# Children with Suspected or Confirmed COVID-19 Infection

***Executive summary***

**Introduction**

Children < 10 years old are less likely to acquire SARS-CoV-2 virus than adults and children > 10 years old. The infection in children is also associated with a less severe illness. The role of children in transmitting the virus to others is still unclear. Many children will be asymptomatic and those with symptoms are more likely to transmit the virus. Children with pre-existing medical conditions, particularly underlying cardiac or respiratory conditions or complex neuro-disability disorders may be more severely affected, although data for this is limited. Children may also have a mixed infection with another respiratory virus or a secondary bacterial infection. Most children should, however, recover 1-2 weeks after the onset of symptoms.

Paediatric Multisystem Inflammatory Syndrome Temporally Associated with COVID-19 (PIMS-TS or MIS-C) is a newly described condition, thought to be due to a delayed immune system response to SARs-CoV2. It can be very severe, requiring critical care and appears weeks after a COVID-19 infection. It has been described in several different countries but is thought to be rare.

## Target User

* Doctors
* Nurses

## Target area of use

* Ward

## Key areas of focus / New additions / Changes

Clinical care of patients under 16 years old with confirmed or suspected COVID-19 infection. Please see separate guideline for care of neonates, pregnant women and adults with COVID-19 as well as palliative care.

**Limitations**

The evidence base for managing COVID-19 infections is growing exponentially as we see more cases. For the most up to date information please see the links in the reference section below as our understanding and response to this disease will change over time. Currently we have no facilities for dedicated paediatric intensive care in The Gambia.

## Presenting symptoms and signs

Children will most often present with fever and cough. Rhinorrhoea, sore throat, abdominal pain, diarrhoea and vomiting are also relatively common. Other less common symptoms include dyspnoea, cyanosis, fatigue, headache and poor feeding. Rashes, including chill blains have also been reported from Europe. Most children will be asymptomatic or have mild symptoms. In severe cases patients may present or progress into pneumonia, sepsis or septic shock

### COVID-19 pneumonia

WHO defines COVID-19 pneumonia in children as: cough or difficulty breathing AND fast breathing and/or chest indrawing

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| **Definition of fast breathing as per WHO** | |
| <2 months old | ≥ 60 breaths/min |
| 2-11 months old | ≥ 50 breaths/min |
| 1-5 years old | ≥ 40 breaths/min |
| > 5 years old | ≥ 20 breaths/min |

Severe COVID-19 pneumonia in children is defined by WHO as:

Pneumonia (see definition above) plus at least one of the following:

* Central cyanosis or SpO2 < 90%
* Severe respiratory distress (fast breathing, grunting or very severe chest indrawing)
* Inability to breastfeed or drink,
* Lethargic or unconscious
* Convulsions

### COVID-19 associated sepsis

Sepsis in children with COVID-19 disease is currently defined by WHO as 2 or more components of the Systemic Inflammatory Response Syndrome (SIRS) criteria with suspected or proven COVID-19 infection.

*≥ 2 of SIRS criteria, of which one must be abnormal temperature or WBC:*

* Hypothermia or hyperthermia
* Tachycardia
* Tachypnoea
* Leukocytosis or leukopaenia or > 10% immature neutrophils

Severe sepsis is defined as sepsis with organ dysfunction (e.g. ARDS). Septic shock is defined as sepsis with signs of cardiovascular dysfunction:

### Signs of cardiovascular dysfunction:

Hypotension (systolic blood pressure < 5th centile or > 2 SD below normal for age)

OR at least 2 of:

* Cold hands with poor peripheral perfusion
* Capillary refill time >2 seconds or weak pulse
* Altered mental state
* Bradycardia or tachycardia
* Fast breathing
* Mottled or cool skin or petechiae/purpuric rash
* Reduced urine output

## Examination findings

In outpatients, do not **routinely** examine any children’s throats during the COVID-19 pandemic as there are likely to be asymptomatic patients with pharyngeal carriage which increases exposure for healthcare professionals. It is reasonable to prescribe antibiotics for a possible streptococcal infection on the basis of history alone at this time. If a child requires testing for COVID-19 then this should be done in full PPE according to SOP-AIR-007 for how to do nasopharyngeal and throat swabs to confirm infection.

