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RESEARCH ARTICLE

Inequalities in the management of diabetic kidney disease in UK primary care: A cross-sectional analysis of a large primary care database

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Abstract

Aims: To determine differences in the management of diabetic kidney disease (DKD) relevant to patient sex, ethnicity and socio-economic group in UK primary care.

Methods: A cross-sectional analysis as of January 1, 2019 was undertaken using the IQVIA Medical Research Data dataset, to determine the proportion of people with DKD managed in accordance with national guidelines, stratified by demographics. Robust Poisson regression models were used to calculate adjusted risk ratios (aRR) adjusting for age, sex, ethnicity and social deprivation.

Results: Of the 2.3 million participants, 161,278 had type 1 or 2 diabetes, of which 32,905 had DKD. Of people with DKD, 60% had albumin creatinine ratio (ACR) measured, 64% achieved blood pressure (BP, <140/90 mmHg) target, 58% achieved glycosylated haemoglobin (HbA1c, <58 mmol/mol) target, 68% prescribed renin–angiotensin–aldosterone system (RAAS) inhibitor in the previous

year. Compared to men, women were less likely to have creatinine: aRR 0.99 (95% CI 0.98–0.99), ACR: aRR 0.94 (0.92–0.96), BP: aRR 0.98 (0.97–0.99), HbA_{1c}: aRR 0.99 (0.98–0.99) and serum cholesterol: aRR 0.97 (0.96–0.98) measured; achieve BP: aRR 0.95 (0.94–0.98) or total cholesterol (<5 mmol/L) targets: aRR 0.86 (0.84–0.87); or be prescribed RAAS inhibitors: aRR 0.92 (0.90–0.94) or statins: aRR 0.94 (0.92–0.95). Compared to the least deprived areas, people from the most deprived areas were less likely to have BP measurements: aRR 0.98 (0.96–0.99); achieve BP: aRR 0.91 (0.8–0.95) or HbA_{1c}: aRR 0.88 (0.85–0.92) targets, or be prescribed RAAS inhibitors: aRR 0.91 (0.87–0.95). Compared to people of white ethnicity; those of black ethnicity were less likely to be prescribed statins aRR 0.91 (0.85–0.97).

Conclusions: There are unmet needs and inequalities in the management of DKD in the UK. Addressing these could reduce the increasing human and societal cost of managing DKD.

KEYWORDS

diabetes, DKD, ethnicity, inequality

1 | INTRODUCTION

Diabetic kidney disease (DKD) is a chronic complication of diabetes and affects 30%–40% of people with type 2 diabetes.[1] It accounts for around 42% cases of chronic kidney disease (CKD) globally.[2] DKD is an established risk factor for all-cause and cardiovascular mortality and end-stage kidney disease (ESKD); 30.2% of patients requiring dialysis in the United Kingdom (UK) have DKD as the primary kidney disease.[3]

Chronic kidney disease (CKD) and type 2 diabetes are more prevalent in people from lower socio-economic groups and those of black and South Asian ethnicities.[4] People from lower socio-economic groups are more likely to develop DKD,[1] and those from black and South Asian ethnicities with DKD are more likely to progress to more advanced stages of CKD, and along with those socio-economically deprived, are more likely to start dialysis. CKD is more prevalent among women, but men are more likely to receive dialysis.[4]

Early recognition and treatment of DKD are important in order to modify cardiovascular disease risk and to limit the progression of disease to end-stage kidney disease (ESKD). In the UK, clinical practice guidelines exist, providing evidence-based recommendations for the management of DKD. These include lifestyle advice, pharmacotherapy for hypertension, lipids and glycaemic control, and recommendations for disease monitoring and treatment targets.[5–7] The NICE recommendations for both CKD and diabetes[8,9] are aimed at the primary care management of both conditions in England and have been updated in 2021 to include more recent evidence.

What's new?

- There are inequalities in outcomes for patients with diabetes and CKD between different socio-economic groups and ethnicities.
- Women with DKD were less likely to be appropriately monitored, prescribed appropriate medications or treated to target. People from socio-economically deprived backgrounds were less likely to be appropriately monitored, prescribed appropriate medications or treated to target. People of black ethnicity were less likely to be prescribed statins than white ethnic group.
- Further research is needed to test low-cost interventions that improve and standardise the management of DKD in primary care.

Data from the National Diabetes Audit in England and Wales showed that people with diabetes who have fewer care processes had a higher mortality rate. There was a significant association between the number of care processes completed and ethnicity, but not deprivation, and the association of completion of care processes and mortality also differed significantly by ethnicity but not deprivation. However, data on the individual targets that were achieved in these different at-risk groups were not available,[10] thus making it difficult to examine the full extent of variation in care and outcomes by ethnicity or deprivation.

In view of the relationship between ethnicity and deprivation and CKD management in the UK, as well as the association of T2DM and progression to ESKD with deprivation and certain ethnic groups, we set out to examine this further using a large, comprehensive primary care dataset from 700 general practices across the UK. The aim of this study was to investigate whether there were any significant variations in the management of DKD in the UK primary care in relation to sex, ethnicity and socioeconomic status.

2 | METHODS

2.1 | Study design and data source

We performed a cross-sectional analysis of the IQVIA Medical Research Data (IMRD) database using an index date on January 1, 2019, to determine the proportion of patients with DKD managed in accordance with a range of care quality metrics derived from the NICE Diabetes and CKD guidelines and guidelines from the Association of British Clinical Diabetologists (ABCD).[5–9,11]

IMRD is an anonymised database of electronic primary care records from general practices in the UK using Vision software. All participating practices contribute coded data on patient characteristics, prescriptions, consultations, diagnoses and primary care investigations. IMRD contains records from over 700 general practices spread across all four nations of the UK, with more than 15 million patient records (22% of the UK population). Around 3.7 million of these are active at any given time point. IMRD is largely representative of the UK population in terms of demographics and morbidity prevalence.[12] Symptoms, clinical examinations and diagnoses in IMRD are recorded using a hierarchical clinical coding system called Read codes.[13] Practices were eligible for inclusion in the study from 12 months after the latest of either practice acceptable mortality recording date (AMR; a standard measure of sufficient data quality)[14] or Vision software installation date.

