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Survival of patients from South Asian and Black populations starting renal replacement therapy in England and Wales

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Abstract

Background. South Asian and Black ethnic minorities in the UK have higher rates of acceptance onto renal replacement therapy (RRT) than Caucasians. Registry studies in the USA and Canada show better survival; there are few data in the UK.

Methods. Renal Association UK Renal Registry data were used to compare the characteristics and survival of patients starting RRT from both groups with those of Caucasians, using incident cases accepted between 1997 and 2006. Survival was analysed by multivariate Cox's proportional hazards regression split by haemodialysis and peritoneal dialysis (PD) due to non-proportionality, and without censoring at transplantation.

Results. A total of 2495 (8.2%) were South Asian and 1218 (4.0%) were Black. They were younger and had more diabetic nephropathy. The age-adjusted prevalence of vascular co-morbidity was higher in South Asians and lower in Blacks; other co-morbidities were generally common in Caucasians. Late referral did not differ. They were less likely to receive a transplant or to start PD. South Asians and Blacks had significantly better survival than Caucasians both from RRT start to Day 90 and after Day 90, and for those on HD or PD at Day 90. Fully adjusted hazard ratios after Day 90 on haemodialysis were 0.70 (0.55–0.89) for South Asians and 0.56 (0.41–0.75) for Blacks.

Conclusion. South Asian and Black minorities have better survival on dialysis. An understanding of the mechanisms may provide general insights for all patients on RRT.

Keywords: ethnic minorities; haemodialysis; peritoneal dialysis; survival

Introduction

Rates of starting renal replacement therapy (RRT) in the UK are increased 4-fold or more in Black and South Asian populations compared to Caucasians [1]. In the UK, these populations originate from sub-Saharan Africa and the Caribbean, and from the Indian sub-continent, respectively. Although they comprise only 6% of the UK population, patients from these ethnic groups make up a significant percentage of those starting RRT [2]. The increased acceptance rates are also found in Blacks in the USA, and in other indigenous and migrant communities [3–5]. In the UK, these populations are younger than Caucasians; ageing will increase demand for RRT if prevailing age-specific rates of established renal failure (ERF) apply [6]. Patient survival will also affect future demand for RRT. Blacks in the USA have better survival on RRT than Caucasians, despite multiple adverse factors [7,8]. Blacks and South Asians in Canada have been shown to have better survival on RRT [9] and patients from diverse countries who migrated to the Netherlands had better survival than native Dutch patients [10].

Ethnic minorities probably experience inequities of healthcare [11]. For RRT specifically, some have found that South Asians are referred later to nephrologists than Caucasians [12]. In the UK, South Asians and Blacks have a higher mortality from cerebrovascular disease [13] and South Asians a higher mortality from coronary heart disease (CHD). Few data are available on survival on RRT of these ethnic minorities in the UK, and referral and baseline morbidity may influence survival on RRT.

This paper presents a prospective cohort analysis of Renal Association UK Renal Registry data to compare the characteristics and survival of incident South Asian and Black patients starting RRT with Caucasians.

Subjects and methods

The Renal Association UK Renal Registry (UKRR) data collection methods are described elsewhere [14]. In brief, a pre-defined dataset is sent electronically to the Registry from participating renal units. Data items include socio-demographic and clinical data, time of referral, modes of treatment, date of death and baseline and 3 monthly blood pressure, biochemical and haematology test results.

Case definition and case ascertainment

All incident patients starting RRT between 1 January 1997 and 31 December 2006 were included if they were treated in a renal unit in England and Wales reporting to the Registry and ethnicity was derivable.

Ethnicity ascription

We used four methods to ascertain ethnicity:

(i) Primary use of recording of ethnicity submitted by renal units to UK Renal Registry, or to UK Transplant for patients who were put on the transplant waiting list. Some renal units upload ethnicity coding electronically from the hospital patient administration systems, which use national coding systems based on patient self-reported ethnicity [15]. For the remaining renal units, ethnic coding is by renal unit ascription rather than by patient self-assessment.

