



COVID-19 MANAGEMENT IN PEDIATRIC

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INTRODUCTION:

Covid-19 or Corona virus disease 2019 is a respiratory virus infection caused by severe respiratory syndrome Corona virus 2 called as SARS-CoV-2. SARS-CoV-2 is a single stranded RNA virus originated from bat. The first case was reported from Wuhan, China in December 2019 and has spread across the world since then. It was declared a world-wide pandemic by W.H.O in 11th March 2020.

Among 2.7 million death of Covid-19 reported in the MPIDR (Max Planck Institute for Demographic Research) data base, 0.3 % (8700) occurs in children and adolescents under the age of 20 years, 60% occurred among adolescent ages 10-19 years and 40% among children ages 0-9 years.

The reaction of Covid-19 in children is different than how adult react with Covid-19. The severity of illness to this disease in children is mild because children are more prone to get colds, the immune systems are able to fight against Covid-19 virus. Children having underlying diseases condition such as obesity, heart diseases, asthma, genetic conditions, diabetes are at higher risk of critical illness with Covid-19.

Infants are at high risk of severe illness with Covid-19 as compare to children due to immature immune systems and they have a narrow airway which can developed breathing problems with respiratory viral infections. Newborns get infections of Covid-19 during childbirth when expose from sick caregivers after delivery.

EPIDEMIOLOGY:

Over 200 million covid-19 cases have been reported around the globe. According to CDC, the incidence rate of Covid-19 is low in pediatric as compare to the adult. According to a series of 171 pediatric cases from age newborn to 15 years old admitted in Wuhan, China. Children tested positive COVID-19, 27 (15.8%) were asymptomatic, 33 (19.3%) have upper respiratory symptoms and 111 (41.5%) have fever lasting for 1-16 days. Among children, infants were most vulnerable to Covid-19 infection. On the basis of gender, it is observed that slightly more boys (56.6%) than girls (43.4%) are affected in Covid-19 outbreak; a similar two recent studies on epidemiological of Covid-19 in children were found.

A study conducted by CDC has found that among 345 pediatric cases with information on underlying conditions, 80 (23%) had at least one underlying condition. The most common underlying conditions were chronic lung disease (40), cardiovascular disease (25), and immunosuppressed (10).

ROUTE OF TRANSMISSION:

Droplets and contacts is the main route in transmission of infection. Exposure to high concentration of aerosol for a long duration in an enclosed environment may develop transmission. Contact transmission can occur through environmental pollution of urine and feces. Newborn can be infected through close contact with infected caregivers.

Mother to child transmission: No cases have been confirmed yet with vertical mother to foetus intrauterine transmission of the virus. Covid-19 mothers have a higher risk of delivery by caesarean section and premature delivery. The virus is not found in breast milk, a study conducted by Chambers et al found that there is no transmission of SARS CoV-2 from Covid-19 positive mothers to infants.

Family clustered: Clustered family is one of the major causes of diseases transmission of Covid-19. Most children in the US had an exposure to Covid-19 patient in the family or in the community.

Community transmission: In addition to schools, child care facilities play a role in the transmission of SARS CoV-19. A study conducted by CDC found that in Utah 12 children acquiring COVID-19 at the facilities spread the virus to 12 (26%) of 46 through household contacts.

CLINICAL MANIFESTATIONS:

The incubation period of Covid-19 is 1-14 days, the most infection period ranges from 3-7 days.

Most of the sign and symptoms developed by children are similar with infections in adults. But children mostly have asymptomatic infections or developed a few symptoms. The signs and symptoms of Covid-19 in children includes fever, nausea and vomiting, coughing, shortness of breath, sore throat, nasal congestions, loss of smell and taste, runny nose and diarrhea

The symptomatic signs mostly seen in children are classified according to the extent of diseases.

1. Acute upper respiratory tract infection: it include sore throat, cough, sneezing, runny nose, fatigue, fever and myalgia.
2. Mild: it affects mostly the upper respiratory tract infection, with or without fever and cough.
3. Moderate: it is associated with pneumonia, dry cough followed by productive cough, wheezing, frequent fever and a dry snoring or wet snoring sound can be heard during auscultation of lungs. CT scan of the chest shows a subclinical lesion of the lung.
4. Severe: respiratory symptoms such as cough and fever accompanied by gastrointestinal symptoms of diarrhea. Around 1 week, the disease will progress with dyspnea and cyanosis. Oxygen saturation level will be < 92% with signs of hypoxia. Disturbance in consciousness, convulsions, difficulty in feeding with presence of dehydration will be found. HRTC (high resolution CT) shows bilateral infiltrates with rapid progress of disease within a short period.
5. Critical: a serious condition requiring ICU care such as respiratory failure, shock, encephalopathy, kidney injury and multiple organ failure.

DIAGNOSTIC EVALUATION:

Laboratory:

Most of the study concluded a finding of decrease in WBC, low lymphocytes count, nucleic acid testing showed co-infection with another pathogen. RT-PCR analysis found in fecal specimen.

Radiology:

- Chest X-ray finding includes bilaterally distributed peripheral and sub pleural ground-glass opacities and consolidation.
- CT scan finding in children includes local patchy and bilateral patchy shadowing.
- 1530 cases out of 3670 (44.1%, 95% CI 39.5% to 48.9%) cases had radiological abnormalities.

COMPLICATIONS:

It is considered by many specialists that MIS-C to be a complication of Covid-19. MIS-C will show signs of skin rash, non-purulent conjunctivitis, muco-cutaneous inflammation on the mouth, hands and feet, shock, coagulopathy, gastrointestinal and cardiac problems. It is reported that, among 186 children with Covid-19 associated MIS-C, the most commonly involved organ systems were the gastrointestinal (171 [92%]), cardiovascular (149 [80%]), hematologic (142 [76%]), muco-cutaneous (137 [74%]), and respiratory (131 [70%]) systems.