DKD was defined as the presence of Read codes for both diabetes and CKD. The data extraction and cohort selection were facilitated using the data extraction for epidemiological research (DextER) tool.[15]

2.2 | Study population

People aged 18 years and older who had been contributing data to the IMRD for at least 12 months as of January 1 2019 were eligible for this analysis. From this, only people with a diagnosis of type 1 or type 2 diabetes and CKD were included.

2.3 | Definition of variables

Diagnoses of CKD (stages 1–5) and type 1 or type 2 diabetes were defined as the presence of a Read Code for these conditions that were recorded before January 1, 2019. The most recent record of sex, ethnicity, Townsend deprivation score (based on the patients' postcode) and body mass index (BMI) before January 1, 2019 were included in the dataset. BMI was categorised using the World Health Organization classification.

A record of prescriptions for statins and renin–angiotensin–aldosterone system (RAAS) inhibitors within the past year was used to determine current treatment. Prescription of RAAS inhibitors was considered appropriate if the patient had an albumin creatinine ratio (ACR) ≥3 mg/mmol.[8] Statins were considered appropriate for all patients in this analysis as NICE guidance advises offering statins to all patients with CKD.[16]

2.4 | Key outcome measures[6–9]

1. A record of blood pressure (BP), cholesterol, creatinine (to calculate estimated glomerular filtration rate; eGFR) and albumin creatine ratio (ACR) measurements within the previous year.
2. Appropriate prescription of statins and RAAS inhibitors as defined above.
3. BP maintained at or below target (≤140/80 mmHg)
4. Glycosylated haemoglobin (HbA_{1c}) maintained at or below target (≤58 mmol/mol (7.5%))
5. Serum total cholesterol at or below target (≤5 mmol/L)

For all these key outcome measures, the absence of data for that variable was assumed to mean that the monitoring had not been carried out or the medication had not been prescribed, as is the nature of this type of data.

2.5 | Statistical analysis

Age at the study entry was calculated and categorised into the following groups: 18–30, 31–40, 41–50, 51–60, 61–70, 71–80 (reference) and ≥81 years. Ethnicity was categorised into five groups: white (reference), black, South Asian, mixed ethnicity and others. Socio-economic group was based on the Townsend deprivation score and divided into

quintiles with the lowest (reference) corresponding to the least deprived and the highest to the most deprived.

Characteristics of participants were reported using appropriate descriptive statistics (mean for normally distributed continuous variables, median and interquartile range (IQR) for non-normally distributed variables and proportions for categorical variables). For each of the key outcome measures, the proportion of people who received appropriate management within the previous year was calculated overall and stratified by age, sex, ethnicity and socio-economic status. Robust Poisson regression models using a log-link function were used to estimate risk ratios for the key outcome measures among those with DKD according to age, sex, ethnicity and Townsend deprivation score and for the adjusted risk ratios (aRR) and 95% confidence intervals (CI) after adjusting for age, sex, ethnicity and Townsend deprivation score (where appropriate). To account for the similarity of outcomes within GP practices, statistical inference from the log binomial regression model was based on cluster-robust standard errors. Data were missing for 27% of socio-economic group, and 47% of patients for ethnicity. To ensure that the same patients were being compared in all analyses, those with a missing value for each particular variable were assigned to a separate category for that variable and included in the regression analysis.

All statistical analyses were performed using Stata statistical software, V.15.1 (StataCorp). Two-sided p values <0.05 were considered to be statistically significant.

3 | RESULTS

The records of 2,293,244 patients 18 years and older were eligible for inclusion in the analysis, of whom 161,278 (7.03%) had a code for type 1 (14,596) or type 2 diabetes (146,682). Of those with diabetes, 32,556 (20.2%) also had a code for CKD and were included in the analysis.

Baseline characteristics are presented in Table 1. Men represented 48.7% of the cohort and the mean age was 76.7 years. Of the 32,556 people with DKD, 1987 (6.1%) had a diagnosis of type 1 diabetes and 30,579 (93.9%) had a diagnosis of type 2 diabetes.

3.1 | Renal function

Of the 32,556 with DKD, 30,171 (92.7%) had their creatinine and 19,433 (59.7%) had ACR measured within the previous year (Figure 1; Table S1). Compared to those aged 71–80 years, people aged 81 years and older were 9% less likely to have ACR measured: aRR 0.91 (95% CI 0.89–0.93) and people aged 18–30 years were 69% less likely to have ACR measured (95% CI 0.11–0.86). Compared to men, women had a significantly lower risk of having their serum creatinine: aRR 0.99 (95% CI 0.98–0.99) and ACR: aRR 0.94 (95% CI 0.92–0.96) measured within 1 year (Figure 2; Table S2).

TABLE 1 Baseline characteristics of patients with DKD.

Characteristic	
Male *N* (%)	15,852 (48.7)
Age mean (SD)	76.7 (10.6)
Age category *N* (%)	
18–30	15 (0.1)
31–40	148 (0.5)
41–50	512 (1.6)
51–60	2072 (6.4)
61–70	5665 (17)
71–80	11,824 (36)
81+	12,330 (37)
Ethnicity *N* (%)	
White	15,782 (48)
Black	419 (1.3)
South Asian	793 (2.5)
Mixed Race	217 (0.7)
Other	61 (0.2)
Missing	15,294 (46)
Townsend deprivation score *N* (%)	
1 Least deprived	4326 (13)
2	4809 (14)
3	5514 (17)
4	5336 (16)
5 Most deprived	3848 (11)
Missing	8733 (26)
BMI category *N* (%)	
Underweight (<18.5)	257 (0.8)
Normal weight (18.5–24.9)	5546 (17)
Overweight (25–29.9)	10,975 (33)
Obese (>30)	15,280 (46)
Missing	508 (1.6)
CKD Stage *N* (%)	
1	540 (1.7)
2	2920 (9.0)
3	26,219 (80)
4	2058 (6.3)
5	707 (2.2)
Missing	122 (0.4)
Type of diabetes	
Type 1 diabetes mellitus	1987 (6.1)
Type 2 diabetes mellitus	30,579 (93.9)

Note: Patients with DKD were defined as those with both a Read code for diabetes and a Read code for CKD.

