Ethnic disparities in quality of diabetes care in Scotland

a national cohort study

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RESEARCH ARTICLE

Ethnic disparities in quality of diabetes care in Scotland: A national cohort study

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Abstract

Aims: The aim of this study is to compare quality of diabetes care in people with type 2 diabetes by ethnicity, in Scotland.

Methods: Using a linked national diabetes registry, we included 162,122 people newly diagnosed with type 2 diabetes between 2009 and 2018. We compared receipt of nine guideline indicated processes of care in the first-year post-diabetes diagnosis using logistic regression, comparing eight ethnicity groups to the White group. We compared annual receipt of HbA1c and eye screening during the entire follow-up using generalised linear mixed effects. All analyses adjusted for confounders.

Results: Receipt of diabetes care was lower in other ethnic groups compared to White people in the first-year post-diagnosis. Differences were most pronounced for people in the: African, Caribbean or Black; Indian; and other ethnicity groups for almost all processes of care. For example, compared to White people, odds of HbA1c monitoring were: 44% lower in African, Caribbean or Black people (OR 0.56 [95% CI 0.48, 0.66]); 47% lower in Indian people (OR 0.53 [95% CI 0.47, 0.61]); and 50% lower in people in the other ethnicity group (OR 0.50 [95% CI 0.46, 0.58]). Odds of receipt of eye screening were 30%–40% lower in most ethnic groups compared to the White group. During median 5 year follow-up, differences in HbA1c monitoring and eye screening largely persisted, but attenuated slightly for the former.

Conclusions: There are marked ethnic disparities in routine diabetes care in Scotland in the short- and medium-term following diabetes diagnosis. Further investigation is needed to establish and effectively address the underlying reasons.

KEYWORDS

cohort studies, diabetes mellitus, type 2, epidemiology, ethnicity, healthcare disparities, quality of health care

1 | INTRODUCTION

Diabetes is a major global health crisis, with the prevalence among adults estimated to be 10% (536.6 million people) in 2021.[1] Diabetes prevalence continues to increase in the UK, including in Scotland where an estimated 330,000 people (6% of the population) have diabetes, almost 90% of whom have type 2 diabetes.[2] As in many other high-income settings,[3,4] minority ethnic groups in the UK are disproportionately affected, with diabetes prevalence around two times greater than in White people, after accounting for sociodemographic factors including deprivation.[5] Studies suggest that type 2 diabetes onset may be earlier,[6] and sub-optimal glycaemic control more common,[7–10] in people in ethnic minority compared to White groups. Some studies report higher all-cause mortality and cardiovascular disease rates in ethnic minority versus White groups,[3,11–14] whilst others report higher rates of these outcomes in people in White versus ethnic minority groups.[15,16] Recent analyses of UK primary care data found that time from diagnosis to treatment initiation was shorter, but treatment intensification was slower, in people in Black and South Asian compared to White groups.[17,18]

Good clinical care and self-management are key to reducing the risk of diabetes complications, as reflected in clinical guidelines for optimal diabetes management.[19] These guidelines recommend regular monitoring of nine processes of diabetes care, which in the UK are conducted mostly in the primary care setting. Despite ethnic disparities in the burden and complications of diabetes, ethnic differences in diabetes care and management are not widely reported in peer-reviewed literature. Much of the existing research is from North America with evidence of poorer, better, or similar receipt of care by ethnicity depending on the study, specific ethnic group and process of care.[3,20,21] There is limited data from universal healthcare settings, with existing studies reporting basic descriptive data on ethnicity relative to receipt of diabetes care[22–24] or having formally analysed receipt of care by ethnicity, but limited by: small study population[25–28]; cross-sectional design[26–28]; reporting on selected processes of care only[25,28–30]; including selected ethnic or migrant groups only[27,29]; and often including relatively old data.[25,26,28] One contemporaneous UK study using English routine data identified ethnicity disparities in receipt of diabetes care but examined selected processes of care and a small number of ethnic groups.[30]

We sought to address these limitations in the present study by comparing quality of routine diabetes care in people with type 2 diabetes by ethnicity in the short- and medium-term following diabetes onset in Scotland.

What's new?

What is already known?

- Compared to White people, ethnic minority groups have a higher prevalence of diabetes, poorer glycaemic control and higher risk of complications, yet there is little peer-reviewed data on ethnic differences in receipt of diabetes care

What this study has found?

