19 (13). A guideline on infection prevention and control of COVID-19 in schools was prepared by the Turkish Ministry of Health Coronavirus Scientific Advisory Board based on WHO recommendations (11).

The expert opinions recommend that children under the age of two not wear a mask due to the difficulty in adaptation and the lack of self-management ability to use the mask properly. It is important to emphasize to children that the use of face masks is a tool, and they should be told that children should also comply with physical distance, hand hygiene, and respiratory protection rules (11, 13).

Preventive measures during the COVID-19 pandemic in Turkey were implemented in schools based on the guideline prepared by the Ministry of Health Coronavirus Scientific Advisory Board (11). The virtual learning and working from home options were presented. Children were informed about hand hygiene and compliance with the rules of the respiratory system (such as using a handkerchief when coughing and sneezing). To ensure the application of the recommended 20-second hand washing period, the children were taught singing while washing their hands and teaching children how to apply them with the hand sanitizer. Pictures

introducing daily protective measures and explaining how to stop germs were placed in highly visible places. Regular announcements were made in schools to reduce the spread of COVID-19, a regular program for routine cleaning and disinfection was made, it was ensured that each child's belongings were stored separately and in individually labeled containers, and the sharing of items was minimized as much as possible. The students were suggested to sit on only one side of the tables, spaced from each other, and the distance between the tables was arranged to be two meters. Common areas, such as dining halls and playgrounds, were cleaned and disinfected gradually between each use. It was suggested that children bring their own meals as much as possible, and if possible, the distance between children on school buses was suggested (11, 14).

Conclusion

In conclusion, COVID-19 has a milder clinical course in children than adults, and children with mild symptoms should generally be treated at home unless they have a chronic condition that increases the risk of severe disease (7). Supportive care (e.g., respiratory support, fluid and electrolyte support, monitoring for complications) is the mainstay of treatment for children with severe or critical COVID-19 (6). Antiviral therapy should be considered on a case-by-case basis in the context of the clinical trials (5). Infection control measures are very important in preventing possible transmission from children with COVID-19 to other people.

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