Impact of COVID-19 on diagnoses, monitoring, and mortality in people with type 2 diabetes in the UK

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The COVID-19 pandemic has had major health and economic effects across the world. At the time of writing (May, 2021), there have been more than 127 000 COVID-related deaths in the UK, with disproportionate effects in people with diabetes. Early in the pandemic, almost a third of all COVID-related deaths were in people with diabetes.[1–3]

The effect of COVID-19 on the National Health Service, and on diabetes services in particular, has been enormous, with frequent interruptions of most routine care. However, the consequences of these service restrictions on diagnosis and monitoring of type 2 diabetes are uncertain. To the best of our knowledge, there is also no available information comparing mortality across the UK nations in people with type 2 diabetes during the pandemic.

We generated a cohort of 25 million patients from 1831 UK general practices registered with the Clinical Practice Research Datalink (CPRD) Aurum (in England) and CPRD GOLD (in Northern Ireland, Scotland, and Wales) databases. The cohort included 14 929 251 patients (median age 41 years [IQR 25–59]; 7 461 565 [50·0%] of whom were women), who were followed between March 1 and Dec 10, 2020. We aimed to compare: (1) the UK-wide incidence of type 2 diabetes; (2) the frequency of HbA_{1c} testing; and (3) mortality in people with type 2 diabetes, by nation, before and after the first nationwide COVID-19 lockdown, which began in March 23, 2020 (appendix pp 1–3). There were 790 377 (5·3%) people with type 2 diabetes in the cohort (median age 67 years (IQR 57–76); 348 515 (44·1%) of whom were women).

In April 2020, the rate reduction (RR) of new diagnoses of type 2 diabetes in primary care practices in England was 0·70 (95% CI 0·68–0·71) when compared with 10-year (January, 2010 to February, 2020) historical trends (figure A), with similar reductions in other UK nations (0·68 [0·70–0·66]). Older individuals (ie, those aged 65 years and older), men, and people from deprived areas had the greatest reductions in diagnosis rates (data not shown). The reduced diagnosis rates in April were mirrored by the reduced rates of new metformin prescriptions in general practices in England when compared with 10-year historical trends (0·53 [0·51–0·55]; appendix p 4).

Between May 1 and Dec 10, 2020, the reduced diagnosis rates recovered gradually but remained well below expected levels (figure A). In general practices in England overall, the RR of type 2 diabetes diagnoses was 0·32 (95% CI 0·28–0·35) between March 1 and Dec 10, 2020, with a smaller RR observed in other UK nations (0·21 [0·16–0·26]). Between March 1 and Dec 10, 2020, the rate of new metformin prescriptions in England decreased by 0·20 (0·16–0·23), with a similarly smaller reduction in other UK nations (0·12 [0·06–0·16]).

On the basis of these figures and data from the Office for National Statistics, we estimate that between March and December, 2020, there were approximately 60 000 missed or delayed type 2 diabetes diagnoses across the UK.

Rates of HbA_{1c} testing in England (figure B) and other UK nations were greatly reduced in people with type 2 diabetes, with an RR of 0·77 (95% CI 0·76 to 0·78) in England and 0·83 (0·83–0·84) in other UK nations in April, 2020, and 0·31 (0·29–0·33) in England and 0·37 (0·34–0·39) in other UK nations overall between March and December, 2020. The largest reductions in the rates of HbA_{1c} testing were observed in older people (data not shown).

In April 2020, mortality rates in people with type 2 diabetes in England were more than two-fold higher when compared with earlier trends between January, 2010, and February, 2020 (mortality rate increase 1·12 [95% CI 1·04–1·20]; figure C), with significantly smaller increases in other UK nations (0·65 [0·58–0·73]; figure D). Peaks in mortality were observed particularly in individuals aged older than 65 years (data not shown). Mortality rates returned to expected levels in people with type 2 diabetes between June and September, 2020, but began to increase again from October to November, 2020 (data for December are underestimated due to recording lags). Overall, between March 1 and Dec 10, 2020, the mortality rate in people with type 2 diabetes in general practices in England increased by 0·19 (95% CI 0·14–0·23) and by 0·13 (0·08–0·16) in all other UK nations (figure C, D).

