Ethnic disparities in diabetes management: a 10-year population-based repeated cross-sectional study in UK primary care†

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ABSTRACT

Background There has been little research on the impact of quality improvement initiatives on ethnic disparities in diabetes management in the UK.


Results Proportions of patients having their blood pressure (BP), cholesterol and HbA1c measured and recorded increased over the study period [from 50.6% to 87.0% (P<0.0001), 17.0% to 76.7% (P<0.0001) and 32.9% to 74.1% (P<0.0001), respectively]. However, some ethnic differences remained. Black patients with diabetes were less likely to achieve target BP (<140/80 mmHg) than the white group [2006 age-sex adjusted odds ratio (AOR), 0.65; 95% confidence interval (CI), 0.51–0.83]. South Asians were found to have better lipid target control (2006 AOR, 1.57; CI, 1.23–2.00), were more likely to receive oral hypoglycaemic agents (2006 AOR, 2.27; CI, 1.79–2.86) but less likely to receive insulin (2006 AOR, 0.54; CI, 0.42–0.69) than the white group.

Conclusions Although ethnic disparities persist in diabetes management in this study population, these are starting to be addressed, particularly in the South Asian group. All ethnic groups have benefited from recent quality initiatives in the UK.

Keywords blood pressure, cholesterol, diabetes, ethnicity, general practice, HbA1c

Introduction

Diabetes mellitus is a growing worldwide health problem, with wide disparities in health-care-related outcomes between ethnic groups. In many developed countries such as the USA, minority groups have a higher prevalence of diabetes, worse clinical outcomes and higher mortality rates than the general population. In the UK, the 2004 Health Survey for England found that people of Pakistani and Bangladeshi origin were up to five times as likely to have diabetes, and Indian people three times as likely, as white people. Furthermore, people from UK ethnic minorities with diabetes are more likely than white people to suffer from co-morbidities such as renal disease.
Reports from UK settings suggest that South Asian patients have poorer glycaemic control, and smaller improvements in blood pressure (BP) and lipid control than white Europeans. South Asian patients have also been shown to receive fewer prescriptions of anti-hypertensive (AHT) and lipid-lowering agents. However, many reports are from hospital-based settings and may not be generalizable to primary care. A study looking at the association between ethnicity and diabetes treatment and outcomes in an English general practice population found fewer South Asian patients treated with insulin compared with their white peers.

Several countries have made improving the quality of diabetes management a priority for their health systems. In the UK, considerable investment has been provided to enhance standards of clinical care for patients with diabetes. This has included the introduction of a National Service Framework (NSF) for Diabetes in 2001 and the introduction of the new contract for general practitioners (GPs) in 2004 in which ~25% of general practice income is generated from achieving key quality targets in a pay for performance scheme. Despite these initiatives, ethnic minorities continue to bear a disproportionate burden of the diabetes epidemic in the UK.

There have been few long-term studies of trends in ethnic disparities in diabetes management outside the USA. In this paper, we present findings from a population-based study that examines the quality of diabetes management in an ethnically diverse area of the UK over a 10-year period.

Methods

The Brent Clinical Information Management System (CIMS) project aims to examine the quality and outcomes of care in a diverse ethnic population. It also enables GPs to standardize data sets and exchange coded data to improve primary care services. The CIMS project extracts information from the electronic general practice records of patients in the London Borough of Brent. The data include demographic and administrative information such as age, sex and area of residence, clinical consultations, coded using Read classification system (the clinical classification system used in primary care in the UK), prescribing records, physical measurements such as BP, height and weight; and laboratory tests including HbA1c and serum cholesterol. The data collected for this study cover the period between 1997 and 2006. We obtained ethical approval to use data from the Brent CIMS project from the Brent Local Research Ethics Committee.

Setting and participants

Twenty-six out of 72 general practices in Brent volunteered to participate in the Brent CIMS project. The registered population of these 26 practices was 106,691 patients. The population of Brent is younger and has higher levels of unemployment than the rest of England. Brent is the most ethnically diverse area in the UK and non-white ethnic groups in Brent now make up the majority (55%) of the population. Over the 10-year study period, there were notable changes in the ethnic proportions in Brent, with a reduction in the white population from 55% in 1997 to 45% in 2006. This contrasts with the South Asian and black populations which increased by ~3% each during the same period.

Identification of diabetes patients

The methods used to develop our disease register for diabetes have been described previously. Briefly, all practices in the study were invited to participate. All people with type 1 and type 2 diabetes were identified from computerized general practice records by searching for Read code diagnoses of diabetes or diabetes care.