- Receipt of routine diabetes care was lower in ethnic minority compared to White groups, in both the short- and medium-term following diabetes diagnosis

What are the implications of the study?

- Findings revealed marked ethnic disparities in diabetes care and reinforce the need for the development and evaluation of culturally appropriate diabetes care

2 | METHODS

This article is written in accordance with the STrengthening the Reporting of OBservational Studies in Epidemiology (STROBE) and REporting of studies conducted using Observational Routinely-collected Data (RECORD) statements.

2.1 | Study population

We conducted a cohort study, using the Scottish Diabetes Research Network National Diabetes Dataset (SDRN-NDS) to identify the type 2 diabetes population. This national register includes more than 99% of all individuals diagnosed with diabetes in Scotland since 2004 and collates data, including on receipt of processes of care, from general practitioners diabetes outpatient clinics and opticians. It is linked to various health datasets, including hospital admission and National Register of Scotland mortality records, via a unique individual Community Health Index number. An algorithm which uses information on prescription, clinical-record of type of diabetes and age at diagnosis of diabetes was used to differentiate between type 1 and type 2 diabetes.[31] We included all adults (≥18 years) who received their first diagnosis of type 2 diabetes starting from 1st January

2009 (the point from which retinopathy screening was routinely conducted in all Scottish health boards) who survived the first year after diagnosis of diabetes. To avoid introducing potential bias we only included data from the pre-COVID-19 pandemic period. At the time of analysis, complete SDRN data required for these analyses were available up to April 2019. We therefore included participants diagnosed with diabetes up to 30th April 2018 for the one-year analysis and 31st December 2017 for the longitudinal analysis (see statistical analysis section). We excluded people with missing information on deprivation and smoking.

2.2 | Definition of ethnicity

We used data on ethnicity recorded in primary care practices, which is generally based on self-report, and, when missing in primary care, from any hospital admission records. We aligned the categorisation with recent recommendations[32] using as many categories as possible but had to group some of the categories to avoid small numbers. A detailed description of the ethnicity variable is found in the supplementary material (ESM Table 1). We used the following categorisation: African, Caribbean or Black; Bangladeshi, Bangladeshi Scottish or Bangladeshi British (hereafter, Bangladeshi); Chinese, Chinese Scottish or Chinese British (hereafter, Chinese); Indian, Indian Scottish or Indian British (hereafter, Indian); mixed or multiple ethnic group (hereafter mixed ethnic group); Pakistani, Pakistani Scottish or Pakistani British (hereafter, Pakistani); White; Other Asian, Other Asian Scottish or Other Asian British (hereafter, Other Asian); and other ethnicity group (which comprised Arab, Arab Scottish or Arab British and any other ethnic group). We also created an additional "missing" category within the ethnicity variable.

2.3 | Diabetes quality of care indicators

Information on receipt of processes of care was obtained from SDRN-NDS. We examined receipt of nine processes of care which, for the period of interest, clinical guidelines recommended should be monitored annually[19]: HbA1c, cholesterol, urinary albumin, serum creatinine, blood pressure, retinopathy screening, foot examination, body mass index (BMI), and smoking status. We examined each process of care indicator individually and created a composite measure of adequate care, defined as having received all nine process of care indicators during the first year after type 2 diabetes diagnosis. Monitoring of these indicators (with the exception of retinopathy screening) takes place in primary care for the majority of people with type 2 diabetes in Scotland. To investigate the receipt of care in the short-term following diabetes diagnosis, we investigated the assessment of all nine process of care indicators in the first year after type 2 diabetes diagnosis (first-year analysis). To determine whether differences in receipt of care differed over the longer term (longitudinal analysis), we examined receipt of HbA1c monitoring (a proxy for indicators routinely measured in primary care settings) and retinopathy screening, which is performed at an opticians or mobile screening unit. In the analyses of retinopathy screening, we included people attending hospital eye clinics within both the numerator and denominator.