Previous data on the effect of the COVID-19 pandemic on diagnosis of type 2 diabetes are scarce. A study from Salford, UK, showed that there were 135 fewer diagnoses (a 49% reduction) of type 2 diabetes than expected between March and May, 2020.[4] In the current study, we extend these observations by showing that the reduced diagnosis rate applies to all areas of the UK. To our knowledge, no study has reported the effect of the COVID-19 pandemic on HbA_{1c} monitoring or has compared national mortality rates in people with type 2 diabetes across different UK nations.

Type 2 diabetes develops over many years; therefore, it seems unlikely that people's behaviour during the pandemic has reduced the true incidence of this condition. If the true incidence has remained constant, our data suggest that, across the UK, there were nearly 60 000 missed or delayed diagnoses of type 2 diabetes between March and December, 2020. This figure could be an underestimation because of well documented behaviours promoting

See **Online** for appendix

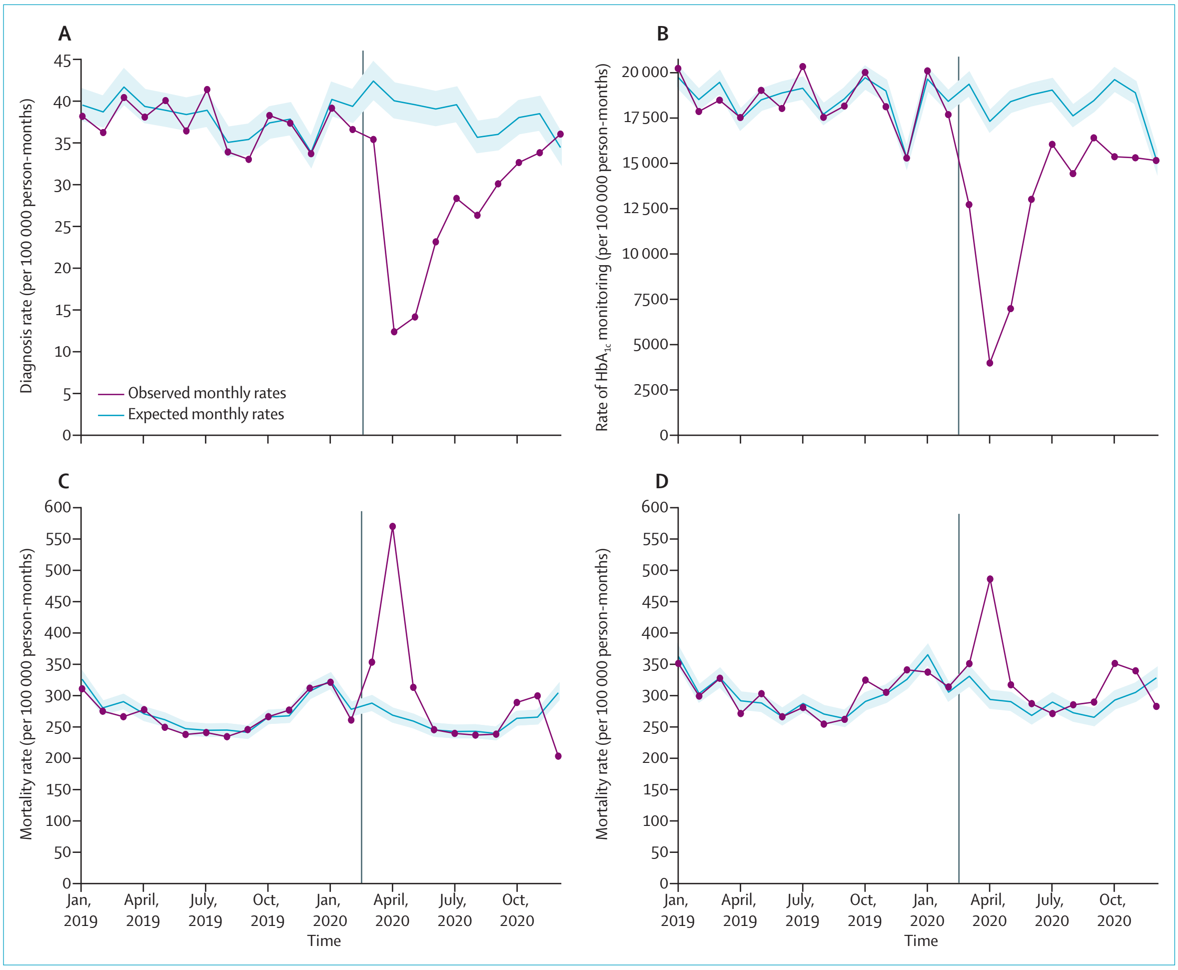

Figure: **Observed and expected incident diagnoses of type 2 diabetes in England (A), HbA_{1c} monitoring in patients with type 2 diabetes in England (B), and monthly mortality rates in people with type 2 diabetes in England (C), and in Northern Ireland, Scotland, and Wales (D)**

In A–D, purple lines indicate observed monthly rates, and yellow shaded regions indicate expected rates with 95% CIs; the vertical black line at March 1, 2020, separates the rates in primary care before and after the start of the COVID-19 pandemic, and x-axis markers indicate mid-months. Rates were derived by use of data from CPRD Aurum, covering 21 797 864 patients in England, and CPRD GOLD, covering 3 625 958 patients in Northern Ireland, Scotland, and Wales. CPRD=Clinical Practice Research Datalink.

weight gain during lockdown, such as poor diet, reduced physical activity, increased alcohol consumption, poorer mental health, and reduced sleep quality when compared with before lockdown.[5–7] These data are a clinical concern because undiagnosed type 2 diabetes can contribute to serious long-term complications.[8]

The reduction in HbA_{1c} testing is another important concern for people with type 2 diabetes, because they, and their treating clinicians, often rely solely on HbA_{1c} data to make treatment decisions. We observed reductions in new prescriptions for insulin, especially in older individuals (data not shown), suggesting a failure to intensify therapy in people with poorly controlled, long-term type 2 diabetes. There are already concerns about clinical inertia in diabetes management, with failures to escalate care when glucose control is poor.[9] These HbA_{1c} data indicate potential further delays that are predicted to cause avoidable diabetes-related long-term complications.