Study variables

We examined control of BP, total cholesterol and HbA1c against national targets [BP <140/80 mmHg, total cholesterol <5.0 mmol/l (193 mg/dl), HbA1c <7.0%]. The first reading per patient in each year was used in our database. We also examined processes of care and prescribing of antihypertensive, lipid lowering, oral hypoglycaemic and insulin medications in our population from 1997 to 2006. We grouped patients into four ethnic categories, the first three derived from the 2001 UK census classifications: white, black, South Asian and Other/Unknown ethnic groups. The majority of our Other/Unknown category consisted of patients with conflicting ethnicity codes in their notes, white and Black Caribbean patients, and Chinese census categories.

Data analyses

We calculated percentage achievement and age-sex adjusted odds ratios (AORs) with 95% confidence intervals (CIs) for each quality indicator in each ethnic category using the Mantel–Haenszel technique. Statistical analysis was performed using Stata 10.0 (Stata Corporation, TX, USA).

Results

We identified 4986 patients ≥18 years with diabetes in the 26 participating practices. A total of 677 (15.7%) patients
were subsequently excluded because they lacked ethnicity coding. Of the 4309 remaining patients, 2393 (55.5%) were men, 1871 (43.4%) were women and sex was not coded in 45 (1.0%). Data on age were missing for 1.1% of the patients. Of the 4309 patients, 13.7% were white British, 16.1% black, 51.2% South Asian and 18.3% belonged to Other/Unknown ethnic groups (Table 1).

**Process of care measures**

The absolute proportion of all patients with diabetes with annual BP, cholesterol and HbA1c measurements increased between 1997 and 2006 (50.6–87.0% \( P < 0.0001 \), 17.0–76.7% \( P < 0.0001 \) and 32.9–74.1% \( P < 0.0001 \), respectively (Table 2, Fig. 1). There was no evidence of difference in the recording of these processes of care between the white, black, South Asian and Other/Unknown groups during 1997. By 2006, the Other/Unknown group showed fewer recordings of all three processes of care compared with the white group (age-sex AOR, 0.59; CI, 0.47–0.75). This difference was not evident in the black and South Asian groups.

**Intermediate clinical outcomes**

The proportion of patients with diabetes meeting national treatment targets for BP, cholesterol and HbA1c control increased from 1997 to 2006 (Table 3, Fig. 2). Although the percentage of black patients achieving target BP doubled over the 10-year period, they remained less likely to achieve this target in 2006 compared with the white group in 2006 (AOR, 0.65; CI, 0.51–0.83). They were also less likely to achieve all three targets than white patients (AOR, 0.66; CI, 0.44–0.99). There was an almost 2-fold increase in the proportion of South Asian patients achieving the cholesterol target over the 10-year period. By 2006, the South Asian group was more likely to achieve this target than the white group (AOR, 1.57; CI, 1.23–2.0).

**Prescribing**

There were marked increases in prescribing lipid-lowering, oral hypoglycaemic agents (OHAs), insulin and antihypertensive medications since 1997 across all ethnic groups (Table 4). The proportion of patients in the black group receiving prescriptions for three or more antihypertensive medications increased by a factor of 2.8. The proportion of lipid-lowering medications issued in this group increased by a factor of 10. However, there was some evidence that the proportion of patients in the black group on lipid-lowering medications remained lower than that of white patients in 2006 (AOR, 0.79; CI, 0.63–1.00). Black patients were more likely

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### Table 1 Characteristics of the study participants in 2006

| Total number of patients with diabetes \( \geq 18 \) years (n = 4309) |
|-----------------|-----------------|-----------------|-----------------|-----------------|
| All n (%)       | White n (%)     | Black n (%)     | South Asian n (%) | Other/Unknown n (%) |
| 4309 (100)      | 590 (13.7)      | 694 (16.1)      | 2236 (51.2)      | 789 (18.3)      |

**Sex**

- Male 2393 (55.5)
- Female 1871 (43.4)
- Missing 45 (1.0)

**Age group (years)**

- 18–44: 849 (19.7) 80 (13.6) 107 (15.4) 516 (23.1) 146 (18.5)
- 45–54: 994 (23.1) 91 (15.4) 110 (15.9) 636 (28.4) 157 (19.9)
- 55–64: 1194 (27.7) 160 (27.1) 235 (33.9) 592 (26.5) 207 (26.2)
- 65–74: 924 (21.4) 165 (28.0) 202 (29.1) 371 (16.6) 186 (23.6)
- \( \geq 75 \): 302 (7.0) 90 (15.3) 39 (5.6) 86 (3.9) 87 (11.0)
- Missing 46 (1.1)

**Mean age (95% CI)**

- 61.3 (60.8–61.7) 63.3 (62.5–64.1) 56.7 (55.2–58.1) 59.4 (58.8–59.9) 66.3 (65.2–67.4)

\( n \), number of patients.