(ii) Application of SANGRA software to detect South Asian surnames. This is a computer algorithm that identifies South Asian origin by surname recognition. It has a sensitivity of 89–96% and specificity 94–98% in non-renal validation studies [16]. Comparison of SANGRA with UK Renal Registry ethnicity recording found similar values for identifying South Asians.

(iii) For the remainder of missing cases, we determined their 2001 Census super output area using postcode of residence; if this was an area with $\geq$ 98% Caucasian ethnicity, we assumed these cases were Caucasian.

Table 1. Source of ethnicity data for all new patients accepted onto renal replacement therapy in England and Wales 1997–2006

Data source	Caucasian	South Asian	Black	Other	Total
UK Renal Registry	21 890	2150	1187	641	25 868
UK Transplant	1068	86	31	24	1209
Sangra		261			261
Census data	3906	0			3906
Total	26 864	2497	1218	665	31 244

We grouped ethnicity as Caucasian Black = Black African, Black Caribbean, Black other, Black mixed; South Asian = people originating from the Indian sub-continent including Pakistan, India and or Bangladesh and South Asian mixed. (Numbers of patients in the Chinese and Other groups were small so they were removed.) As population coverage was not complete, ethnic specific acceptance rates were not calculated.

The numbers of renal units contributing data increased from 9 in 1997 to 34 in 2001 and to 52 in 2006, varying in location, size and teaching hospital status.

Of the 33 677 patients who were accepted onto RRT in the period 1997–2006, 31 244 (92.7%) had an ethnicity ascribed (Table 1) most by the UK Renal Registry 25 868/31 244 (92.8%), SANGRA added 261 South Asians and the Census method identified nearly 4000 Caucasians. After excluding the 'other' ethnic group and a few patients with no mode timeline, there were 30 561 patients included, 26 848 Caucasian (87.9%), 2495 South Asians (8.2%) and 1218 Blacks (4%).

Social deprivation. For patients residing in England, each patient's postcode of residence was matched to the 2001 UK Census output area file. The Townsend Index deprivation score was derived for each Census output area; this was based on the percentages of unemployed, and percentages of households that had no car, were overcrowded and were not owner occupier [17]. The postcodes were divided into five equal-sized population quintiles according to the level of deprivation of the area they were in, a high Townsend score indicating more deprivation.

Co-morbidity is assigned by the renal unit staff using a standard UK Renal Registry classification. As these data items were not complete, we used all the available data from all renal units and as sensitivity only used data on comorbidity from the 19 renal units with $\geq$80% completeness of co-morbidity data. Primary renal disease (PRD) was modelled as Diabetic nephropathy vs other causes.

Smoking has been included for simplicity under comorbidity.

Glomerular filtration rate (eGFR) was estimated for all patients at start of RRT using the modified MDRD equation with appropriate adjustment for the Black population [18]. No correction was made for South Asians.

Late referral was defined as referral to the renal unit $<$90 days before RRT start; referral $\leq$1 year was also examined. Data on referral were only included for patients from units with reasonably complete data ($\geq$80%).

Follow-up for survival was up to 31st December 2006.

Statistical analysis

Statistical analyses used standard tests for comparing groups (chi-squared and Fisher's exact test, ANOVA, Wilcoxon rank sums, Kruskal–Wallis). Log transformation was used where appropriate for skewed distributions.

Logistic regression was used to assess the effect of ethnicity on dichotomous baseline variables such as late referral, adjusting for age at start of RRT and gender.

For survival, the primary outcome was all-cause mortality after Day 90. Follow-up time was divided before and after the first 90 days as the first 90-day period is a clinically distinct time with a higher mortality rate, while post-day 90 indicates chronic RRT.

Cox's proportional hazards regression model was used to explore the independent effect of ethnicity on survival. The assumption of

proportionality was assessed by graphical methods (Nelson–Aalen plots) and the final models by Schoenfield residuals. The patients were censored at the time they were last known to be alive.

In all analyses, Caucasians were taken as the reference category. The main survival model was run on the full patient set to look at the effect of ethnic group on survival adjusting for confounders such as age (entered as a linear term), gender, type of primary renal disease (diabetes versus no diabetes), mode of treatment, social deprivation (in quintiles), year of start and comorbidity.

The effect of restricting comorbidity to the subset of patients from units with more complete data (>80% complete) was investigated.