2.4 | Definition of covariates

Our analyses included the following covariates at diagnosis of diabetes: sex, age, calendar year of type 2 diabetes diagnosis, health board, area-based deprivation, and history of each of hospital admission record for mental illness, cardiovascular disease, comorbidities, alcohol use disorder and smoking. In the longitudinal analysis, we additionally included diabetes duration. Area-based deprivation was defined using the Scottish Index of Multiple Deprivation (SIMD), categorised into quintiles. The index uses information on seven domains of an area including income, employment, education, health, access to services, crime, and housing to assign a deprivation score to the area. We determined history of a mental health condition prior to diabetes diagnosis from routinely collected national general and psychiatric hospital admissions records, available from 1981 onwards (see ESM Table 2 for ICD codes). History of cardiovascular disease (CVD) and alcohol use disorder were ascertained from hospital admission records using a 10-year look-back period from the date of diabetes diagnosis (ESM Tables 3 and 4). We defined comorbidity using an adaption of the Charlson Comorbidity Score[33] that excluded diabetes and diabetes complications (ESM Table 5) and using a 10-year look back period from the date of diabetes diagnosis. Since the score was highly skewed we categorised it as 0, 1–8, and >8 to create equally sized groups. Smoking status was obtained from SDRN-NDS and categorised as: smoker, ex-smoker, and never smoked.

2.5 | Statistical analysis

In the first-year analysis, we included people with type 2 diabetes diagnosed between 1st January 2009 and 30th

April 2018, following participants for one year. In the longitudinal analysis, we included individuals with type 2 diabetes diagnosed between 1st January 2009 and 31st December 2017 (to enable analysis by complete calendar year) and followed these individuals from type 2 diabetes diagnosis to end of follow-up (31st December 2018) or death, whichever came first. Since the longitudinal analyses did not allow for the inclusion of partial calendar years, people who died during follow-up were included up to 31st December of the year prior to that in which they died.

We compared receipt of diabetes care by ethnicity during the first year using logistic regression analysis. In the longitudinal analysis, we used a generalised linear mixed effect model to examine the receipt of each process of care indicator within each calendar year by ethnicity status. We included an individual-specific random intercept to account for correlation between care indicators from the same individual, with ethnicity and covariates included as fixed effects.

We serially adjusted for covariates in both analyses as follows: model 1 included age, sex, calendar year, and diabetes duration (only included in the longitudinal analysis); model 2 additionally included deprivation, and health board; model 3 additionally included mental illness, CVD, alcohol use disorder, comorbidity, and smoking status.

For continuous variables (age, year of type 2 diabetes, and diabetes duration), we used the Akaike information criterion to determine whether a linear term or a natural spline gave the best fit. For the natural splines we used 4 knots, with knots allocated so that events were evenly distributed between the knots.

2.6 | Ethics approval

Permission for the use of pseudonymised data for research was obtained from a Scottish Multicentre Research Ethics Committee (reference 21/WS/0047) and the Public Benefit and Privacy Panel (reference 1617–0147).

3 | RESULTS

3.1 | Baseline characteristics

After excluding 687 people (0.4%) with missing information on area-based deprivation and smoking, our cohort included 162,122 people with type 2 diabetes (ESM Figure 1). As in the general Scottish population,[34] the study population was predominantly of White ethnicity (83.9%). Information on ethnicity was missing for 14,316 (8.8%) participants. Except for the mixed ethnicity group, all ethnic minority groups were younger at type 2 diabetes diagnosis compared to White people (Table 1). The proportion of females was higher in White people compared to the other ethnicity groups. Compared to White people, higher proportions of people in the Bangladeshi, other Asian, African, Caribbean or Black, and the other ethnic group lived in the most deprived areas in Scotland. In contrast, Pakistani, Indian, and Chinese people, and people of mixed ethnicity, were less likely than White people to live in the most deprived areas. Compared with almost all other ethnic groups, White people were more likely to have a history of mental illness, alcohol use disorder, CVD, and comorbidities and to smoke. The pattern of baseline characteristics of people classified as mixed ethnicity was similar to that of White people, whilst those with missing ethnicity information were generally healthier than White people (Table 1).