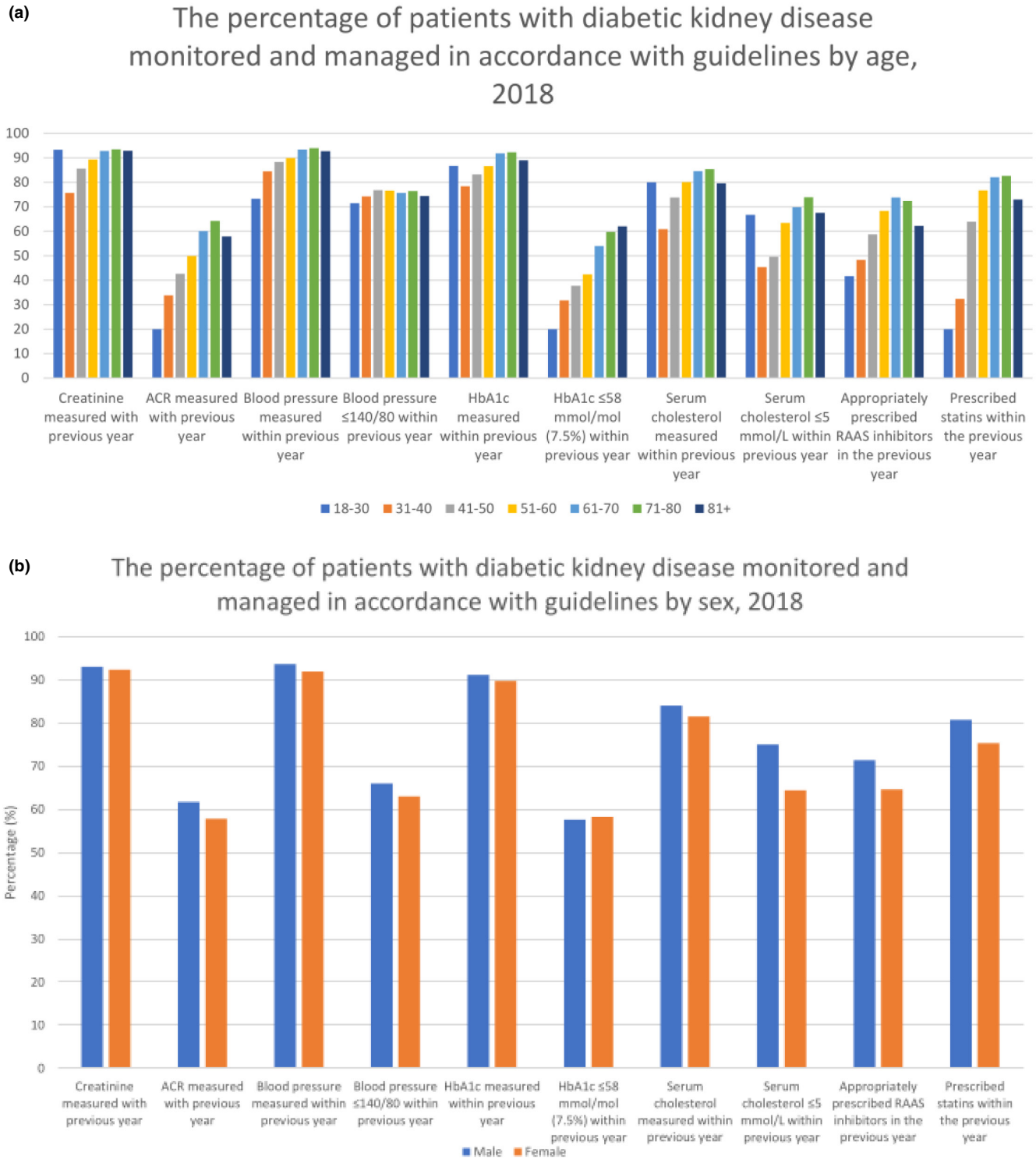
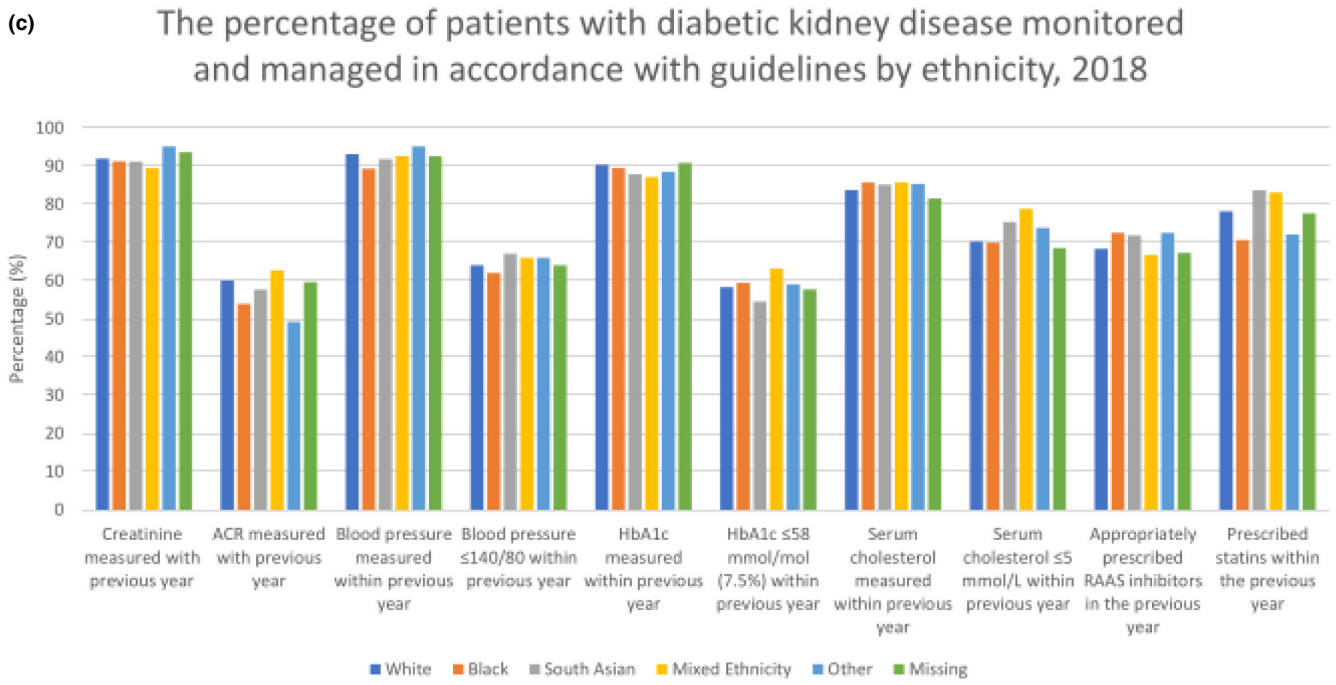


FIGURE 1 The proportion of patients appropriately monitored and managed in accordance with guidelines stratified by (a) age, (b) sex, (c) ethnicity and (d) Townsend deprivation score.