MANAGEMENT:

Commonly used therapies among hospitalised children were antimicrobials (32.2%), intravenous immunoglobulin (IVIG) (19.5%) and systemic-steroids (19.3). Other treatment regimens included aspirin, inotropic drugs, inhaled interferon- α (IFN- α), antimalarials and antivirals (ribavirin, oseltamivir, lopinavir, ritonavir and litonavir). Mechanical ventilation was provided to 490 patients (12.2%).

Guidelines management according to the classification of disease severity by IAP:

Mild disease:

- OPD or home management
- Oral feed and breast feeding to maintain hydration.
- Antimicrobial are not indicated.
- Administer paracetamol if fever, for nose blocks instillation of nasal saline drop.
- If presence of high-grade fever for >3 days it could be Covid positive. Investigate for alternate diagnosis for CBC, CRP, Urine routine, Blood culture and Chest x-ray.
- Home isolation or Covid care center.

Moderate:

- Admit in Covid-19 ward
- Investigations: CBC, RFT, LFT, CRP, CXR. Repeat 48-72 hours according to the clinical condition.
- If Spo2 >94%
 - Assess for hydration.
 - Administer paracetamol and antimicrobials.
- If Spo2 <94%
 - Start oxygen therapy.
 - Administer IV steroids, remdesivir and antimicrobials.

Severe/Critical Disease:

- Admit in Covid-19 ward/ICU/HDU.
- Investigations required: CBC, RFT, LFT, CRP, D-dimer, procalcitonin, lactate, ABG, ECG, CXR. Maybe repeated at 24-48 hours as per the clinical condition.
- Start oxygen therapy, CPAP, NIV and invasive ventilation if required.
- Considering prone position.
- Restrict fluids
- Administer IV steroids, remdesivir, enoxaparin and antimicrobials.
- Management of shock, ARDS, AKI, HLH and myocarditis as per protocol.

Anti-viral therapy:

- The revised antiviral drug therapy remains to be interferon- α (IFN- α) sprays and aerosol inhalation
- Remdesivir:
 - Weight 3.5-40 kg: 5mg/kg on day 1, 2.5 mg/kg from day 2-5. If weight > 40 kg: 200 mg on day 1, 100 mg from day 2-5.
 - It should be used within 10 days on the onset of symptoms with oxygen.
 - Contraindicated in renal disorder children and liver problems. For children undergoing remdesivir treatment, liver function test should be done prior and during the treatment.
- Lopinavir/ritonavir:
 - 14 days – 12 months; 16/4 mg/kg or 0.2 ml/kg twice a day.
 - 12 months – 18 years; if weight < 15 kg: 12/3mg/kg or 0.15 ml/kg twice a day. If weight > 15 kg: 10/2.5 mg/kg or 0.125 ml/kg twice a day.

Steroids:

- Dexamethasone 0.15 mg/kg IV once a day for 5-14 days
- Methylprednisolone 1-2 mg/kg once a day

Anti-microbials:

- Amoxicillin/co-amoxiclav IV 90 mg/kg/day in 3 doses.
- Ceftriaxone IV 80-100 mg/kg/day once a day.

Anticoagulation therapy:

- Monitor thrombosis, start low molecular weight heparin in therapeutic dose for 12 weeks.

Enoxaparin:

- <2 months: 1.5 mg/kg/dose every 12 hourly.
- 2 months: 1 mg/kg/dose every 12 hourly.

Management guidelines for MIS-C:

- IVIG (Intravenous immunoglobulin) 2g/kg for 12-24 hours.
- Steroids: methylprednisolone 1-2 mg/kg/day.
- A broad-spectrum antimicrobial

If no signs of improvement, other options include:

- Repeat IVIG
- High dose of methylprednisolone 10-30 mg/kg/day for 3-5 days.
- Aspirin 3-5 mg/kg/day.
- Enoxaparin 1 mg/kg twice a day subcutaneously.

For children with cardiac involvement, ECG should be done 48 hourly and repeat ECHO for 7-14 days and between 4-6 weeks.

PREVENTION:

Testing: A viral tests nucleic or antigen are recommended for the diagnosis. Health care provider should prepare question for the families about testing, when is safe for the child, exposed to Covid-19, return from school and contact with people outside the house. Prioritize school-aged children for viral test if they have:

- Signs or symptoms, close contact with infected person and likelihood for exposure if any history of traveling and living in a community with substantial transmission.
- No symptoms but have close contact with infected person.

Isolation:

- Children having symptomatic infections should not attend the school.
- If the child had any close contact with an infected person should stay for home isolation for 14 days after their last exposure to that person.
- If the child had close contact with infected person but is fully vaccinated with no symptoms of Covid-19 should get tested 3-5 days after exposure. If negative home isolation is not required.

During home isolation:

- Monitor symptoms, stay in separate room with separate bathroom.
- Avoid contacting family members and pets
- Avoid sharing items like cups, utensils and towel.
- Wearing a mask around family members.

Quarantine:

- Quarantine is recommended if any close contact within 6 feet for 15 minutes or more with Covid-19 positive person unless fully vaccinated.
- Fully vaccinated should get tested 3-5 days after their exposure, even if asymptomatic wear a mask indoors for 14 days until test result is negative.
- Quarantine should be done for 14 days after close contact with Covid-19 positive person.
- During quarantine monitor for fever, shortness of breath, fever and other related symptoms.
- After quarantine watch for symptoms for 14 days of exposure.
- If symptoms appear, self-isolate immediately and contact health care provider.

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