3.2 | Receipt of diabetes care one-year post-diagnosis

Compared to all other ethnic groups, a higher proportion of White people received each of the processes of care during the first-year post-diabetes diagnosis (Table 2). After adjusting for all included covariates, odds of receiving diabetes care in the first year was mostly lower in people in ethnic minority groups compared to White people. Fewer differences were observed between people with mixed ethnicity and Chinese people versus White people, with fewer differences in odds of receipt of care and any disparities generally smaller than those observed for other groups. Differences were largest for the Indian, African, Caribbean or Black, and the other ethnic group, where statistically significant disparities were observed for virtually all processes of care and the odds of receiving care were up to half those observed for the White ethnic group (Figure 1). For example, receipt of HbA1c measurement was less common in all ethnic groups compared to the White group, but the degree of difference was greatest for the African, Caribbean or Black (OR 0.56, 95% CI 0.48–0.66), Indian (0.53, 95% CI 0.47–0.61), and the other ethnicity (OR 0.50, 95% CI 0.43–0.58) groups. Odds of receipt of eye screening were reasonably consistently 30%–40% lower in most groups than in White people. Regardless of ethnicity, the proportion receiving urinary albumin monitoring was particularly low (64%), and there were fewer ethnic differences for this indicator (Figure 1). All effect estimates