3.2 | Blood pressure

Overall, 30,202 (92.7%) patients with DKD had their BP measured within a year. However, only 20,915 (64%) had BP at or below the target of 140/80 mmHg (Figure 1; Table S1). Results in Figures 2 and 3 and Table S2 show that those aged 81 years and older were significantly less likely to have their blood pressure measured in the last year (aRR 0.98 (95% CI 0.97–0.99)) and for it to be below target: aRR 0.96 (0.95–0.98) and as were those aged 31–40 years (blood pressure measured: aRR 0.9 (0.83–0.97) below target: aRR 0.71 (0.6–0.83)). Women were 2% less



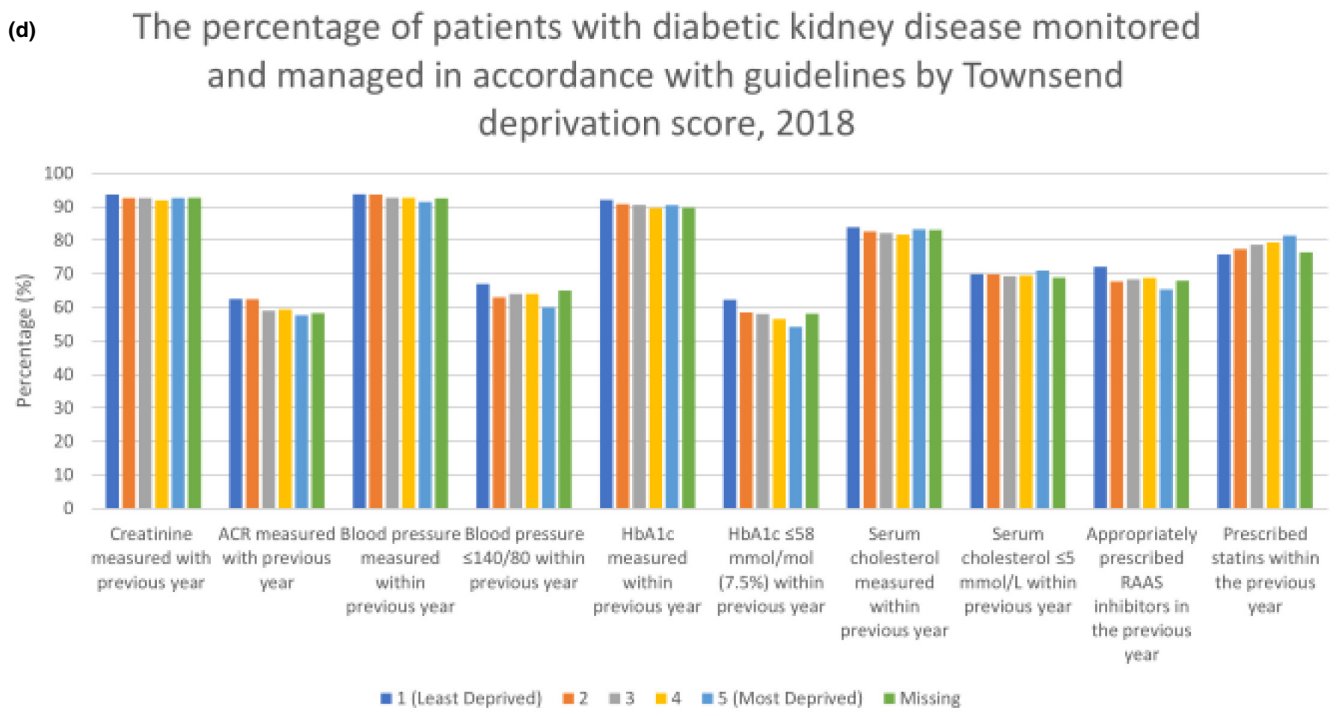


FIGURE 1 (Continued)

likely to have their BP measured within a year: aRR 0.98 (95% CI 0.98–0.99) and have a BP below target: aRR 0.95 (0.94–0.97). People living in the most deprived areas were 2% less likely to have their BP measured within a year: aRR 0.98 (95% CI 0.96–0.99) and 9% less likely for BP to be on target: aRR 0.91 (0.87–0.95) compared to those in the least deprived areas.

3.3 | HbA_{1c}

There were 29,444 (90.4%) patients with DKD who had their HbA_{1c} measured within 1 year (Figure 1; Table S1). However, only 18,876 (58.0%) had their HbA_{1c} at the target of 58 mmol/mol or lower (Figure 1; Table S1). Those aged 81 years and older were 3% less likely to have their

