# COVID-19 Pandemic: Through the eyes of a Paediatrician

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The Coronavirus Disease 2019 (COVID-19) pandemic which has been sweeping the globe has taken the greatest toll on the elderly, with children (0-19 years) being largely spared. As of 29th June 2020, the deaths of only 5 children in the above age group have been reported due to this pandemic in the UK, compared with over 43,000 adults. Amongst the devastating number of infections reported, children account for 0.9% and 1.7% of infections in China and the USA, from where the strongest epidemiological data have been published.[1,2]

## Clinical Presentation

As the pandemic continues, we are now observing numerous reports describing the clinical presentation and hospital course of children with confirmed COVID-19.[3] What is currently known is that children have milder symptoms and are less likely to be hospitalised compared to adults.[4] However, as with adults, infected children may not present with typical viral upper respiratory tract symptoms and can easily spread infection whilst remaining asymptomatic themselves.[5]

As of mid-May, 2020, 131 published studies across 26 countries have described clinical features in 7780 paediatric cases.[6] Of the 81% of symptomatic children in these studies, they presented with:

Fever (59%), Cough (56%), Rhinorrhoea (20%), Sore throat (19%), Myalgia/Fatigue (18%), Shortness of breath (12%), Diarrhoea (7%), Vomitting (5%), Rash (0.25%).

It should be noted that the incidence of asymptomatic children may be significantly higher considering all the studies are based solely on symptomatic children. Data from China showed that 13% of confirmed cases in children were in fact asymptomatic (cases detected by contact tracing).[7] When suspected cases are also considered, 32% of children aged 6-10 years were also asymptomatic. Similarly, data from the Italian Emergency Departments found 21% of confirmed cases were asymptomatic.[8]

With regards to specific symptoms, several cases of rashes often occurring on feet/toes have been reported from Europe, contemporaneously associated with the outbreak but with only a few simultaneously confirmed infected cases.9 Unlike in adults, lymphocytopaenia is relatively rare amongst infected children.[6,8] Inflammatory markers such as C-reactive protein and procalcitonin have been found to often be raised, albeit mildly.[6] In confirmed paediatric cases with respiratory symptoms, chest X-rays and the majority of CT scans have been shown to be normal. Abnormalities are often less severe when they are present.[6]

## Paediatric Inflammatory Multisystem Syndrome-Temporarily associated with SARS-CoV-2 (PIMS-TS) in Europe/ Multisystem Inflammatory Syndrome in Children (MIS-C) in the USA

On 27th April 2020, NHS England reported a number of unwell children presenting with signs of circulatory shock and hyperinflammatory state, with features consistent with toxic shock and Kawasaki disease (KD).[10] Some of these cases were confirmed COVID-19 cases. The first COVID-19 confirmed case with classic KD features was reported in the USA on 7th April 2020.[11] Subsequently, a number of COVID-19 cases with PIMS-TS have been reported from Italy, France and USA, mainly from New York State.[12,13,14] Approximately, 15% of them were confirmed COVID-19 cases. These children presented with early symptoms of abdominal pain, vomiting and diarrhoea, with persistent high grade fever and progression to cardiogenic shock.[10] Raised inflammatory markers, maculopapular rash and non-suppurative conjunctivitis are common. Notably, respiratory involvement is absent. Though most children recovered, five patients unfortunately died.[12]

In keeping with adult COVID-19 literature, children from Black, Asian and Minority Ethnic (BAME) backgrounds seem to be more susceptible to severe disease and overrepresented in the case reports of PIMS-TS/MIS-C.[10]

## Newborns

A large number of infants born to COVID-19 positive mothers have been reported. Mother and their babies generally recover well. However, there is a small but notable rise in preterm delivery.[15] There have been a few cases of newborns with elevated IgM antibody to SARS-CoV-2 born to COVID-19 positive mothers indicating intrauterine transmission.[16,17] However, they have not suffered many complications and required minimal ventilator support.[18]

## Children with co-morbidities

There was growing anxiety that this group of children are more likely to be hospitalised and/or need intensive care from COVID-19. Most of the Paediatric Intensive Care Unit (PICU) admissions in the USA and Italy are these children who, otherwise, would have an underlying increased risk of complication from all respiratory viruses.[8] Hence, there does not seem to be a disproportionate rise in PICU admissions compared to any other respiratory virus infection.

## Why are Children responding to SARS-CoV-2 infection differently?

SARS-CoV-2, MERS and SARS viruses generally cause milder infections in children. In SARS-CoV-2 infection, CD8+ T cells and IL-6 (a cytokine contributing to host defence stimulating acute phase reactions and immune response) play a vital role in virus clearance. In paediatric cases, the average IL-6 response level is low whilst children show higher total T cell levels, which may be responsible for

less severe symptoms.[19]

One possible mechanism of PIMS-TS in children could be related to antibody-dependent enhancement (ADE). The presence of antibodies may be harmful when the level is too low to protect, but high enough that it helps in spreading the virus. In SARS-CoV-2, ADE has been demonstrated to improve the ability of the virus to enter cells.[20]

## Are children asymptomatic spreaders?

There have been lots of concerns whether children play a major role in spreading COVID-19 as most of them are asymptomatic and even if they are infected, they have mild symptoms.[21]

South Korea and Iceland have implemented widespread community testing in their response to COVID-19. In Iceland, on population screening, no child under the age of 10 was found to be positive, compared with 0.8% of the general population.[22] This observation is replicated in the pre-print data from a town in Vo, Italy[23] and a lower secondary attack rate in children (OR 0.23 compared with adults >60 years) from Guangzhou, China (pre-print data).[24]

Based on the evidence so far, the answer appears to be no, children are not COVID-19 'spreaders' and nor are they acquiring the infection significantly.

## Conclusion

COVID-19 appears to be mild in children and they can be frequently asymptomatic or have subclinical infection. Even children with co-morbidities do not appear to have a heightened risk of complications compared to any other respiratory virus infection. There have been reports of a Kawasaki Disease like critical illness but it is still rare. Generally, there is consistent evidence that children have a lower likelihood of acquiring infection even in the same household.

We are still learning more and more on a daily basis on COVID-19 and this article is based on the evidence that has been available until 29th June 2020.

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