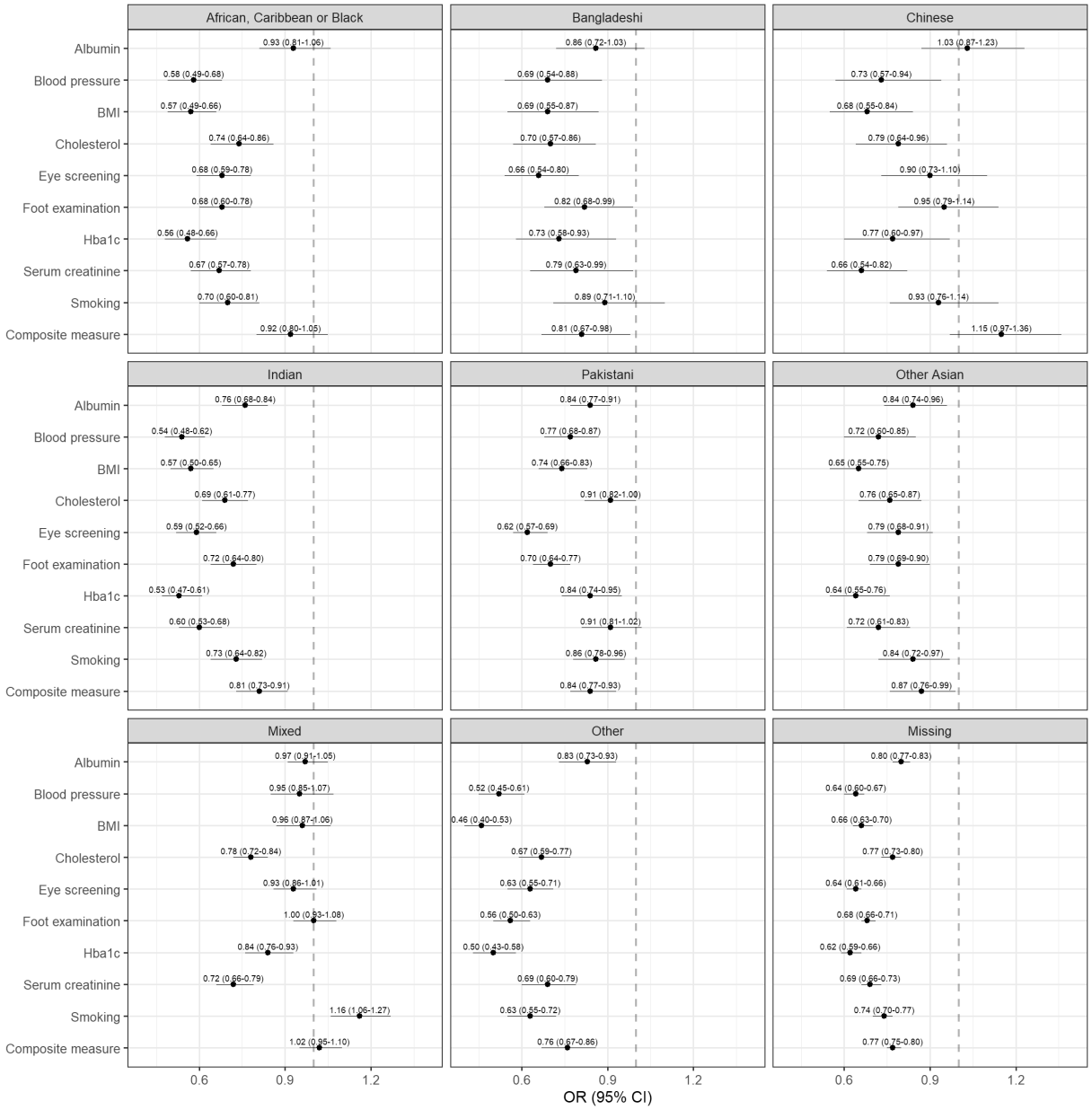

FIGURE 1 Odds ratios for receipt of diabetes process of care indicators, during the first-year post-diabetes diagnosis (first-year analysis) comparing each ethnicity to White ethnicity, in Scotland 2009–2017. $N = 162{,}122$. Adjusted for sex, age, calendar year, area-based deprivation, mental illness, health board, alcohol disorder, cardiovascular disease, comorbidities and smoking. BMI, body mass index; CI, confidence interval; OR, odds ratio. NB Composite measure refers to receipt of all 9 processes of care.

changed only slightly upon adjustment in serial models (ESM Table 6).

3.3 | Receipt of diabetes care for longer duration of diabetes

Median follow-up in the longitudinal analysis was 5 years (interquartile range 3–7 years). Ethnic disparities were generally similar to that observed for the first-year analysis. With the exception of the other Asian group, people in all ethnic minority groups were less likely to receive HbA1c monitoring when compared to White people (Figure 2). The magnitude of effect was, however, smaller than for the first-year analyses, with point estimates ranging from 10% to 39% lower odds of receipt of care. Retinopathy screening remained lower in all ethnic minority groups compared to White people with point estimates ranging from 11% to 38% lower odds of eye screening. Over time, disparities narrowed somewhat for the Pakistani and Indian groups, but widened for the Chinese group (Figures 1 and 2). In both the first-year and longitudinal analyses, disparities in receipt of care were particularly marked for the group with missing information on ethnicity (Figures 1 and 2).

TABLE 1 Baseline characteristics of people with type 2 diabetes included in the first-year analysis of receipt of diabetes care, by ethnicity, in Scotland 2009–2018.

Characteristic	Ethnicity									
	White (*N*, 136,031)	Pakistani (*N*, 2260)	Indian (*N*, 1478)	Bangladeshi (*N*, 511)	Chinese (*N*, 568)	Other Asian (*N*, 1055)	African, Caribbean or Black (*N*, 991)	Mixed (*N*, 3700)	Other (*N*, 1212)	Missing (*N*, 14,316)
One year analysis study sample[a]										
Age at T2D diagnosis, years (SD)	60.4 (13.0)	49.1 12.4)	47.4 12.9)	46.6 (11.8)	52.7 (14.0)	48.5 (12.1)	46.4 (11.6)	59.8 (13.2)	52.1 (13.6)	58.4 (12.7)
Female (%)	43.6	40.6	35.7	37.0	43.0	41.7	39.8	43.3	40.7	38.8
Deprivation[b] (%)										
5 (least deprived)	13.4	19.3	24.7	18.6	21.7	16.7	10.6	14.2	18.6	17.1
4	17.5	17.0	19.7	14.9	19.7	17.3	11.0	20.5	17.0	21.4
3	20.1	20.1	17.4	16.4	19.7	17.6	11.6	26.7	15.9	22.6
2	23.5	20.6	19.0	21.7	18.1	19.5	14.9	22.2	18.8	21.6
1 (most deprived)	25.5	22.9	19.2	28.4	20.8	28.9	51.9	16.4	29.7	17.2
Mental illness (%)										
No mental illness	92.3	95.9	97.2	96.1	97.2	96.8	96.4	93.3	96.0	96.5
Schizophrenia	1.1	0.7	0.3	1.0	1.1	0.9	0.9	1.1	0.3	0.6
Bipolar disorder	0.5	0.0	0.2	0.2	0.0	0.3	0.5	0.6	0.0	0.2
Depression	3.5	1.7	1.1	2.0	0.4	1.0	1.2	2.8	2.1	1.4
Other mental illness	2.6	1.6	1.2	0.8	1.4	1.0	1.0	2.2	1.7	1.2
History of alcohol use disorder (%)	3.7	0.6	1.0	0.4	0.2	0.4	0.7	2.6	1.5	1.5
History of CVD (%)	15.8	8.4	5.5	6.5	7.6	6.1	3.9	15.8	7.8	5.7
History of comorbidity[c] (%)										
0	80.5	91.0	93.5	95.1	93.0	93.5	93.4	81.0	90.6	93.4
1–8	11.6	6.3	4.7	3.5	4.2	4.3	4.1	11.4	5.5	4.0
>8	7.8	2.7	1.8	1.4	2.8	2.3	2.4	7.6	3.9	2.6
Smoking status (%)										
Never smoked	42.9	76.3	75.6	69.1	71.5	70.9	73.4	43.3	52.6	48.9
Ex-smoker	35.7	8.9	13.1	13.5	15.0	15.3	15.6	37.0	24.4	31.5
Current smoker	21.4	14.8	11.3	17.4	13.6	13.8	11.0	19.7	23.0	19.6
HbA1c	90.0	86.5	79.8	84.0	85.9	82.8	80.3	87.7	79.0	84.9
Cholesterol	82.8	77.6	73.1	75.5	77.5	75.9	74.5	78.6	73.4	78.2

