

The SARS-CoV-2 Pandemic Is Associated With Increased Severity Of Presentation Of Childhood Onset Type 1 Diabetes Mellitus: A Multicentre Study Of The First COVID-19 Wave

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INTRODUCTION

- Children are usually mildly affected by Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2, COVID-19).
- However, the pandemic has caused collateral damage to those with non-COVID-19 diseases.
- Reports show an unusually high proportion of children and young people presenting in diabetic ketoacidosis (DKA) during the pandemic¹⁻⁴.

AIM

We aimed to determine the impact of the COVID-19 pandemic on the presentation of newly diagnosed childhood onset type 1 diabetes.

METHODS

- Cross-sectional study over a one-year period.
- We compared the severity of presentation of new-onset type 1 diabetes in children under the age of 18 presenting to the multi-centre North Central London diabetes network before (1st July 2019 to 22nd March 2020) and during (23rd March 2020 to 30th June 2020) the first wave of the COVID-19 pandemic in the United Kingdom.
- We compared demographic data and the severity of DKA as measured by:
 - The degree of acidosis (pH)
 - DKA admissions requiring paediatric intensive care unit admission
 - Electrolyte imbalance
 - Presenting glycated haemoglobin (HbA1c)
- Statistical analyses: Fisher's exact tests (two-sided); independent sample t-tests; SPSS v27.0.1.

RESULTS

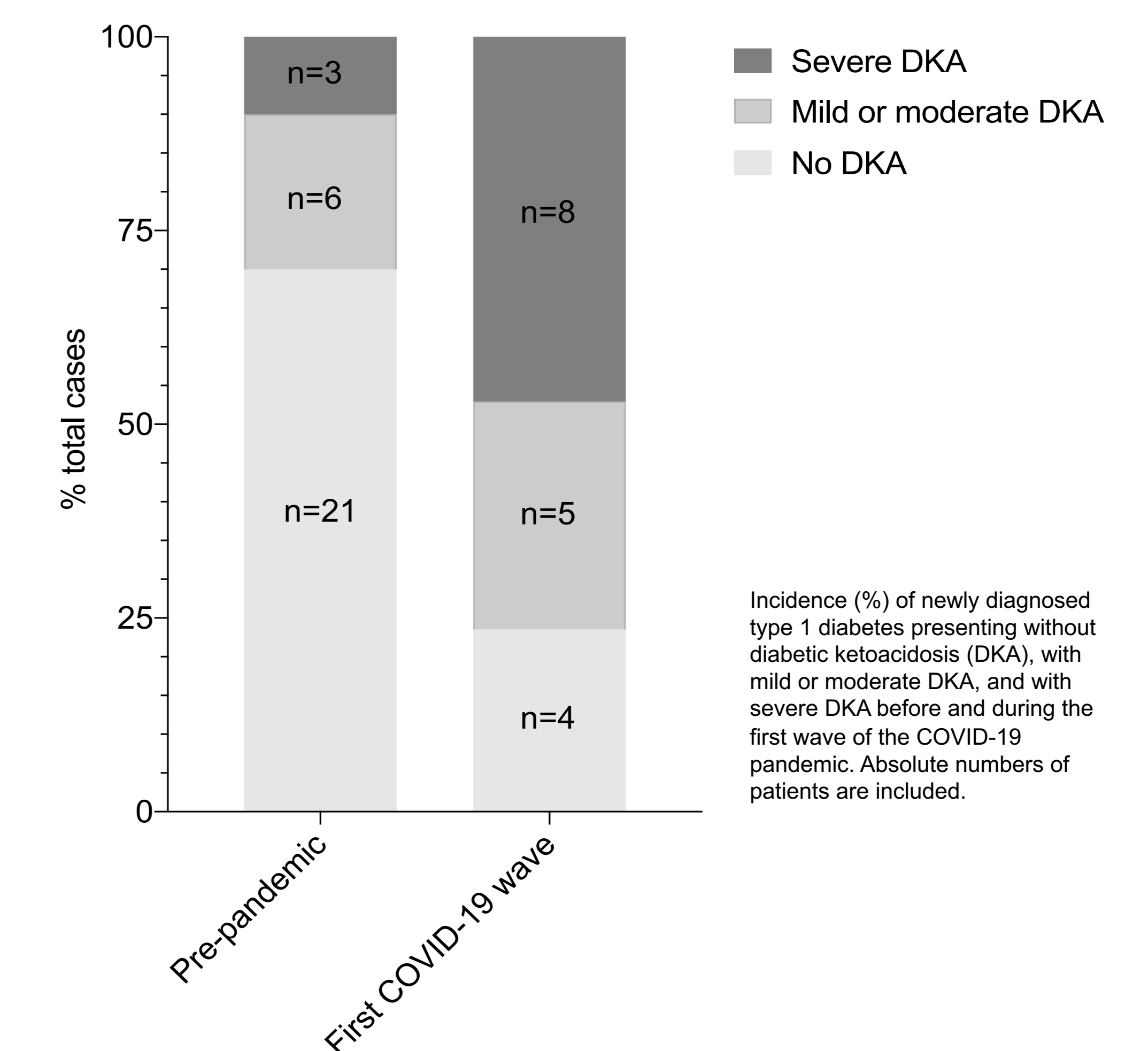
- A total of 30 children presented with new-onset type 1 diabetes during the pre-pandemic period and 17 presented during the first COVID-19 wave.
- Presenting mean pH was lower and first HbA1c measurement was higher in those presenting during the first COVID-19 wave (*Table 1*).
- There was no significant increase in paediatric intensive care unit admissions for DKA during the first COVID-19 wave compared to pre-pandemic (*Table 1*).