\( ^a \) 1.0% of patients had missing ethnicity codes for gender.

\( ^b \) 1.1% of patients had missing ethnicity codes for age.
to be on OHAs than white patients (AOR, 1.14; CI, 1.07–1.87) in 2006.

In the South Asian group, there was a 31.5% increase in the proportion of patients on three or more antihypertensive agents and a 5-fold increase in the proportion of those on lipid-lowering medication and insulin over the study period. In 2006, South Asian patients were more likely to receive lipid-lowering medication than white

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Table 2 BP, cholesterol and glycaemic control monitoring among ethnic groups in 1997 and 2006

<table>
<thead>
<tr>
<th>Year</th>
<th>Measurement</th>
<th>Ethnic group</th>
<th>White</th>
<th>Black</th>
<th>South Asian</th>
<th>Other</th>
<th>All</th>
</tr>
</thead>
<tbody>
<tr>
<td>1997</td>
<td>Blood pressure</td>
<td>White</td>
<td>71 (59.2)</td>
<td>16 (13.3)</td>
<td>39 (32.5)</td>
<td>13 (10.8)</td>
<td>156 (12.5)</td>
</tr>
<tr>
<td></td>
<td>Cholesterol</td>
<td>Black</td>
<td>89 (57.4)</td>
<td>18 (11.6)</td>
<td>52 (33.6)</td>
<td>15 (9.7)</td>
<td>183 (14.1)</td>
</tr>
<tr>
<td></td>
<td>Lipid-lowering</td>
<td>South Asian</td>
<td>0.81 (0.46–1.43)</td>
<td>0.79 (0.35–1.78)</td>
<td>0.96 (0.55–1.69)</td>
<td>0.85 (0.45–2.07)</td>
<td>0.85 (0.45–2.07)</td>
</tr>
<tr>
<td></td>
<td>HbA1c</td>
<td>Other</td>
<td>257 (50.7)</td>
<td>102 (20.1)</td>
<td>173 (34.1)</td>
<td>76 (15.0)</td>
<td>172 (34.1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>All</td>
<td>60 (37.3)</td>
<td>24 (14.9)</td>
<td>46 (28.6)</td>
<td>19 (11.8)</td>
<td>26 (5.1)</td>
</tr>
<tr>
<td>2006</td>
<td>Blood pressure</td>
<td>White</td>
<td>527 (89.3)</td>
<td>484 (82.0)</td>
<td>456 (77.3)</td>
<td>424 (71.9)</td>
<td>1481 (28.9)</td>
</tr>
<tr>
<td></td>
<td>Cholesterol</td>
<td>Black</td>
<td>617 (89.0)</td>
<td>555 (80.0)</td>
<td>539 (77.7)</td>
<td>510 (73.5)</td>
<td>1745 (34.5)</td>
</tr>
<tr>
<td></td>
<td>Lipid-lowering</td>
<td>South Asian</td>
<td>0.92 (0.64–1.31)</td>
<td>0.84 (0.63–1.12)</td>
<td>0.95 (0.73–1.25)</td>
<td>0.50 (0.38–0.64)</td>
<td>0.50 (0.38–0.64)</td>
</tr>
<tr>
<td></td>
<td>HbA1c</td>
<td>Other</td>
<td>1991 (89.0)</td>
<td>1727 (77.2)</td>
<td>1687 (75.5)</td>
<td>1564 (70.0)</td>
<td>2209 (45.0)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>All</td>
<td>613 (77.8)</td>
<td>540 (68.5)</td>
<td>508 (64.5)</td>
<td>471 (59.8)</td>
<td>1630 (32.4)</td>
</tr>
</tbody>
</table>

AOR, adjusted odds ratio; CI, confidence interval; n, number of patients.

*Age and gender adjusted odds ratios, reference group = white.

*P < 0.0001 on comparison of measurements between 1997 and 2006.
patients, more likely to be on OHAs (AOR, 2.27; CI, 1.79–2.86), but less likely to be prescribed insulin (AOR, 0.54; CI, 0.42–0.69).

