Health Outcome Indicators in Children and Young People with Diabetes Mellitus during the SARS-CoV-2 Pandemic

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INTRODUCTION

The SARS-CoV-2 pandemic has resulted in major cutbacks in service provision to patients. This could be detrimental to children with diabetes mellitus (DM) who need regular access to healthcare. The lockdown has also potentially caused changes in diet, sedentary behavior and psychological burden due to stress associated with COVID-19, which can affect glycemic control. Current literature is inconclusive and focuses on the impact on HbA1c levels in the short term; little is known on other markers of control or long term effects[1,2].

AIM

- To observe the long-term effects of the pandemic and lockdowns on clinical outcome markers amongst children and young people's (CYP) with DM
- To evaluate service provision during the pandemic of the paediatric diabetes team
- To understand mental health outcomes of the pandemic and lockdown on CYP with chronic conditions

RESULTS

- There were 207 patients with T1DM, 18 with T2DM, 11 with MODY and 34 with others.
- The mean age was 14.2 ± 4.0 and ranged from 2 to 19 years old.

	Total (n=250)	T1DM (n=207)	T2DM (n=18)
Mean BMI- T0 (95% CI)	22.42 (21.45-23.39)	21.15 (20.36-21.94)	33.40 (29.48-37.32)
Mean BMI- T1 (95% CI)	23.42 (22.41-24.43)	22.23 (21.36-23.10)	32.92 (28.99-36.85)
P value	p<0.001	p<0.001	p=0.787
Mean HbA1c-T0/ mmol/mol (95% CI)	61.7 (59.4-64.0)	63.7 (61.3-66.1)	51.4 (44.2-58.6)
Mean HbA1c- T1/ mmol/mol (95% CI)	62.1 (59.7-64.5)	63.5 (61.1-65.9)	57.8 (46.5-69.1)
P value	p=0.286	p=0.614	p=0.052

Table 1: *Mean HbA1c of patients during T0 and T1 and percentage changes in HbA1c levels from T0 to T1*

- The BMI of patients with T1DM significantly increased from T0 to T1 (21.15 to 22.23, p<0.001). (Table 1)
- BMI of those with T2DM reduced, but this was skewed from a small sample size and one patient whose BMI decreased substantially due to change in management.
- The mean HbA1c values for the whole cohort did not change significantly (61.7 to 62.1 mmol/mol, p=0.286), neither did that for just the patients with T1DM.
- The increase in HbA1c for patients with T2DM alone was significant (51.4 to 57.8 mmol/mol, p=0.052).

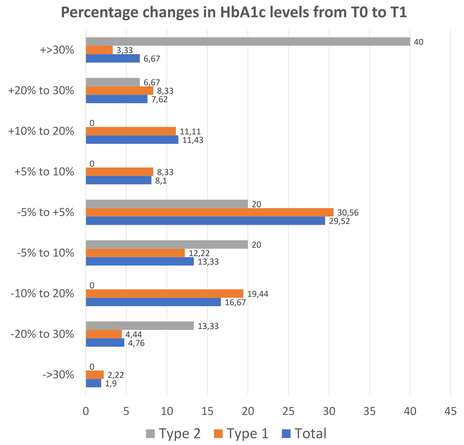

Figure 1: Categories of percentage change in HbA1c levels for the total cohort and by diabetes type from T0 to T1

- 40% of those with T2DM had a large HbA1c increase of over 30%
- A greater proportion of those with T1DM had a decline in their HbA1c than an increase
  - Of those who increased, a very small percentage (3.33%) increased by as large a margin (Figure 1).
- The mean number of BMI and HbA1c measurements taken significantly dropped from 1.40 (1.32-1.48) to 0.70 (0.62-0.77) and 1.46 (1.39-1.53) to 0.93 (0.87-0.99) respectively (p<0.001). (Figure 2)

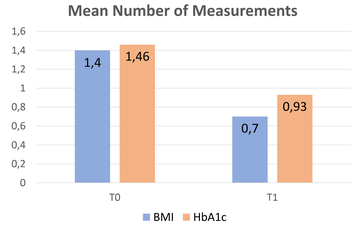

Figure 2: Mean number of measurements of BMI and HbA1c taken during T0 and T1

- Of those assessed during both periods, (n=111), 55.9% required psychological support in T0 versus 57.7% in T1.
- The percentage of patients staged 'red' increased drastically from T0 to T1 (4.20% to 15.40%) (Figure 3).
- Of those with data for both periods and receiving psychological input during T0/ T1 (n=56), mental health staging declined for 38.6%, remained unchanged for 42.1% and improved for 19.3% (p=0.092) (Figure 4).