The higher COVID-related mortality rate in people with diabetes compared with the general population has been well documented.[1–3] Herein, we add to these data by showing regional differences in the effect of COVID-19 on mortality rates in people with type 2 diabetes, with higher rates observed in England than in the rest of the UK. Further research is required to understand how population characteristics, including ethnicity, population density, and social deprivation, might explain these differences.

To our knowledge, this is the first UK-wide study reporting the indirect effects of the COVID-19 pandemic on the diagnosis of type 2 diabetes, related prescribing rates, and HbA_{1c}

testing in primary care. Our findings in general practices in England were replicated by use of data from other regions of the UK. By combining assessments of diabetes coding and prescribing, our data support the conclusion that reduced rates of type 2 diabetes diagnoses can be genuinely explained by missed diagnoses.

We could not explore ethnicity-related variation in care because ethnicity coding was available in only 40% of records. It is possible that some type 2 diabetes diagnoses could have been made in hospital settings, with delays in updating primary care coding. However, these hospital-based diagnoses would not explain the reductions in metformin prescribing, and it is known that people have tended to avoid attending hospitals during the pandemic. Finally, our findings might not be generalisable to health-care systems outside the UK, due to differences in diabetes care, differing COVID-19 prevalences and effects on health-care systems, and differing COVID-19 measures and policies.

In conclusion, we highlight reductions in the diagnosis and monitoring of type 2 diabetes during the COVID-19 pandemic, which have important clinical and public health implications. Over the coming months, health-care services will need to manage this predicted backlog, and the anticipated deterioration of blood glucose levels and cardiovascular risk factors due to delayed diagnoses and reduced monitoring of patients with established diabetes. Our data showed that older individuals, men, and people from areas of high deprivation were most adversely affected and could represent specific groups to target for early intervention. Moving forward, during and beyond the pandemic, effective public health communication should ensure that patients remain engaged with diabetes services and make use of HbA_{1c} monitoring and remote consultations.[10]

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