Abbreviations: BMI, body mass index; CVD, cardiovascular disease; SD, standard deviation; TDM, type 2 diabetes.

[a]Among the 162,122 people included in the first-year analyses of receipt of care.

[b]Area-based deprivation, based on the Scottish Index of Multiple Deprivation.

[c]Defined using the Charlson comorbidity index.

TABLE 2 Receipt of diabetes processes of care in the first year and thereafter in people with type 2 diabetes, by ethnicity, in Scotland 2009–2018.

	Ethnicity									
Process of care	**White (*N*, 136,031)**	**Pakistani (*N*, 2260)**	**Indian (*N*, 1478)**	**Bangladeshi (*N*, 511)**	**Chinese (*N*, 568)**	**Other Asian (*N*, 1055)**	**African, Caribbean or Black (*N*, 991)**	**Mixed (*N*, 3700)**	**Other (*N*, 1212)**	**Missing (*N*, 14,316)**
First-year analysis sample[a] (%)										
HbA1c	90.0	86.5	79.8	84.0	85.9	82.8	80.3	87.7	79.0	84.9
Cholesterol	82.8	77.6	73.1	75.5	77.5	75.9	74.5	78.6	73.4	78.2
Albumin	64.3	56.7	55.1	58.5	63.9	58.4	60.1	63.5	59.6	63.7
Serum creatinine	87.8	83.3	76.4	81.0	79.8	79.9	78.6	83.0	79.3	82.5
Blood pressure	91.4	86.1	81.3	84.9	86.8	85.7	82.0	90.9	81.9	86.7
Foot examination	67.6	58.2	58.2	60.7	65.3	61.9	56.8	67.9	54.7	63.3
Retinopathy screening	82.0	73.3	70.2	70.8	79.0	76.1	72.0	79.3	70.8	74.2
Smoking	82.5	78.1	74.7	79.3	79.6	78.2	74.5	84.2	73.4	77.0
BMI	87.1	82.2	78.2	81.6	81.3	80.6	78.3	86.6	74.8	82.5
Composite measure[b]	38.7	32.6	32.2	32.7	41.0	34.9	35.0	39.4	32.6	38.2
Longitudinal study sample[c]										
Mean follow-up, years (SD)	4.85 (2.54)	4.51 (2.54)	4.77 (2.53)	5.46 (2.40)	4.94 (2.55)	5.00 (2.38)	4.66 (2.58)	4.86 (2.51)	4.56 (2.48)	4.25 (2.49)
Mean percentages receiving the process of care indicator during follow-up, % (SD)										
HbA1c	86.5 (34.2)	81.5 (38.8)	74.3 (43.7)	74.6 (43.5)	75.7 (43.5)	77.7 (41.6)	69.1 (46.2)	85.1 (35.6)	72.2 (44.8)	78.8 (40.8)
Retinopathy screening	76.6 (42.4)	72.6 (45.1)	67.3 (46.9)	64.4 (47.9)	69.1 (46.2)	69.7 (45.9)	62.9 (48.3)	74.2 (43.8)	64.3 (47.9)	66.9 (47.1)

[a]Among the 162,122 people included in the first-year analyses of receipt of care.

[b]Among 156,094 included in the longitudinal analyses.

[c]Composite measure refers to assessment of all 9 processes of care.