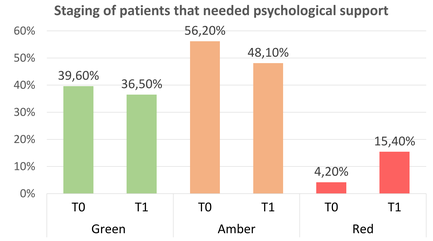

Figure 3: Changes in 'traffic-light' staging of patients from T0 to T1

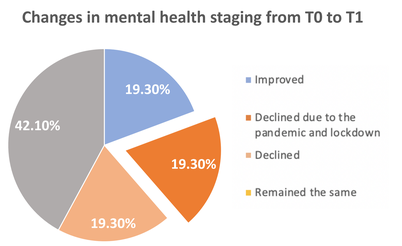

Figure 4: Overall changes in mental health outcomes of those receiving psychological support from T0 to T1

Of those who declined, 52.4% (n=11) attributed this to the pandemic or lockdown (Figure 4).

METHODS

Setting and Participants

- This was a retrospective, observational, single-centre service evaluation in a tertiary hospital in the UK.
- Data for 270 patients was compared between pre and post-pandemic periods: T0 (01/08/2019 to 01/03/2019) and T1 (01/08/2020 to 01/03/2021) respectively.

Data collection

- Data included anthropometric measurements, frequency of completion of care processes, and markers of outcomes such as BMI and HbA1c.
- Newly diagnosed, transitioned and discharged patients were excluded.
- Data was collated for both the entire cohort and by each diabetes type. Only those who had data for both periods on their electronic medical records were compared for each marker of clinical care.

Data Analysis

- Done on SPSS statistics software version 25
- Paired sample student t-tests performed and p values of <0.05 was considered statistically significant.
- Continuous data was reported as mean (95% CI), while categorical as absolute percentage values.

Psychology Data

- Paediatricians assessed if patients needed additional psychological support during T0 or T1
- Subsequently referred them on to the team's psychologist, who staged them in a 'traffic light' system
  - 'Green' was defined as requiring infrequent additional support, 'amber' as frequent support and 'red' as medications, admissions or severe difficulties.

DISCUSSION

- T1DM: No deterioration in glycaemic control during the pandemic, which correlates with previous studies showing an improvement or no change. [3,4]
- Lockdown may have allowed more timely insulin administration, monitoring of glucose levels and familial support.
- T2DM: significant decline in glycemic control
  - Mainstay of T2DM management is outpatient clinics discussing lifestyle changes and therapy, but with the transition to virtual clinics, there was reduced attendances and monitoring of outcome markers. Also, technologies like insulin pumps and continuous glucose monitors lends T1DM management to a better transition to remote care.[5,6]
- T2DM: BMI significantly increased during the pandemic
  - Previous studies have similarly shown negative effects of lockdown measures on healthy eating behaviors and exercise in CYP.[7,8]
  - Emphasis on lifestyle management is essential as it can largely impact on HbA1c in the long term. [9]
- First to report on mental health of CYP with DM during COVID-19
- Although the proportion of patients assessed as needing support did not increase, those having severe mental health problems increased drastically.
  - Increased mental health needs has been uniformly noted globally during the pandemic, [10,11] and may be due to anxiety from the pandemic, stress of disrupted routines and loneliness from isolation measures.
  - CYP with DM already experience higher stress from the need for compliance to chronic medication and regular remote appointments, school disruption and the fear of death[12], so added stress and reduced access to health services could play a large part in their anxiety.

Conclusion

- During the pandemic, the BMI of patients with T1D and the HbA1c of patients with T2D increased significantly. Key indicators were monitored less frequently and patient's mental health deteriorated likely due to less face to face contact.

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