Between 1997 and 2006, there was nearly a 7-fold increase in the proportion of patients in the Other/Unknown ethnic group receiving lipid-lowering medication and a 2-fold increase in the proportion receiving insulin. However, they were less likely to be prescribed insulin (AOR, 0.56; CI, 0.41–0.76) and lipid-lowering medication (AOR, 0.68; CI, 0.54–0.85) compared with white patients in 2006. In 2006, a very small proportion of each ethnic group (<10%) did not receive OHAs or insulin, unlike in 1997 when the proportions not receiving medication for diabetes were almost 50%.

### Discussion

**Main findings of the study**

We have shown major improvement in diabetes care over a 10-year period among an ethnically diverse population in North-West London. Over this time, there has been increased investment in diabetes services and publication of national guidance on the management of diabetes. However, despite this guidance and investment, <20% of individuals met all three national targets for BP, HbA1c, and cholesterol in 2006. Furthermore, improvements in care varied markedly across ethnic groups. At the end of the study period, black patients remained less likely to achieve BP control compared with the white group. In contrast, South Asian patients were found to have better lipid control, more likely to be prescribed lipid-lowering treatment and OHAs but less likely to be prescribed insulin than the white group.

**What is already known on this topic**

Our findings are consistent with previous UK and international studies which have found improvements in the recording of processes of care, prescribing and intermediate outcomes over the past decade.20–22 This trend is expected, given the large investments made in improving the management of common chronic diseases in many developed countries over this period. However, ethnic disparities in treatment and control of diabetes appear to have persisted in most countries where this has been studied.

A similar study of diabetes management conducted in Wandsworth, South-West London, involved a less ethnically diverse population. It found that variations in prescribing and achievement of treatment targets between ethnic groups evident before the introduction of the GP contract that included a major pay for performance programme were not attenuated after its launch.23 The Wandsworth study used targets set out in the Quality and Outcomes Framework (QOF) which are easier to achieve than those used in this study, and likely explains the differences found in achieving targets (around 30% meeting

### Table 3 BP, cholesterol and glycaemic control target achievement in ethnic groups in 1997 and 2006

<table>
<thead>
<tr>
<th>Year</th>
<th>Target</th>
<th>Ethnic group</th>
<th>White</th>
<th>Black</th>
<th>South Asian</th>
<th>Other</th>
<th>All</th>
</tr>
</thead>
<tbody>
<tr>
<td>1997</td>
<td>Blood pressure (&lt;140/80 mmHg)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cholesterol (&lt;5.0 mmol/l)</td>
<td>5 (31.3)</td>
<td>7 (38.9)</td>
<td>0.97 (0.17–5.43)</td>
<td>41 (43.2)</td>
<td>2.00 (0.53–7.63)</td>
<td>12 (52.2)</td>
<td>1.61 (0.35–7.51)</td>
</tr>
<tr>
<td>HbA1c (&lt;7.0%)</td>
<td>(0)</td>
<td>(3.9)</td>
<td></td>
<td>(4.1)</td>
<td>b</td>
<td></td>
<td>(2.2)</td>
</tr>
<tr>
<td>All three targets met</td>
<td>(0)</td>
<td>(0)</td>
<td>b</td>
<td>1.4 (1.4)</td>
<td>b</td>
<td></td>
<td>(0)</td>
</tr>
<tr>
<td>2006</td>
<td>Blood pressure (&lt;140/80 mmHg)</td>
<td>229 (43.5)</td>
<td>211 (34.3)</td>
<td>0.65 (0.51–0.83)</td>
<td></td>
<td>896 (45.0)</td>
<td>1.14 (0.93–1.39)</td>
</tr>
<tr>
<td>Cholesterol (&lt;5.0 mmol/l)</td>
<td>342 (72.6)</td>
<td>389 (71.9)</td>
<td>1.08 (0.81–1.44)</td>
<td></td>
<td>1340 (79.2)</td>
<td>1.57 (1.23–2.00)</td>
<td>388 (77.6)</td>
</tr>
<tr>
<td>HbA1c (&lt;7.0%)</td>
<td>185 (40.6)</td>
<td>210 (39.0)</td>
<td>0.96 (0.74–1.24)</td>
<td></td>
<td>602 (35.7)</td>
<td>0.94 (0.76–1.18)</td>
<td>198 (39.0)</td>
</tr>
<tr>
<td>All three targets met</td>
<td>67 (16.0)</td>
<td>55 (11.0)</td>
<td>0.66 (0.44–0.99)</td>
<td></td>
<td>221 (14.3)</td>
<td>1.03 (0.75–1.43)</td>
<td>64 (14.3)</td>
</tr>
</tbody>
</table>

AOR, adjusted odds ratio; CI, confidence interval; n, number of patients.

aAge and gender adjusted odds ratios, reference group = white.

bValues for 1997 are too small for ORs to be calculated.
three targets in Wandsworth compared with around 20% in Brent). Furthermore, the Wandsworth study was conducted over a much shorter time scale which may have contributed to the lack of attenuation of variation between ethnic groups before and after the introduction of the new GP contract.