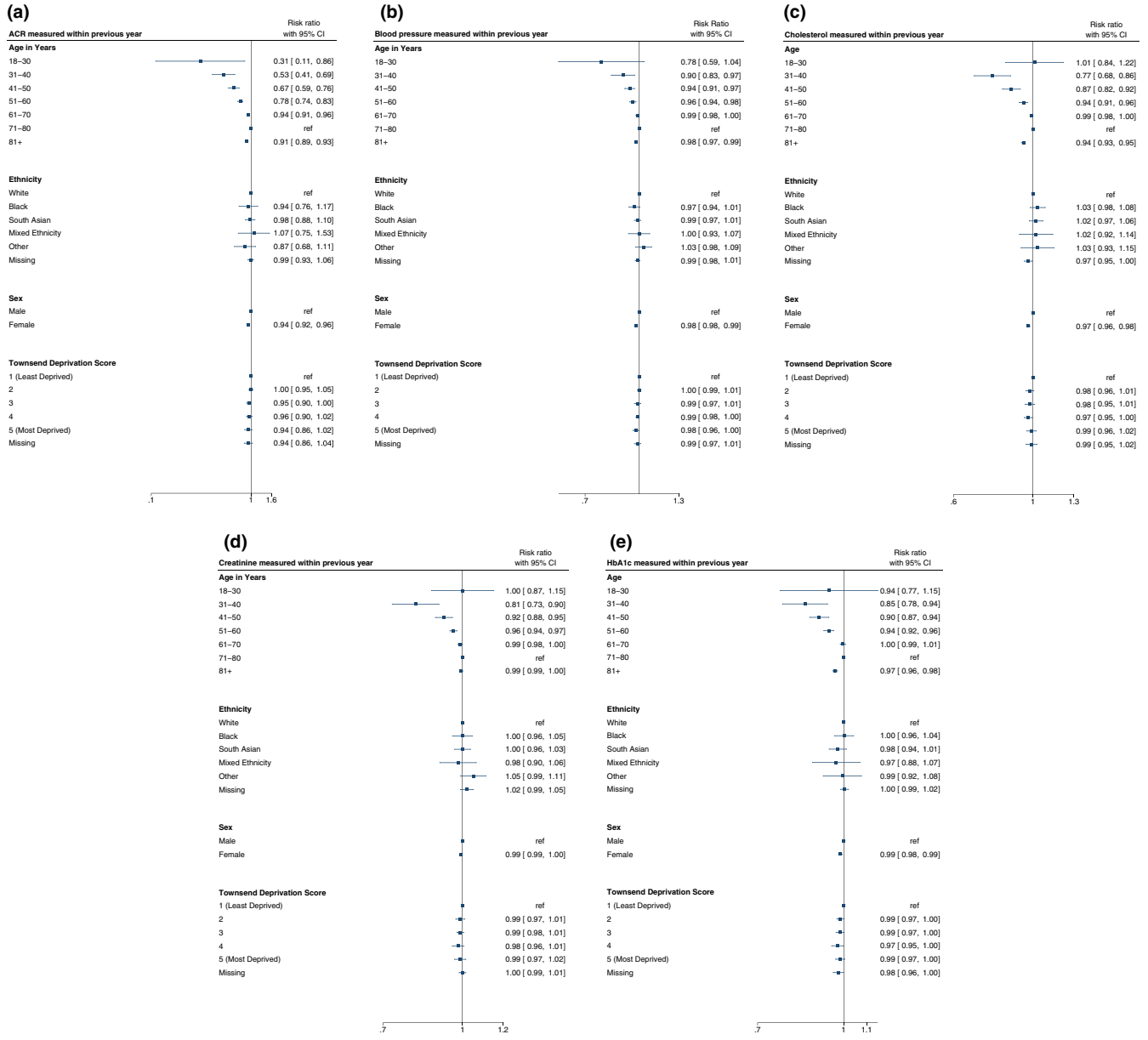


FIGURE 2 Adjusted risk ratios for the monitoring of creatinine, (a) ACR, (b) BP, (c) cholesterol, (d) creatinine and (e) HbA_{1c} between age categories, sex, ethnicities and Townsend deprivation score.

HbA_{1c} measured: aRR 0.97 (95% CI 0.96–0.98), but of those that did, this older age group was slightly more likely to have HbA_{1c} lower than 58 mmol/mol: aRR 1.04 (95% CI 1.02–1.06) compared to those aged 71–80 years. Those aged 18–30 years were also less likely to have had their HbA_{1c} below target (aRR 0.33 (0.12–0.94)). Women were less likely to have their HbA_{1c} measured within the past year: aRR 0.99 (95% CI 0.98–0.99). People living in the most deprived areas were 12% less likely to have their HbA_{1c} measurement lower than 58 mmol/mol (7.5%): aRR 0.88 (95% CI 0.85–0.92; Figures 2 and 3; Table S2).

3.4 | Serum total cholesterol

In the cohort overall, 26,843 (82.8%)patients had their serum cholesterol measured within a year and total cholesterol was ≤5 mmol/L for 22,655 (69.6%) patients (Figure 1; Table S1). Those aged 81 years and older were 6% less likely to have their serum cholesterol measured: aRR 0.94 (95% CI 0.93–0.95) and were also 7% less likely to meet the target of ≤5 mmol/L: aRR 0.93 (95% CI 0.91–0.94). Those aged 31–40 years were 23% less likely to have their cholesterol measured (95% CI 0.68–0.86) and 39% less likely for it to be on target (95% CI 0.5–0.75). Women were less likely to have

