Paediatric Critical Care Referrals of Children with Diabetic Ketoacidosis During the COVID-19 Pandemic

Child health practitioners in the UK and internationally have voiced concerns that restrictions and measures introduced to combat the COVID-19 pandemic may be causing unintended adverse consequences for the health and social wellbeing of children. Initial reports suggested a significant reduction in the utilisation of health care services by children during the pandemic, raising concerns about late presentation of children with serious illness.[1] In a national survey of UK paediatricians, 32% of clinicians reported having witnessed delayed presentations to emergency care over a two-week period in April 2020.[2] The most frequently reported delayed presentation was new diagnosis of diabetes mellitus. Analysis of children newly diagnosed with type 1 diabetes in Germany identified that between March to April 2020 a significantly greater proportion of cases presented with DKA (45%) when compared to corresponding periods over the previous two years (24%).[3]

Here, we report the frequency of referral of children with DKA to a regional paediatric critical care advice and transport service in the UK, before and during the COVID-19 pandemic. We also report overall referral activity to the service during these periods for comparison. We included all children up to 15 years of age with a confirmed diagnosis of DKA (based on national criteria).[4] Two children referred from overseas for repatriation to the UK were excluded.

31 children were referred with DKA between March to July 2020, compared with a median of 12 (range 11 to 20) over corresponding months in the preceding five years (figure). In comparison, overall referrals to the service were lower during the pandemic period compared to previous years (figure).

We explored whether there was any difference in the severity of DKA cases referred before and during the pandemic, by comparing the clinical characteristics of 105 children referred between January 2018 to February 2020 with those of 31 children referred between March to July 2020. There were no significant differences between the groups in reported duration of symptoms prior to hospital attendance, blood gas analysis parameters at presentation, intensive care unit admission rates, or intubation rates (supplementary table).

In summary, we observed an increase in referral of children with DKA during the COVID-19 pandemic compared to previous years, at a time when overall referral activity to the service was lower than usual. There are various possible explanations for this observation. Reduced access to primary care services and/or parental anxiety about presenting to healthcare providers during the pandemic period may have contributed to later diagnosis of new cases of type 1 diabetes (with a higher likelihood of DKA at the time of diagnosis). Changes in the organisation of regional paediatric services during the pandemic, with closure of children's inpatient units at a number of district general hospitals to accommodate a predicted surge in acutely unwell adults, may have influenced the threshold for requests to our service for transport of cases (although clinical severity among referred cases was unchanged). There has also been speculation that COVID-19 infection may itself trigger the development of ketoacidosis via direct damage to pancreatic beta cells, based upon observations that other

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coronaviruses bind to angiotensin-converting enzyme 2 (ACE2) receptors expressed by these cells.[5]

This study is limited by its small size, and the increase in cases observed during the pandemic period may have occurred by chance alone. Furthermore, the study cohort is limited to children referred for critical care advice. Interrogation of larger, nationally representative datasets which capture the overall occurrence of DKA in children would be beneficial to further investigate whether there has been a true increase in incidence during the pandemic period.

References:

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Figure: **DKA referrals and overall referrals by month, comparing 2020 with the preceding five years.**