Although most children will only have mild symptoms, it is important to specifically assess their:

* Breathing: Respiratory rate, work of breathing, presence of severe chest indrawing, SpO2 level
* Circulation: Heart rate, central capillary re-fill time, BP if available
* Hydration: Skin turgor, anterior fontanelle, mucous membranes
* Temperature and features of sepsis
* Blood glucose level if history of poor feeding or vomiting

## Investigations

### Well child: Do not do any investigations for a child with confirmed COVID-19 who is well with mild symptoms.

### Unwell child: If the child meets criteria for COVID-related severe pneumonia:

* Chest Xray
* Blood cultures
* FBC and U&Es
* Blood glucose

If the child meets criteria for COVID-related sepsis:

* Blood cultures
* FBC and U&Es
* Rapid Diagnostic Test for malaria or Malaria Parasite Smear
* Blood glucose
* Urine dip and MC&S
* CXR
* Lumbar puncture if signs suggest meningitis

If the child looks generally unwell (specifically with persistent fever, dehydration or suspected sepsis, signs of liver dysfunction or respiratory failure) then they should be investigated with full blood count, blood culture, LFTs and U&Es as a minimum.

**Typical investigation results in COVID-19**

In COVID-19 you would typically see normal or reduced white cell count with low neutrophil and/or lymphocyte counts. Some patients will have low platelets too. In severe cases there may be elevated liver enzymes, if these persist then check coagulation as this may also be deranged. Liver function tests should not routinely be checked.

Radiological changes in children may be non-specific. Chest X-rays may show bilateral patchy airspace consolidation at the periphery of the lungs, peribronchial thickening and ground-glass opacities. Chest CT shows airspace consolidations and ground-glass opacities.

## Management

The majority of children with confirmed COVID-19 can be managed with advice on hand hygiene, self-isolation and staying well hydrated. Hospital admission depends on national guidelines and whether the child requires oxygen therapy, feeding or fluid support or has a suspected bacterial infection.

### Respiratory care

* Oxygen therapy should be given if SpO2 < 90%.
* If signs of severe pneumonia, shock, coma or convulsion aim for SpO2 ≥ 94%.
* Infants and young children can use nasal prongs or cannula (maximum flow rate 2 L/min). Older children and adolescents should receive oxygen via a face mask. Face masks with reservoir bags should be reserved for those with severe disease to deliver 10 – 15 L/min. Head boxes or other devices to maximise oxygen delivery should be used where possible.
* CPAP is not currently available for children with confirmed or suspected COVID-19 although could be considered on a case-by case basis
* Children with asthma should be treated as usual but with salbutamol given via a spacer rather than nebulized to reduce the risk of aerosolisation of COVID-19. Oral steroids should be used as normal for children with asthma.
* Proning should be used where possible to minimise oxygen requirement

### Supportive care

Feeding and hydration are very important. If a child is not feeding well then nasogastric feeds or fluids should be considered before IV fluids.

If IV fluids are required for fluid resuscitation of a child or infant with COVID-19 and sepsis then Ringer’s Lactate given at maintenance volume would be first choice unless there is hypotension or poor perfusion. If hypotension or poor perfusion is present then Ringers Lactate should be given cautiously at 10-20 ml/kg over 30-60 minutes to a maximum of 40 ml/kg. If Ringers Lactate is unavailable then 0.9% normal saline, 0.9%/5% dextrose saline or 5% dextrose could be used depending on availability. There are concerns about liberal fluid use in severe COVID-19 being associated with poorer outcomes. Children with significant respiratory compromise should be fluid restricted to 2/3rds maintenance to reduce the risk of ARDS.

Infants and children of mothers with COVID-19 should continue to breastfeed on demand, if clinically able.

### Management of fever

First line antipyretic for children with a fever should be paracetamol. There is currently no significant evidence that ibuprofen is associated with worse outcomes in COVID-19 infection. If ibuprofen is prescribed regularly for a pre-existing medical condition (e.g. for rheumatoid arthritis) then this should be continued. Tepid sponging is not recommended.

### Bacterial infection

Children who have signs and symptoms of sepsis at any stage in their illness, severe pneumonia or if they are not clinically improving, should be assessed for possible bacterial infection and started on IV ceftriaxone following blood cultures within an hour of assessment. Duration of antibiotics should be guided by clinical course and blood culture results. All children with suspected PIMS-TS should also be given IV ceftriaxone and oral clindamycin until their BC results are reported.

