Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Ethnicity and COVID-19 in children with comorbidities

COVID-19, caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), has rapidly spread through human populations worldwide, presenting across a spectrum of severity from asymptomatic carriage to respiratory failure and death.[1,2] In adults, comorbidities, including advanced age, diabetes, and cardiovascular disease, are associated with severe disease and the highest risk of mortality.[3,4] In the UK and USA, which are countries with ethnically diverse populations, mortality is disproportionately high in minority groups.[5]

Little is known about COVID-19 in children. Population data from China and Italy indicate that children are mildly affected in comparison to adults, representing approximately 5% of cases and less than 1% of admissions to hospital.[6,7] These data do not describe any association between comorbidities and severe disease in children, and are mostly derived from populations that are ethnically homogenous.

We describe the effect of COVID-19 on paediatric patients with co-morbidities and aim to facilitate rapid sharing of information in this dynamic and evolving situation.

Children (aged 0–16 years) with confirmed COVID-19 and comorbidities who required admission to hospital were prospectively identified from King's College Hospital, London, UK, between Feb 25, 2020, and April 28, 2020. Demographic and clinical data were collected from electronic patient records or the clinical information system of the paediatric intensive care unit, or both.

Combined nose and throat samples were tested by qualitative real-time RT-PCR targeting the RNA polymerase region. It uses two probes, one being specific to the SARS-CoV-2, which will not pick up the closely related severe acute respiratory syndrome coronavirus (SARS-CoV), and the second covering a broader specificity of SARS-CoV, SARS-CoV-2, and severe acute respiratory syndrome-related bat coronaviruses.[8] Samples were tested using KingFisher Flex automated RNA extraction (ThermoFisher Scientific) followed by Tecan robotics and detection on the QuantstudioTM 7 Flex Real-Time PCR System (ThermoFisher Scientific).

All patients had extensive septic screening, including blood, urine, and respiratory secretions for bacterial and fungal cultures, and viral PCR for Epstein-barr virus, cytomegalovirus, herpes simplex virus, adenovirus, and hepatitis viruses in patients with liver disease. Fungal infection biomarkers (β-D-glucan and galactomannan) were measured weekly.

We identified five children with COVID-19 and comorbidities requiring admission to hospital (appendix p 1). The mean age was 7·1 years (range 0·2–15·3). Two (40%) of five patients were aged less than 1 year and two patients (40%) were male. The most common symptoms on admission were fever (three patients [60%]) and tachypnoea (three patients [60%]).

The pre-existing comorbidities included cerebral palsy, prematurity, Wilson disease, and dilated cardiomyopathy. Four patients (80%) were from a black, Asian, and minority ethnic (BAME) group. Investigations showed that three patients (60%) had lymphopenia and the same three patients had thrombocytopenia (appendix p 2). Of the four patients that had CRP measurements, three (75%) had elevated measurements. Radiographic evidence of new infiltrates was seen in two (50%) of four patients who had chest x-ray because of clinical indication. Respiratory support was required in three (60%) of five patients, of which two patients needed mechanical ventilation in the intensive care unit. All five children received antibiotics, one child received antiviral therapy (remdesivir) on compassionate grounds, and one child was treated with hydroxychloroquine. There were no side effects noted in either patient. Liver dysfunction was observed in four patients (80%), although two of these patients had underlying liver conditions (one patient was newly diagnosed), and renal dysfunction was detected in one patient. The child with Wilson disease underwent a liver transplant 3 weeks after the diagnosis of COVID-19 because of persistent coagulopathy and liver failure and is progressing well post-transplant. As of May 20, 2020, four patients have been discharged and one is still an inpatient, with a median length of stay of 20 days (range 7–84 days). None of the patients had signs or symptoms on admission that might have been compatible with the newly described syndrome: paediatric multisystem inflammatory syndrome temporally associated with COVID-19, as according to the Royal College of Paediatrics and Child Health guidelines.

During the same period of time, seven children without comorbidities were admitted to hospital with COVID-19. The mean age was 4·8 years (range 0–15·4) and five patients (71%) were male. Five patients were from a BAME group and two were white. None of the patients were classified as obese. The most common signs on admission were fever (six patients [86%])) and tachypnoea (five patients [71%]). Median length of stay was 3 days (range 1–8). One of the patients was admitted to hospital for safeguarding concerns and another was a neonate with vertical transmission of COVID-19.

Our cohort included patients with substantial comorbidities, in which the clinical course of COVID-19 has not been previously described. Overall, the number of children admitted was small (12 [0·5%]) in comparison with admissions to the adult wards (2288). However, despite the small number of children admitted to hospital, several important themes emerge: the wide range in severity of the disease,

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See Online for appendix

frequent multi-organ involvement, and that most patients were from BAME populations.

Our hospital admissions covered a range of severity, from mild disease to critically unwell patients. The two patients that required intensive care unit admission had comorbidities associated with respiratory disease. Patient 1 had chronic lung disease on previous radiography, with severe scoliosis contributing to respiratory compromise. Patient 2 was born at 27 weeks preterm and despite being discharged home without oxygen, he had evidence of chronic lung disease of prematurity on previous imaging. Patient 3, by contrast, had severe chronic lung disease of prematurity, requiring ventilation via tracheostomy at baseline but required only increased oxygen during the admission. At the other end of the extreme, patient 4 had Wilson disease and presented with liver failure. It was unclear whether COVID-19 or the pre-existing condition had caused the liver failure. Patient 4 and patient 5 did not have respiratory symptoms.

Four (80%) of five patients with comorbidities had multi-organ involvement. The liver was the most frequently affected organ. Patient 4 had an underlying liver condition, although the positive COVID-19 status coincided with worsening liver derangement. Reports suggest that approximately a third of adult patients with COVID-19 have some abnormalities on a liver function test. It is unclear whether the liver dysfunction is due to the viral damage per se, or whether the coexistence of systemic inflammatory response, respiratory distress syndrome-induced hypoxia, and multiple organ dysfunction might contribute.[9] Acute kidney injury is reported in approximately 25% of adults with COVID-19 with acute respiratory distress syndrome; however, little is known about the prevalence of acute kidney injury in children with COVID-19.[2] Only one child in this cohort had renal dysfunction, which was thought to be mostly due to prerenal acute renal failure.

Four (80%) of five patients with comorbidities were from BAME groups. In the wider group of paediatric patients admitted to hospital with COVID-19, nine (75%) of 12 patients were from a BAME group. This partly reflects the population of inner London, where ethnic minorities make up 39% of the population compared to just 13% in the rest of the UK. BAME communities might be at increased risk of adverse outcomes for several reasons, including genetic influences on susceptibility and cultural, behavioural, and societal differences (eg, differences in socio-economic status, health-care seeking behaviour, cohabitation arrangements, and amount of overcrowding in the environment).[10,11]

Although hospitalisation for COVID-19 is rare in children, ethnicity and the presence of pre-existing comorbidities might be independent risk factors for severe disease.

We declare no competing interests.

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