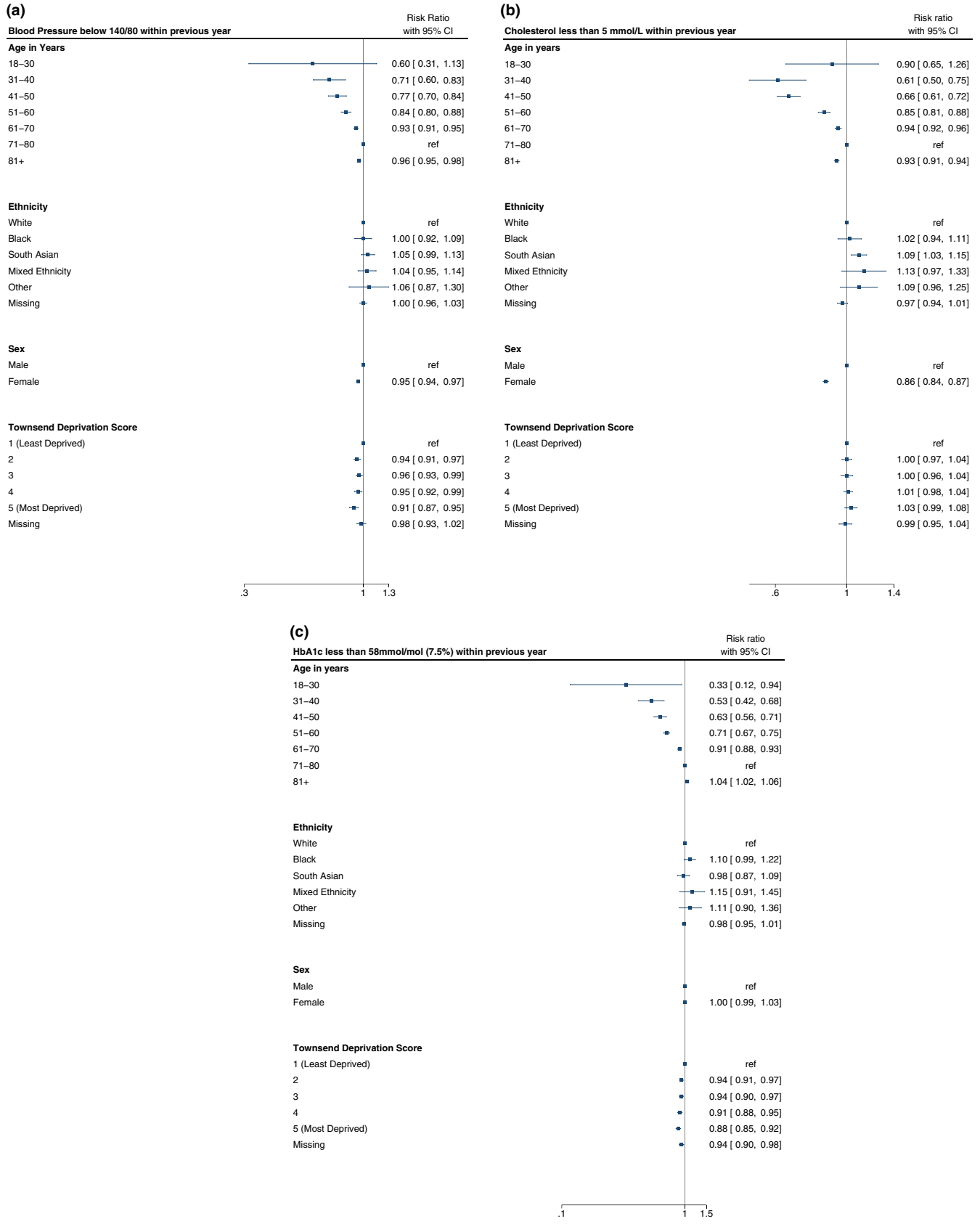


FIGURE 3 Adjusted risk ratios for the achievement of (a) BP, (b) cholesterol and (c) HbA_{1c} targets between age categories, sex, ethnicities and Townsend deprivation score.

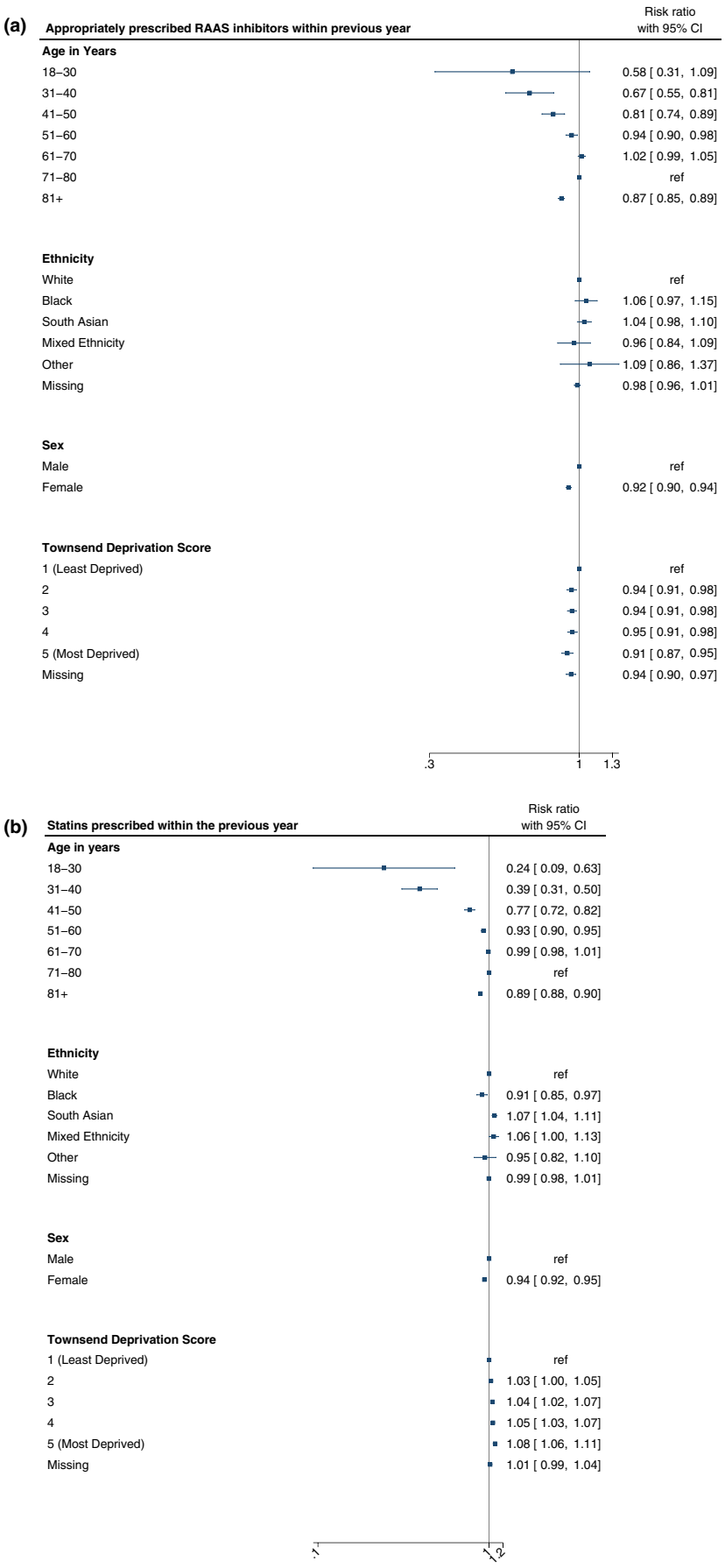


FIGURE 4 Adjusted risk ratios for the appropriate prescribing of (a) RAAS inhibitors and (b) statins between age categories, sex, ethnicities and Townsend deprivation score.

their serum cholesterol measured within a year: aRR 0.97 (0.96–0.98) and 14% less likely for their total cholesterol to be ≤5 mmol/L (aRR 0.86 (0.84–0.87)). People of South Asian ethnicity were 9% more likely to have their serum cholesterol on target: aRR 1.09 (1.03–1.15; Figures 2 and 3; Table S2).