Our findings are also consistent with those from national health survey data which found improvements in diabetes care in all ethnic groups between 1998 and 2004 but lower increase in the use of AHT medications in black respondents and lower increase in the use of insulin in South Asian respondents compared with white British respondents.24 In contrast to our study, an analysis of processes and outcomes in patients with diabetes in Tayside, Scotland, found similar patterns of treatment for OHAs and insulin among South Asians and non-South Asians.25 The 2001 census found 1.9% of this population belonged to ethnic minority groups.26 Thus, the small numbers of South Asian patients with diabetes and different socio-economic characteristics of the two areas may have contributed to the lack of difference found in this study.

In the USA, a 7-year time trend study looking at racial differences in patients enrolled in Medicare managed care did not show a reduction in disparities in diabetes control over time. In fact, the disparity between white and black groups increased for HbA1c levels over the study period.27 Similarly, variation in glycaemic control in ethnic minority groups persisted between the 1988–94 and 1999–2002 National Health and Nutrition Examination Surveys (NHANES), despite publication of national clinical guidelines.28–30 Some of these findings are likely to reflect poorer access to care among ethnic minorities in some US healthcare settings and the lack of universal health coverage, as well as deficiencies in the quality of care.30,31

**What this study adds**

Although there has been considerable improvement in diabetes care since 1997 in the locality studied, our study adds to the growing body of evidence highlighting persisting disparities in chronic disease management between ethnic groups. Nevertheless, we have shown there may be signs that such disparities are starting to be addressed, exemplified by much improved lipid management in the South Asian group, which has a particularly high cardiovascular risk. Since the introduction of the pay for performance in the UK GP contract, general practices have consistently achieved high target scores year on year.32 However, these data are aggregated to practice level and do not permit examination of variations in quality of care by ethnicity (and by other patient variables such as age, gender or socio-economic status). Thus, the persistence of ethnic variations

**Fig. 2** Patients with all three targets met (BP <140/80 mmHg, cholesterol <5 mmol/l and HbA1c <7%).
may be overlooked. In order to address these ethnic disparities effectively, further analysis of local longitudinal data, strategies targeting ethnic groups, and ongoing evaluation of universally applied quality initiatives such as the new GP contract and National Service Frameworks are required.

**Limitations of the study**

We analysed population-based data over a 10-year period from an ethnically diverse region of North-West London. The vast majority of people in the UK are registered with a general practice and through the UK National Health Service, all residents of the UK have access to primary healthcare and specialist care free at the point of use. Hence, no section of the population is excluded from healthcare. People with diabetes are also exempt from prescription charges for all medical conditions and therefore have no financial barriers to accessing healthcare. Currently, 26 practices are contributing data to the Brent Clinical Information Management Sharing system, with plans in place to extend data sharing to the remaining 46 practices in Brent.

As we used routine patient level clinical data, there may have been some variability in the completeness and accuracy of the information collected. People with diabetes were identified from computerized records using algorithms based upon diagnostic and diabetes care Read codes. A study looking at computer searches based on such methods showed that in the past, this may miss up to one-third of diabetes cases. However, the implementation of a new financial incentive scheme for GPs in 2004 is likely to have improved the recording of cases of diabetes in primary care. Our study spanned 10 years and so it is likely that GP recording of data was affected by computerization of GP systems. Rising levels of computerization were seen in the early 1990s, but results from a questionnaire in 1996 found evidence for under-utilization and inefficient use of GP computer systems.

As numbers in individual ethnic groups were small, we combined the ethnic categories into larger groups based on the 2001 UK census categories to give overall white, black, South Asian and Other/Unknown groups.
may have missed differences in diabetes management and outcomes between sub-groups. We were also unable to adjust for certain patient factors, such as duration of diabetes, diabetes type, presence or severity of complications, appropriateness of prescribing and patient education and treatment compliance. These factors may have been confounders in the relationship between ethnicity and diabetes management.

Authors’ contribution
C.M. and A.M. planned the study. R.B. extracted the data from CIMS and performed the statistical analyses. J.M. assisted with analyses. All authors contributed to the data interpretation. A.V. wrote the first draft of the manuscript, and all authors contributed to the revision and approved the final version. A.V., C.M. and A.M. are guarantors for the study.

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Conflict of interest: A.M. is the Associate Director (Primary Care) of the National Diabetes Research Network.

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