We fitted our main models with no censoring at transplantation (as transplant patients tend to be the younger fitter patients: such censoring would favour survival in ethnic groups as Caucasians have higher transplantation rates) and we fitted transplantation as a time-dependent variable.

We investigated whether our ascription of ethnicity affected the parameters by repeating the modelling just with the subset with UK Renal Registry coding.

Interactions of ethnicity with age, gender, PRD and deprivation were assessed in the model.

There was non-proportionality for diabetic vs non diabetc PRD, which disappeared after fitting an age PRD interaction.

Kaplan Meier graphs and the log rank test were used to describe survival by ethnic group, separately for PRD as diabetes or not as there was a significant age PRD interaction.

Robust standard errors were used to account for clustering in renal units.

All statistical analyses were performed using the SAS software.

In initial modelling, significant non-proportionality was detected by mode of treatment at Day 90 and so we divided the model into HD and PD at Day 90. As the number of patients on HD was much larger, we present the HD data and comment on any differences for PD.

Results

The cohort comprised 30 561 patients; 87.9% ($n = 26848$) were Caucasian, 8.2% ($n = 2495$) South Asian and 4.0% ($n = 1218$) Black. The median proportion of new patients who were South Asian or Black in the 52 renal units in 2006 was 5.2% (IQR 13.7%)

The baseline characteristics are shown in Table 2. Both ethnic minority groups were significantly younger than Caucasians. There were more men than women amongst South Asians and Caucasians at start of RRT; in Blacks, there was almost an even mix. Both ethnic minority groups had a substantially higher percentage of patients living in more socially deprived areas than Caucasians.

The prevalence of diabetic nephropathy varied by age with similar prevalence in all groups under 54 but a much higher prevalence in both ethnic minorities in those aged 55 and older than that in Caucasians.

In the subsample from units with high data completeness, there was no evidence that late referral (both <3 months and <12 months) was increased in ethnic minorities; in fact, there was more late referral in older Caucasians. After adjusting for age, gender and diabetes as PRD, the odds ratios for the ethnic minorities compared to Caucasians were all non-significant.

There was a strong interaction between age and the ethnic group for kidney function at start of RRT, with South Asians and Blacks having a higher eGFR than Caucasians at older ages, though this was not found after adjusting for PRD. Starting haemoglobin was lower in young Blacks when compared to others.

Both ethnic minority groups had very high levels of diabetes, which include non-diabetic nephropathy (Table 3). Compared to Caucasians, there was a lower prevalence of vascular disease in Blacks, and a higher prevalence in South Asians. The prevalence of smoking, COPD and malignancy was lower in the ethnic minorities than that in Caucasians.

There were differences in modality of treatment by ethnic group (Table 4). The proportion of patients transplanted was small even at 1 year. The percentage on peritoneal dialysis was lower in South Asians and Blacks. After adjusting for age at start, gender and PRD, the odds of starting PD were still reduced in South Asians [0.70 (0.63–0.78)] and Blacks [0.69 (0.60–0.79)] when compared to Caucasians.

Caucasians had significantly higher haemoglobin (in the fourth quarter) than both ethnic minority groups; haemodialysis adequacy as measured by urea reduction ratio (URR) was highest in South Asians (Table 5). PTH levels were significantly increased in both Blacks and South Asians (though there was significant missing data on PTH); calcium levels lower in both and serum phosphate levels were lowest in Blacks. Systolic and diastolic BP were highest in Blacks.

Mortality

The median duration of follow-up overall was 1.8 years (IQR 3.0 years) with a total of 75 188 patient years (pyrs), 65 574 pyrs in Caucasians, 6387 pyrs in South Asians and 3227 pyrs in Blacks.

Survival from start RRT to Day 90

There were 2473 deaths in the first 90 days, 2324 in Caucasians, 117 in South Asians and 32 in Blacks.

Survival was better in the two ethnic minority groups in the first 90 days. Adjusted for age, gender, PRD, deprivation, year of start and initial mode, based on $n = 26\,606$ patients, the hazard ratios (HR) were 0.70 (95% CI: 0.54–0.90) in South Asians and 0.51 (0.35–0.75) in Blacks. Adjustment for comorbidity in a subset of $n = 5760$ patients from units with >80% data completeness led to slight attenuation in point estimates and loss of statistical significance.