3.5 | RAAS inhibitors

RAAS inhibitors were indicated in 18,901 of the study cohort. 12,842 (68.4%) of these were prescribed RAAS inhibitors within the previous year (Figure 1 and Table S1). Results in Figure 4 and Table S2 show that those aged 81 years and older were 13% less likely to be prescribed a RAAS inhibitor (aRR 0.87 (95% CI 0.85–0.89)). Those aged 31–40 years were 33% less likely to be prescribed RAAS inhibitors (95% CI 0.55–0.81). Women were 8% less likely to have been appropriately treated with RAAS inhibitors within the previous year: aRR 0.92 (0.90–0.94). People living in the most deprived areas were 9% less likely to have been prescribed RAAS inhibitors: aRR 0.91 (95% CI 0.87–0.95).

3.6 | Statins

In the DKD cohort, 25,374 (77.9%) were prescribed statins within the previous year (Figure 1; Table S1). Those aged 81 years were 11% less likely to be prescribed a statin: aRR 0.89 (95% CI 0.88–0.90) and those aged 31–40 years were 61% less likely to be prescribed a statin (95% CI 0.31–0.5). Women were significantly less likely to have been prescribed statins within the previous year: aRR 0.94 (95% CI 0.92–0.95; Figure 1). People of black ethnicity were 9% less likely to have been prescribed statins within the previous year: aRR 0.91 (95% CI 0.85–0.97), and people of South Asian ethnicity were 7% more likely to have been prescribed statins within the previous year: aRR 1.07 (1.04–1.11). People living in the most deprived areas were also 8% more likely to have been prescribed statins within the previous year: aRR 1.08 (1.06–1.11; Figure 4; Table S2).

Including an adjustment for the type of diabetes made little difference to the risk estimates of the key outcome measures for sex, ethnicity and social deprivation. However, patients aged 18–30 were no longer at significant risk of having ACR measured or HbA_{1c} being on target when type of diabetes was included as an adjustment (Table S3).

4 | DISCUSSION

This analysis of the management of DKD in primary care demonstrates areas of significant unmet need and inequality.

4.1 | Overall management

Over 90% of patients with DKD in this study had HbA_{1c}, BP and serum creatinine measured within the previous year. This is consistent with results from the National Diabetes Audit (NDA) on people with type 2 diabetes in England and Wales for 2018–2019.[17] Fewer patients in this study had serum cholesterol measured (83.7%) and slightly higher percentage had ACR measured (58%) than in the NDA analysis (97.8% and 49.3% respectively). However, with regard to meeting the BP target of ≤140/80 mmHg (the target used in the NDA), a difference was observed between the two analyses (75% in the NDA vs. 64.2% in this study).[17] Our results are similar to a previous analysis of NDA data from 2007 to 2008 of patients with DKD where 62% of patients were below the BP target.[18] In the present work, 58% of patients were at or below the HbA_{1c} target (58 mmol/mol) which is in contrast to previous studies where 32% of those with type 1 and 68% of those with type 2 met this glycaemic target.[18] It is interesting to note that there has been very little change in the achievement of either BP or glycaemic target in people with DKD in the UK in over a decade.

Following the introduction of financial incentives to monitor urinary markers of CKD through the Quality Outcomes Framework (QOF) in 2010/11, improvements in the rates of annual ACR testing were reported.[19] However, this particular QOF indicator was 'retired' in 2014, perhaps contributing to the overall lower rates of testing found in this study and in the recent NDA report.[20]

We also observed that older adults (81+ years) tended to have fewer care processes measured and less likely to meet the treatment targets compared to the younger age groups. This could possibly be due to difficulties in attending appointments and more relaxed treatment targets due to advancing age and frailty.

4.2 | Management disparity by age

A U-shaped relationship was seen between age and many of the key outcome measures. Compared to those aged 71–80 years, patients aged over 81 years were less likely to have had ACR, BP, HbA_{1c} and cholesterol measured BP and cholesterol on target and RAAS inhibitors and statins prescribed. Patients aged 31–40 were significantly less likely to have had any of the key outcomes measured. Patients aged 18–30 were less likely to have had ACR measured, HbA_{1c} on target or statins prescribed (although including an adjustment term for type of diabetes meant that there was no longer a significant association for ACR measurement or achievement of HbA_{1c} targets). The low numbers of patients in this age group may account for the lack of significance for some of the results.

A similar U-shaped relationship with age was found in an Italian cohort study which analysed compliance to care processes for the management of diabetes, congestive heart failure and coronary heart disease. Young adults and those over 75 had lower levels of achievement for almost all quality indicators examined than those aged 65–74 years.[21] A London study also examined the impact of age on achievement of quality indicators in diabetes and found those aged 18–44 years were less likely to have creatinine, ACR, blood pressure, cholesterol and HbA_{1c} measured compared to the older age groups.[22]

Potential reasons for those aged 65–74 years having better achievement of key outcomes include ease of access (opening hours of GP practices may mean they are more accessible to those who are retired) and better adherence to management.[21,22] In older and, potentially, more frail adults, it may be appropriate to adjust treatment targets, which could account for the reduced likelihood of being managed in accordance with guidance in those over 81 years.