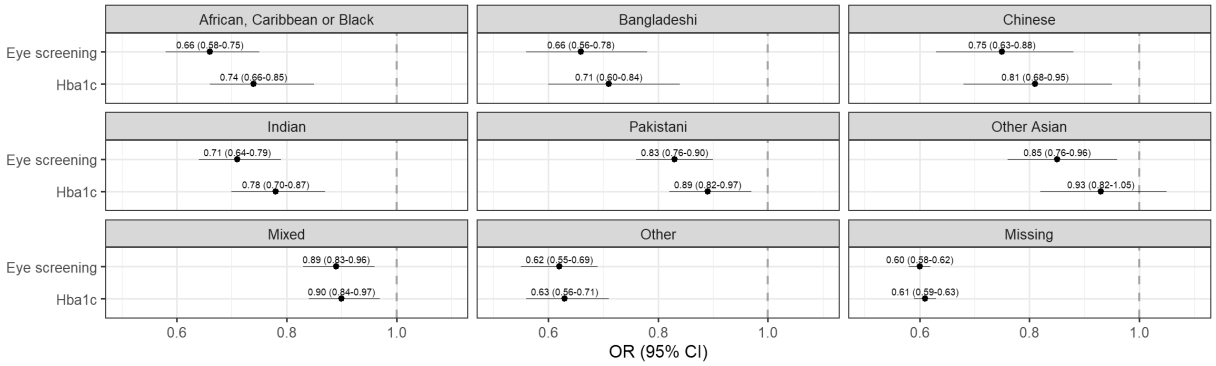

FIGURE 2 Odds ratios for receipt of HbA1c and eye screening during the whole follow-up period (longitudinal analysis), comparing people with each ethnicity versus White ethnicity, in Scotland, 2009–2017. $N = 156{,}094$. Adjusted for sex, age, diabetes duration, calendar year, area-based deprivation, mental illness, health board, alcohol disorder, cardiovascular disease, comorbidities and smoking. CI, confidence interval; OR, odds ratio.

4 | DISCUSSION

We observed striking ethnic disparities in receipt of diabetes care in the short- and medium-term following diabetes diagnosis. Patterns of disparities varied by ethnic group and by process of care. Although disparities in receipt of HbA1c monitoring, a marker for diabetes care delivered in primary care, generally narrowed beyond the first-year post-diagnosis, odds of HbA1c monitoring remained statistically significantly lower ranging from 10% to 39% lower odds of monitoring in most minority ethnic groups compared to the White group. Marked disparities in eye screening, ranging from 11% to 38% lower odds of monitoring, were evident for all ethnic minority groups, and generally persisted over time.

Our study makes a significant contribution to the sparse existing data on ethnicity and receipt of routine diabetes care in a UK setting. In particular, few studies have examined a similarly comprehensive set of diabetes care indicators and ethnicity classification has generally been very restricted.[32] To our knowledge, there is only one other contemporaneous UK-based study that has formally investigated receipt of diabetes care by ethnicity after adjusting for key confounding factors. This study used English routinely collected data to compare monitoring of HbA1c, blood pressure, serum creatinine, and eye screening and neuropathy in five ethnic groups (White, Mixed, Asian, Black, and other) between 2012 and 2016.[30] As in our study, Black people were less likely to receive annual HbA1c monitoring. In contrast to our findings, they found that Asian people were more likely to be monitored for HbA1c and kidney function when compared to White people, which may reflect the use of a cruder classification of Asian people and masking of differences between Asian ethnicities. Our findings were consistent in terms of lower proportions of ethnic minorities receiving eye screening and the finding that those included in the "other" and missing ethnicity groups were less likely to receive monitoring for each of the five processes of care.[30] Older UK studies found no ethnicity differences for most process of care indicators but included fewer and less refined ethnic groups.[25,28] Comparisons with non-UK universal healthcare settings are limited by differences in methodologies, particularly ethnicity classification, which was often restricted[26] or entailed comparisons by migrant status[29] or country of birth.[27]