### Monitoring of children with COVID-19 infection

Hospitalised children need regular vital signs to identify deterioration, use the MEWS score and alert senior nurse or doctor if MEWS >5

### Treatments to avoid in COVID-19

* Although recommended for adults, the following medical treatments are not routinely recommended in children and may, in fact, have more side effects than potential beneficial effects: bronchodilators, steroids, antivirals and diuretics.
* Angiotensin converting enzyme (ACE) inhibitors have not been shown to be harmful to children with COVID-19 infections. Patients taking ACE inhibitors for a pre-existing condition should continue them.
* There is no evidence at the time of writing (March 2020) to support any specific treatment for COVID-19 in children. The use of anti-viral drugs is not currently recommended in children

## PIMS-TS (also known as MIS-C in USA)

Features of this illness are similar to those of Kawasaki disease, staphylococcal and streptococcal toxic shock syndrome and bacterial sepsis. It appears to be a delayed immune response to SARS-Co-V2 and is more frequent in patients of Black or Asian and those who are > 75th centile for weight. It has been reported in children of all ages, Children usually present with persistent high-grade fever, abdominal pain, vomiting and diarrhoea. Respiratory involvement is absent. Children < 5 years present with a more typical Kawasaki picture and older children with myocarditis/pancarditis and shock. Children may have had symptoms of COVID-19 in the preceding weeks but they may have had an asymptomatic infection. Most cases recover quickly but deaths have been reported.

### WHO case definition of PIMS-TS:

Children and adolescents 0–19 years of age with fever > 3 days

**AND** two of the following:

a) Rash or bilateral non-purulent conjunctivitis or muco-cutaneous inflammation signs (oral, hands or feet).

b) Hypotension or shock (as per definition above)

c) Features of myocardial dysfunction, pericarditis, valvulitis, or coronary abnormalities (including ECHO findings or elevated Troponin/NT-proBNP),

d) Evidence of coagulopathy (by PT, PTT, elevated d-Dimers).

e) Acute gastrointestinal problems (diarrhoea, vomiting, or abdominal pain).

**AND**

Elevated markers of inflammation such as ESR, C-reactive protein

**AND**

No other obvious microbial cause of inflammation, including bacterial sepsis, staphylococcal or streptococcal shock syndromes.

**AND**

Evidence of COVID-19 (RT-PCR, antigen test or serology positive), or likely contact with patients with COVID-19.Investigation & management of PIMS-TS:

### Investigations for PIMS-TS:

* Urgent ECHO daily if possible (pan-carditis including coronary artery dilatation) or as directed by Consultants
* CXR (may be normal or patchy symmetrical infiltrates, pleural effusion)
* Blood culture (mostly negative)
* FBC (lymphopaenia, neutrophilia, anaemia, thrombocytopaenia)
* U&E, LFTs, albumin (low albumin, acute kidney injury, transaminitis)
* Coagulation (deranged)
* CK and LDH (raised)
* Troponin if reagent available (raised)
* Abdominal USS if abdominal concerns (colitis, ileitis, lymphadenopathy, free fluid, hepatosplenomegaly)

### Management of PIMS-TS:

If you are suspecting PIMS-TS then use cautious IV fluids as there may be a rapid progression to pulmonary oedema as well as hypotension being refractory to fluids. 10ml/kg fluid boluses with reassessment for response should be used with maximum 30ml/kg. Inform the consultant if fluid boluses are required.

Steroids and / or aspirin can be used but should be a consultant led decision. Aspirin should be used in criteria for Kawasaki disease are fulfilled, with doses as per BNF:

* Neonate 8 mg/kg QDS
* Child > 1 month 10 mg/kg QDS

Patients with PIMS-TS will require close outpatient follow-up and a repeat ECHO 4-6 weeks after discharge.

### Research

Clinical trials for COVID-19 are ongoing so please consider whether the patient is eligible and contact the relevant research team.

### Palliative care

Please see separate guideline for advice on symptom-control and other considerations for the dying patient.

### Discharge

Self-isolation of a child will need to follow Ministry of Health guidance where possible but this may need to be adjusted on a case-by-case basis. Patients who have been critically unwell, especially if they have had PIMS-TS, will need follow up in the clinic and this should be determined by the consultant team.

## Key Issues for Nursing care

* All the routine precautions for caring for patients with COVID-19 apply, see relevant guidelines.
* Given increased demand on staffing and for the comfort of the children, it will still be important for children 15 years and under to have an escort present even if their escort is confirmed negative or asymptomatic.
* Adults and children may be cohorted together on the same wards. Where possible, all children should be grouped together and be near to the nurses station to maintain their safety.

## Additional Information

For the most current case definition and details of countries with transmission:

<https://www.who.int/emergencies/diseases/novel-coronavirus-2019/situation-reports>

## Online Resources:

<https://www.ncbi.nlm.nih.gov/research/coronavirus/>

<https://foamid.com/2020/03/17/covid-19-ultimate-resource-list/>

RCPCH Guidance on P-MIST CoV: <https://www.rcpch.ac.uk/resources/guidance-paediatric-multisystem-inflammatory-syndrome-temporally-associated-covid-19>

Don’t forget the Bubbles online resource: <https://dontforgetthebubbles.com/evidence-summary-paediatric-covid-19-literature/>

## References

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