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LETTER

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Impact of the UK COVID-19 pandemic on HbA1c testing and its implications for diabetes diagnosis and management

Letter to the Editor

Diabetes mellitus (DM) is a risk factor for poor outcome in patients with COVID-19.[1] However, the focus on mitigating the effects of SARS-CoV-2 has resulted in many routine healthcare services, including blood test monitoring in conditions such as DM, being disrupted.

We recently explored the impact of the COVID-19 pandemic on DM diagnosis and management using routinely collected laboratory data on the key DM test, glycated haemoglobin (HbA1c).

We extracted HbA1c data from clinical laboratory information systems at the University Hospitals of North Midlands (UHNM), St. Helens & Knowsley Hospitals (STHK), Salford Royal Foundation Trust (SRFT), Cambridge University Hospitals (CUH) and Warrington & Halton Hospitals (WHH) from October 2017-September 2020 (representing 3.3 million people; ~4.8% of the UK population). We were particularly interested to compare the periods before and after the United Kingdom (UK) lockdown on 23 March 2020 and the related curtailment of usual National Health Service (NHS) activities in relation to routine programmed care, in order to focus resources on management of those people acutely unwell with COVID-19.

From these data (3 million tests), we calculated the monthly number of missed diagnostic/monitoring tests between 23 March-30 September 2020). We compared the period leading up to 23 March 2020 (UK Lockdown) to the period post 23 March 2020.

We showed that HbA1c tests dropped by 82%-88% in April 2020 and had not reached expected volumes by September (Figure 1). During the 6-month period, in people with DM or at risk of DM, 206 422 monitoring tests were missed. Of these, 23 466 (11.4%) had previous HbA1c values ≥59 mmol/mol. The testing delay in this group would, on average, result in a mean increase in HbA1c of 5.7 mmol/mol (95% confidence interval (CI) 5.2-6.2mmol/mol) over and above that expected if monitoring were performed according to NICE guidance.[2-4] This estimate is based on the analysis of 400 497 HbA1c tests in 79 409 individuals as previously described.[4] We found in that analysis that testing outside guidance on HbA1c monitoring frequency, is associated with a significant detrimental effect on diabetes control.

There were also an estimated 81 245 missed diagnostic tests. Of these, ~6105 (7.5%) would be expected to be in the pre-diabetes range (42-47 mmol/mol) and ~3633 (4.5%) with the diabetes range (≥48 mmol/mol), with ~1333 of these having HbA1c values of ≥76 mmol/mol.

Extrapolating this to the UK population, these data equate to missed monitoring tests in 489 000 people with sub-optimally-controlled diabetes, leading to missed glycaemic control targets with associated increased risk of complications, including symptomatic cardiovascular disease and renal impairment, with their associated excess mortality risk.[5] These data also equate to ~127 000 missed pre-diabetes and 76 000 missed diabetes diagnoses, with consequent delay in lifestyle advice and treatment initialisation as advised by NICE.[2,4]

We have previously shown that HbA1c testing at a 3 monthly interval was associated with a 3.8% reduction in HbA1c compared with a 1.5% increase observed with annual testing. Compared with annual monitoring, 3-monthly testing was associated with a halving of the proportion showing a significant rise in HbA1c (7-10 vs 15%-20%).[4] Thus, any perturbation of the system that results in disruption of testing protocols will likely result in many patients drifting above target glycaemia and in many of those above target HbA1c, remaining at that level. We accept that treatment decisions by clinicians and patients are based on the combination of blood glucose readings (whether by standard finger prick or by continuous blood glucose monitoring) plus HbA1c.

This is not a worse case scenario, but rather based on real world large data in which all the factors described above are in play. Our findings, in keeping with those of a recent study using general practice data,[6] illustrate the widespread collateral impact of implementing measures to mitigate the impact of COVID-19 in people with, or being investigated for DM. Ironically, failure to focus of the wider implications for people with DM and other groups with long-term conditions, may place them at increased risk of poor outcomes from SARS-CoV-2 infection itself, irrespective of the implications for their longer term health prospects.

