



Risk factors for PICU admission and death among children and young people hospitalized with COVID-19 and PIMS-TS in England during the first pandemic year

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Identifying which children and young people (CYP) are most vulnerable to serious infection due to severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is important to guide protective interventions. To address this question, we used data for all hospitalizations in England among 0–17 year olds from 1 February 2019 to 31 January 2021. We examined how sociodemographic factors and comorbidities might be risk factors for pediatric intensive care unit (PICU) admission among hospitalizations due to the following causes: Coronavirus Disease 2019 (COVID-19) and pediatric inflammatory multi-system syndrome temporally associated with SARS-CoV-2 (PIMS-TS) in the first pandemic year (2020–2021); hospitalizations due to all other non-traumatic causes in 2020–2021; hospitalizations due to all non-traumatic causes in 2019–2020; and hospitalizations due to influenza in 2019–2020. Risk of PICU admission and death from COVID-19 or PIMS-TS in CYP was very low. We identified 6,338 hospitalizations with COVID-19, of which 259 were admitted to a PICU and eight CYP died. We identified 712 hospitalizations with PIMS-TS, of which 312 were admitted to a PICU and fewer than five CYP died. Hospitalizations with COVID-19 and PIMS-TS were more common among males, older CYP, those from socioeconomically deprived neighborhoods and those who were of non-White ethnicity (Black, Asian, Mixed or Other). The odds of PICU admission were increased in CYP younger than 1 month old and decreased among 15–17 year olds compared to 1–4 year olds with COVID-19; increased in older CYP and females with PIMS-TS; and increased for Black compared to White ethnicity in patients with COVID-19 and PIMS-TS. Odds of PICU admission in COVID-19 were increased for CYP with comorbidities and highest for CYP with multiple medical problems. Increases in odds of PICU admission associated with different comorbidities in COVID-19 showed a similar pattern to other causes of hospitalization examined and, thus, likely reflect background vulnerabilities. These findings identify distinct risk factors associated with PICU admission among CYP with COVID-19 or PIMS-TS that might aid treatment and prevention strategies.

Most CYP experience a mild disease after SARS-CoV-2 infection compared to adults^{1–3}, and asymptomatic infection is common⁴. However, severe clinical outcomes have been reported in CYP due to COVID-19 and to PIMS-TS or multi-system inflammatory syndrome in children (MIS-C), including a small number of deaths^{5–9}. Understanding which CYP are vulnerable to increased risk is important to guide clinicians, families and policymakers in relation to protective shielding and potential vaccination strategies.

Early in the pandemic, guidance from the UK Royal College of Paediatrics and Child Health identified CYP with immunodeficiency or immunosuppression and those with certain malignancies as having the greatest vulnerability to COVID-19¹⁰. However, CYP with a broad range of other conditions have also

been highlighted as being potentially clinically extremely vulnerable (CEV). CYP in many countries who are identified as CEV have been advised to take additional ‘shielding’ precautions to reduce the risk of SARS-CoV-2 infection. These include measures that may result in harm to CYP and their families, including measures associated with reduced social mixing and restriction of in-person schooling.

To limit harms due to inappropriate shielding, clear guidance is urgently needed on which CYP are at higher risk of poorer outcomes of SARS-CoV-2 infection. The rarity of severe and fatal COVID-19 in CYP means that large-scale, population-based studies are needed to identify CYP at greatest risk. These analyses also need to take into account background risks for severe illness that preceded the pandemic. CYP who are at increased risk of severe disease due to

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