Survival from Day 90 onwards

After Day 90, a further 9649 deaths occurred, 8867 in Caucasians, 585 in South Asians and 197 in Blacks.

There were 17 578 patients alive at Day 90 on haemodialysis: 15 188 Caucasians, 1604 South Asians and 786 Blacks. The ethnic differences in their socio-demographic (age, sex, deprivation) and clinical characteristics were similar to the whole RRT cohort as in Table 2 (data not shown).

Table 6 shows crude and adjusted hazard ratios for those on HD at Day 90 for the effect of the ethnic group compared to Caucasians. In the unadjusted model, Blacks had a considerable survival advantage; this was present to a lesser degree also in South Asians. Kaplan–Meier survival curves are shown in Figures 1 and 2 by whether PRD was diabetes or not. Log rank tests are highly significant overall in both groups.

Table 2. Baseline socio-demographic and clinical characteristics by ethnic group ($n = 30\,561$)

	Caucasian ($N = 26\,848$)	South Asian ($N = 2495$)	Black ($N = 1218$)	
Age				
Median (IQR)	65.4 (51.4–74.5)	58.9 (47.0–67.8)	53.7 (39.5–67.5)	
Distribution (%)				
<45	17.2	21.9	36.8	
45–64	32.8	44.4	32.1	
65+	51.0	33.8	31.1	$P < 0.001$
Gender	$N = 24\,648$	$N = 2495$	$N = 1218$	
% male	62.5	60.4	54.6	$P < 0.001$
Townsend deprivation index				
% in population quintiles	$N = 26\,144$	$N = 2432$	$N = 1183$	
1 (least deprived)	19.4	6.5	4.2	
2	21.0	7.7	4.9	
3	20.1	13.7	9.3	
4	20.9	29.9	21.8	$P < 0.0001$
5 (most deprived)	18.6	42.3	59.8	
Primary renal disease %	$N = 26\,848$	$N = 2495$	$N = 1218$	
Diabetes	16.3	34.1	29.2	
Hypertension	5.1	4.6	12.8	
Renovascular	7.5	2.6	1.6	
Glomerulonephritis	10.2	7.6	9.4	
Polycystic kidney (PCKD)	7.1	1.8	3.5	
Pyelonephritis	8.0	5.7	3.4	$P < 0.001$
Uncertain	24.0	26.5	16.5	
Other & missing	21.9	17.0	23.5	
Year of start				
1997–2000	22.4	19.2	15.5	
2001–2003	33.4	29.3	30.0	$P < 0.0001$
2004–2006	44.2	51.5	54.5	
% Late referred				
Under 3 months before RRT	$N = 6622$	$N = 479$	$N = 138$	
All	27.8	23.6	22.5	$P = 0.060$
Age <65	23.5	24.4	24.4	$P = 0.93$
Age ≥ 65	32.0	22.1	22.1	$P = 0.0046$
% referred under 1 year before start of RRT				
All	46.5	41.8	42.0	$P = 0.086$
Age < 65	42.3	41.7	43.7	$P = 0.94$
Age ≥ 65	50.1	41.9	39.2	$P = 0.025$
eGFR at start of RRT median (IQR)[a]	$N = 17\,535$	$N = 1551$	$N = 606$	
All	7.7 (5.9–10.3)	7.6 (5.7–10.9)	7.8 (5.9–10.7)	$P = 0.008$
Age < 65	7.4 (5.7–9.8)	7.2 (5.4–10.3)	7.4 (5.5–10.1)	$P = 0.33$
Age ≥ 65	8.0 (6.1–10.7)	8.5 (6.6–12.2)	8.9 (6.7–11.6)	$P < 0.0001$
Haemoglobin g/dL at start of mean (SD)[b]	$N = 8531$	$N = 1431$	$N = 572$	
All	10.0 (1.7)	9.9 (1.7)	9.6 (1.7)	$P < 0.0001$
Age < 65	10.0 (1.8)	9.9 (1.7)	9.4 (1.7)	$P < 0.0001$
Age ≥ 65	10.0 (1.6)	10.1 (1.7)	9.8 (1.7)	$P = 0.10$

Numbers show patients with data for each variable; if not otherwise indicated numbers are percentages of column totals.
[a]Log eGFR, significant interaction between age-groups and ethnic group, $P = 0.0001$.
[b]Haemoglobin, significant interaction between age and ethnic group, $P = 0.0001$.