4.3 | Management disparity by sex

Compared to men, women with DKD were less likely to have biochemical markers measured within the previous year, have their BP and cholesterol measurements below or at the target, or were prescribed RAAS or statins. Although some of the differences we found were small, inequalities by sex in the management of cardiovascular risk factors have been described previously. Lower prescribing rates for statins and RAAS inhibitors in women have been reported in a systematic review.[23] Moreover, results from a multi-country study showed that women with established coronary heart disease were less likely than men to achieve all treatment targets, including glucose and cholesterol. However, women were more likely to meet BP targets, which is in contrast to the current study.[24] The finding that women were less likely to be managed to treatment targets is well established in the secondary prevention of cardiovascular disease.[24,25] There are several potential reasons for these differences, including reduced prescription of medicines for secondary prevention,[26] underestimation of cardiovascular risk of women by clinicians,[27] and a lower awareness of cardiovascular risk by women[28] despite better engagement with and attendance at follow up.[29] The prior finding of reduced appropriate prescribing for women[26] is consistent with results from this study of lower prescribing of RAAS and statins. These gender disparities for management of cardiovascular disease are similar to that within the management and attainment of treatment targets for type 2 diabetes.[30]

4.4 | Management disparity by ethnicity

There were some inequalities noted between ethnic groups. Compared to white ethnicity, people of black ethnicity were less likely to be prescribed statins. Interestingly, people of South Asian ethnicity were more likely to be prescribed statins than people of white ethnicity and meet the target for serum total cholesterol <5 nmol/L. Disparities in the management of DKD have been described between ethnic groups in the UK previously. People of black ethnicity were less likely to have their BP controlled to below target in a cross-sectional study of patients in London.[31] The relatively small numbers of patients in some of the ethnicity categories may mean that our study was not powered to detect differences between groups and almost half of the study population did not have their ethnicity recorded, which means some of these findings should be interpreted in light of this. It would be imperative to improve recording of ethnicity in primary care records, as the first step, to address the disparities in the management noted in this study.

In England, Wales and Northern Ireland, QOF incentivises maintaining a register of patients with CKD stages 3–5 and diabetes registers that include aspects of diabetes care.[16] Despite this, results from the NDA show that approximately 30% of patients meeting biochemical criteria for CKD in primary care do not have a diagnostic code for CKD.[17] Lower levels of CKD diagnoses are associated with greater deprivation and being in a non-white ethnicity group. Being non-coded for CKD is also associated with poorer management[32] (but these people would not have been captured in this analysis). It may be the case that, once identified as having DKD, people from certain ethnic groups are generally managed in accordance with guidance. This would be in keeping with the results of the National Diabetes Audit.[17]

4.5 | Management disparity by deprivation

People from more deprived areas were less likely to have BP measured; less likely to have their HbA_{1c} or BP below the target, and less likely to be prescribed RAAS inhibitors but more likely to be prescribed statins compared with those from less deprived areas. Other studies have reported suboptimal diabetes control in patients of lower socio-economic status and that high social deprivation was independently associated with worse control.[33] Several reasons for this association have been suggested. Health literacy, a person's capacity to access, understand, appraise and apply health information, has been found to be lower in people of lower socio-economic status. Increasing medical complexity, reduced capacity to cope

and reduced access to care, as well as being more likely to serially miss appointments are potential factors contributing to poorer health outcomes in lower socio-economic groups.[4,34,35]

4.6 | Strengths and limitations

The cohort of more than 30,000 people with DKD comes from a large primary care dataset which has been demonstrated to be representative of the UK population.[23] Therefore, the results are generalisable to the UK primary care population. To our knowledge, this is the first UK study looking specifically at the management of DKD patients in relation to sex, social deprivation and ethnicity.

However, there are several limitations to this study. This is a cross-sectional analysis and therefore management over time was not captured. The time period of the study was prior to the COVID-19 pandemic, so this may not reflect the current state of management of these patients. The prevalence of CKD in this study is lower than would be expected in a diabetic cohort, likely due to poor coding. Almost half (47%) of patients did not have ethnicity coded and a measure of deprivation was missing for 27% and therefore some inequalities between ethnic groups and deprivation may not have been detected. The study only considered management within general practice, as we were not able to link IMRD (primary care) to secondary care datasets. Therefore, patients managed within secondary care may have been misclassified as not receiving appropriate management.

For our analysis, we employed standardised cut-offs for BP and HbA_{1c} supported by previously published guidance.[9–13,16] These may not be appropriate for patients who had had previous drug reactions, contra-indications or individualised targets (for example those with frailty or on dialysis). Since the time period considered in this study, NICE has recommended to consider starting sodium-glucose co-transporter-2 (SGLT2) inhibitors in people with DKD and proteinuria.[13] As there is evidence of inequalities in the prescription of these drugs for diabetes, it would be worth considering the prescription of SGLT2 inhibitors in future studies.[28]

5 | CONCLUSIONS

This cross-sectional analysis of a large primary care database identifies significant inequalities in the management of DKD in the UK. Improving the awareness of heart and kidney disease among people living with diabetes, engaging them more in their own care and the development of low-cost interventions targeting the improvement of management of DKD in primary care are required to mitigate the variation in care identified. Given the difficulties in addressing several risk factors in a limited healthcare setting low-cost multicomponent strategies aimed at-risk factor identification and management[36] will be central to the future of diabetes care to minimise the future risk of complications. An implementation trial, or a hybrid implementation-effectiveness trial, of multicomponent interventions based on current national guidelines may help to facilitate embedding of such interventions within primary care, with a view to improving access to treatment in at-risk patients, which is crucial in the context of an increasing prevalence of DKD nationally.

AUTHOR CONTRIBUTIONS

All authors were involved in the conception and design of this work. Katherine Phillips conducted the analysis of data. Katherine Phillips, Jonathan M. Hazlehurst, Christelle Sheppard and Indranil Dasgupta drafted the work and all authors edited, reviewed and approved the final version of the manuscript.

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CONFLICT OF INTEREST STATEMENT

ID received research grants from Sanofi and Medtronic and attended advisory board and delivered talks for GSK, Vifor, Sanofi and AstraZeneca. MAK has received speaker honoraria and/or advisory board fees from Novo Nordisk, Eli Lilly, B.I, Astrazeneca, Sanofi and Abbott Diabetes Care.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from IQVIA Medical Research Data but restrictions apply to the availability of these data, which were used under license for the current study and therefore are not publicly available. Data are, however, available from the authors upon reasonable request and with permission of IQVIA Medical Research Data.

ETHICS APPROVAL

Scientific review committee approval for this analysis was obtained from IMRD in October 2021 (SRC reference 21SRC051).

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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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