The reasons for the observed ethnic disparities in receipt of diabetes care in the UK, a universal healthcare setting, are likely multifactorial. It is interesting that in our study adjusting for confounding factors, including socioeconomic status did not materially alter the effect estimates. Systemic barriers such as higher deprivation in some minority ethnic groups might be expected to play a role in explaining some of the observed disparities.[14] Ethnic minority groups face multiple systemic, cultural, and language/linguistic barriers when accessing diabetes care, including: living in medical underserved areas/unequal access to healthcare resources, cultural differences in health behaviours, religious beliefs, language differences, low health literacy, cultural differences in beliefs around health, belief in expert and professional support, low accessibility of culturally appropriate services/information, and lower concordance with Western professional advice.[35] Cultural views and beliefs around nutrition, including social expectations of maintaining traditional diets and misunderstandings of a "diabetic diet", might impede uptake of dietary advice, whilst culturally diverse views on healthy body weight may create barriers to behaviour change.[6] Some of these cultural differences are thought to particularly impact women's access to health care or diabetes management more than men and so gender dynamics (which differ from those in White cultures) is another important consideration.[36] Systemic structural,

institutional, and interpersonal racism plays a role, with ethnic disparities wide-ranging, affecting areas of health, housing, education, criminal justice, employment, immigration, and political participation.[14] With respect to health, institutional mistrust due to this racism is thought to play a role in sub-optimal receipt of care.[14]

Key strengths of our study include the use of an unselected and nationally representative cohort, long follow-up that enabled analyses in the short and medium-term post-diabetes diagnosis and adjustment for a wide range of confounding factors, including deprivation. Although Scotland has a predominantly White population, the large sample size allowed comparisons across multiple ethnic groups with reasonable precision. To our knowledge, our study is one of the first in the UK to examine ethnic disparities in receipt of diabetes care, the first to investigate a comprehensive suite of guideline-indicated diabetes care indicators and the first to analyse ethnicity using more refined categories.

Our study has some limitations. Information on ethnicity was missing for 8.8% of people. However, we included these people in our analyses as a comparison group rather than excluding them. Although we were able to investigate multiple ethnic groups, small numbers in some groups meant we had to collapse some ethnic groups, which limits the generalisability of some findings. However, we included more categories than previous studies in this area. Our classification also closely aligns with recent recommendations and exceeds the recommended minimum categorisation of ethnicity.[32] Since we analysed multiple ethnicity groups and processes of care indicators, multiple testing could have given rise to chance findings. However, we similarly found ethnicity disparities in the combined outcome of receiving all processes of care. In the longitudinal analyses, we examined HbA1c as a proxy for receipt of processes of care received in primary care and so our findings are limited in that we did not examine all processes of care delivered in that setting. Although we adjusted for area-based socioeconomic status, there may be residual confounding by individual socioeconomic factors such as education. Unfortunately, we did not have access to measures of healthcare engagement such as primary care consultation rates and so could not investigate whether adjustment for this alters the effect estimates. Finally, it was beyond the scope of our study to investigate associations by age, sex, or deprivation level or investigate the impact of the COVID-19 pandemic lockdown periods. These are important areas for further research that would support development of strategies to improve diabetes care in ethnic minority groups and improve preparedness for future disruptions to health care services.

Future research should focus on developing, implementing and evaluating culturally appropriate diabetes care. Given that multiple systemic, linguistic, and cultural barriers to diabetes care have been previously identified, strategies should be multifaceted, and address the issue of differing gender dynamics across cultures to address the particular vulnerability of women in ethnic minority groups as identified in previous studies. The UK Diabetes Tackling Inequalities Commission report identified four principles to frame approaches to addressing ethnic disparities in diabetes services – Context, Curiosity, Collaboration, and Commitment. These highlight the importance of ensuring services are culturally appropriate and inclusive and are informed by building sustainable community partnerships through long-term funding commitments.[14] The report also recognised that in addition to improving support for patients, there needs to be better support for health care professionals to deliver equitable diabetes services. While additional strategies to improve culturally appropriate diabetes care are being developed, we should ensure that health professionals are aware of resources in non-English languages[37] and support available for both clinicians and patients from NHS services, the Centre for Ethnic Health Research,[38] and similar bodies in other countries.

Finally, improved collection and quality of linkable ethnicity and deprivation data across the four UK nations is critical for supporting these steps to improving diabetes services and achieving optimal diabetes care including optimal treatment decisions for people with different phenotypes of type 2 diabetes.

AUTHOR CONTRIBUTIONS

Caroline A. Jackson, Stine H. Scheuer, Kelly Fleetwood and Sarah H. Wild conceived and designed the study, Stine H. Scheuer and Kelly Fleetwood conducted the statistical analyses, all authors contributed to interpretation of the findings, Caroline A. Jackson and Stine H. Scheuer drafted the manuscript, and all authors commented on the draft manuscript.

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CONFLICT OF INTEREST STATEMENT

None.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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