	Pre-pandemic	First COVID-19 wave	p value
Sample size	30	17	-
Presentations per month	3.5	4.9	-
Age (years)	11.4 (range 2.2-17.6)	10.6 (range 3.2-16.3)	0.571
Male sex	15 (50.0)	9 (52.9)	1.000
Ethnicity			0.790
Black	2 (6.7)	0 (0.0)	
Asian	4 (13)	2 (12)	
White	15 (50)	10 (59)	
Mixed	2 (6.7)	0 (0.0)	
Other	7 (23)	5 (29)	
DKA at presentation			0.002
No DKA	21 (70)	4 (24)	
Mild DKA	4 (13)	1 (5.9)	
Moderate DKA	2 (6.7)	4 (24)	
Severe DKA	3 (10.0)	8 (47)	
Paediatric critical care unit-treated DKA	2 (6.7)	4 (24)	0.170
HbA1c % (mmol/mol) at diagnosis	10.4±3.2 (90±35)	13.0±1.7 (119±19)	0.008
pH at diagnosis	7.30±0.13	7.09±0.21	0.001

Table 1: Characteristics of all patients with newly diagnosed type 1 diabetes between 1st July 2019 and 30th June 2020

Children presented more frequently in DKA and more frequently in severe DKA during the first COVID-19 wave compared with the pre-pandemic period.

- During the first COVID-19 wave, DKA presentations in children with a family history of type 1 diabetes were less frequent compared to those without a family history (33.3% vs 100.0%; $p=0.006$).
- Pre-pandemic, children presenting in severe DKA had a lower mean age at presentation compared to those not in severe DKA (3.9 years vs 12.2 years; $p<0.001$). However, during the first COVID-19 wave, this difference was no longer significant (10.1 years vs 11.2 years; $p=0.568$).
- The likelihood of presenting in DKA was not significantly influenced by weight-for-age nor time from symptom onset to first presentation.
- Serum electrolyte concentrations (potassium, sodium, calcium, phosphate) did not differ significantly between the groups.
- COVID-19 PCR status did not significantly influence mean pH nor likelihood of presenting in DKA.



CONCLUSIONS

- The COVID-19 pandemic is associated with increased severity of presentation of childhood onset type 1 diabetes.
- This was evidenced by a lower pH at diagnosis, a higher presenting HbA1c, and a greater risk of developing DKA and severe DKA.
- This may be indirectly due to delayed presentation or directly due to the emerging complex relationship between SARS-CoV-2 infection and glucose metabolism or diabetes pathogenesis^{5,6}.
- Whatever the context, young people with suspected new-onset type 1 diabetes should be referred for urgent clinical review.**

REFERENCES

- Ball S, Banerjee A, Berry C, Boyle JR, Bray B, Bradlow W, et al. Monitoring indirect impact of COVID-19 pandemic on services for cardiovascular diseases in the UK. *Heart*. 2020 Oct 5;106(24):1890-7.
- Richards M, Anderson M, Carter P, Ebert BL, Mossialos E. The impact of the COVID-19 pandemic on cancer care. *Nat Cancer*. 2020 Jun;1(6):565-7.
- Maringe C, Spicer J, Morris M, Purushotham A, Nolte E, Sullivan R, et al. The impact of the COVID-19 pandemic on cancer deaths due to delays in diagnosis in England, UK: a national, population-based, modelling study. *Lancet Oncol*. 2020 Jul 20;21(8):1023-34.
- Woolf SH, Chapman DA, Sabo RT, Weinberger DM, Hill L, Taylor DDH. Excess Deaths From COVID-19 and Other Causes, March-July 2020. *JAMA*. 2020 Oct 20;324(15):1562-4.
- Liu Q, Chen H, Li J, Huang X, Lai L, Li S, et al. Fasting blood glucose predicts the occurrence of critical illness in COVID-19 patients: A multicenter retrospective cohort study. *J Infect*. 2020 Jul 8;81(3):e20-3.
- Wang Q, Zhang Y, Wu L, Niu S, Song C, Zhang Z, et al. Structural and Functional Basis of SARS-CoV-2 Entry by Using Human ACE2. *Cell*. 2020 May 14;181(4):894-904.e9.

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