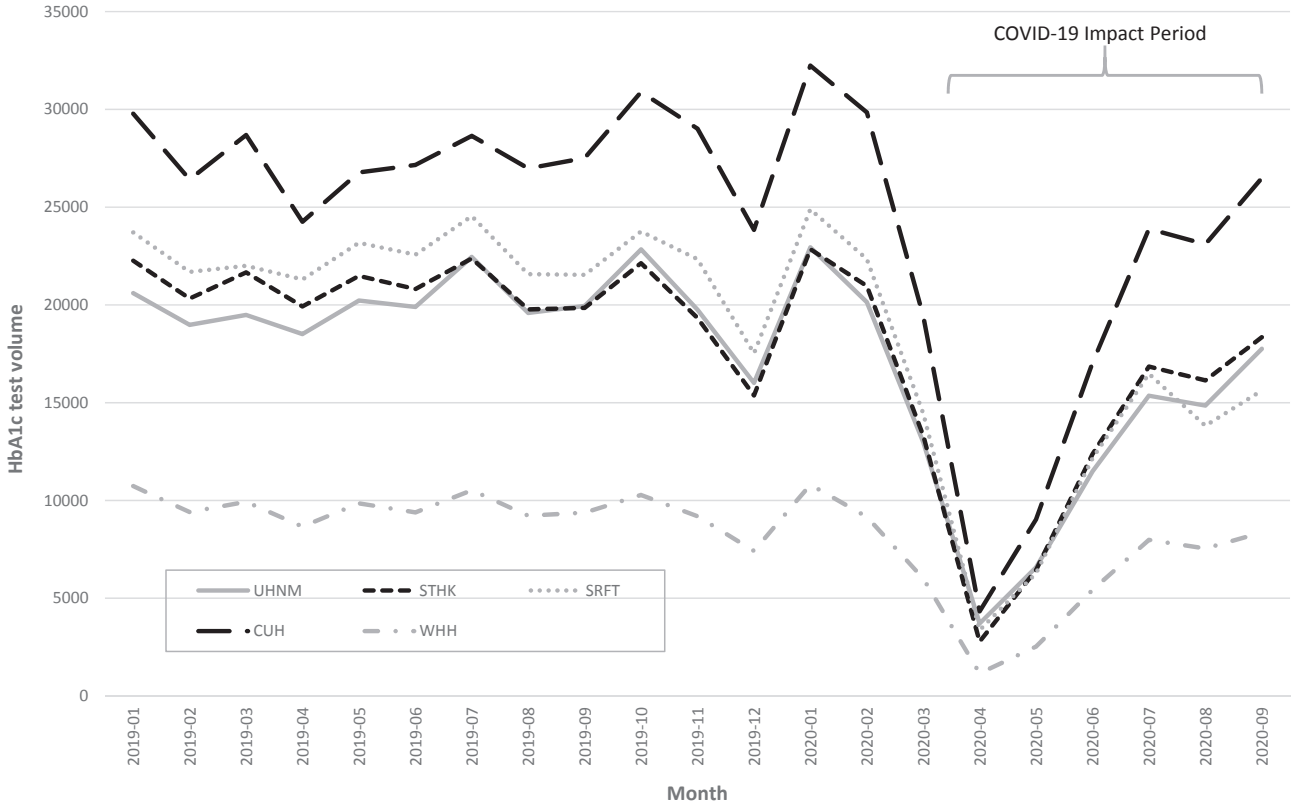

FIGURE 1 Month-by-month HbA1c test numbers across the five sites prior to and during the COVID-19 Impact Period

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REFERENCES

1. Muniangi-Muhitu H, Akalestou E, Salem V, Misra S, Oliver NS, Rutter GA. Covid-19 and Diabetes: A Complex Bidirectional Relationship. *Front Endocrinol (Lausanne)*. 2020;11:582936.

2. National Institute for Health and Care Excellence (NICE). Type 2 diabetes in adults: management NICE guideline [NG 28]. 2015. https://www.nice.org.uk/guidance/ng28. Accessed November 13, 2020.
3. Driskell OJ, Holland D, Waldron JL, et al. Reduced testing frequency for glycated hemoglobin, HbA1c, is associated with deteriorating diabetes control. *Diabetes Care*. 2014;37:2731-2737.
4. Public Health Guideline [PH38]. National Institute for Health and Care Excellence (NICE). Type 2 diabetes: prevention in people at high risk; 2012. https://www.nice.org.uk/guidance/ph38. Accessed November 13, 2020.
5. Klein KR, Buse JB. The trials and tribulations of determining HbA1c targets for diabetes mellitus. *Nat Rev Endocrinol*. 2020;16:717-730.
6. Carr MJ, Wright AK, Leelarathna L, et al. Impact of COVID-19 on the diagnoses, HbA1c monitoring and mortality in people with type 2 diabetes: a UK-wide cohort study involving 13 million people in primary care. https://www.medrxiv.org/content/10.1101/2020.10.25.20200675v1.full.pdf. Accessed November 13, 2020.