Adjustment for age and sex attenuated the advantage in both, reflecting their younger age; the converse was true of adding PRD given the higher prevalence of diabetic nephropathy in both ethnic groups. There was a significant interaction between age and diabetic PRD, such that the multiplicative effect of diabetes was attenuated in older ages. Deprivation and start year had little effect on the ethnic hazard ratios. Adjusting for transplantation as a time-dependent variable slightly improved the ethnic minority advantage, as expected given their lower transplant rates.

Adjustment for comorbidity attenuated the advantage in both ethnic groups though it remained significant, and greatest in Blacks. A similar pattern was found when restricting analysis to patients with comorbidity from units with >80% completeness for comorbidity ($n = 3669$).

There were 8129 patients who started PD. A similar pattern of survival advantage for both ethnic groups compared to Caucasians was found, though point estimates were slightly less than those for HD (data not shown). In a fully adjusted model including available comorbidity data, the hazard ratios on PD were 0.79 (0.60–1.04) in South Asians and 0.62 (0.44–0.86) in Blacks when compared to Caucasians on PD.

Our findings were very similar for both HD and PD in the subsets with ethnicity data ascribed by the UK Renal Registry.

Table 3. Co-morbidity at start of RRT by ethnic group

	Caucasian ($n = 5862$)	South Asians ($n = 581$)	Blacks ($n = 288$)	*P*-value (chi-square)	Odds ratio (95% CI) for South Asians versus Whites[a]	Odds ratio (95% CI) for Blacks versus Whites[a]
Coronary heart disease (CHD)	26.2	25.7	9.9	$P < 0.0001$	1.34 (1.09–1.65)	0.46 (0.31–0.69)
Diabetes (not primary renal disease)	8.2	11.9	5.2	$P = 0.0016$	1.86 (1.41–2.46)	1.72 (1.34–2.19)
Any diabetes	25.1	49.6	35.7	$P < 0.0001$	3.00 (2.54–3.55)	1.72 (1.34–2.19)
Any vascular disease	37.7	36.0	21.9	$P < 0.001$	1.26 (1.04–1.52)	0.70 (0.52–0.95)
Chronic obstructive pulmonary disease (COPD)	8.3	4.7	2.1	$P < 0.001$	0.67 (0.45–1.00)	0.32 (0.14–0.74)
Current smoker[b]	18.8	8.6	8.4	$P < 0.0001$	0.39 (0.28–0.53)	0.35 (0.23–0.55)
Any malignancy	13.9	4.0	4.5	$P < 0.0001$	0.32 (0.21–0.50)	0.42 (0.24–0.75)
Chronic liver disease	2.3	4.1	4.2	$P = 0.0058$	1.83 (1.17–2.86)	1.84 (1.00–3.38)

If not otherwise indicated, numbers are percentage breakdown of column totals. Data are from units with >80% completeness for comorbidity.
[a]Adjusted for age gender.
[b]Included under comorbidity for simplicity.

Table 4. Total number of patients and their percentage on different modes of treatment at start of RRT, 3 months and 12 months by ethnicity[a]

Time	Mode	Caucasian	South Asians	Black	
Start RRT		$N = 26\,815$	$N = 2493$	$N = 1218$	
	Haemodialysis	71.2	75.2	74.5	$P < 0.0001$
	Peritoneal dialysis	26.3	22.2	23.2	
	Transplant	2.5	2.6	2.3	
Day 90		$N = 23\,337$	$N = 2273$	$N = 1118$	
	Haemodialysis	65.4	71.1	70.8	$P < 0.0001$
	Peritoneal dialysis	31.1	26.3	26.8	
	Transplant	3.5	2.6	2.4	
1 year		$N = 17\,905$	$N = 1771$	$N = 904$	
	Haemodialysis	61.6	68.5	69.2	$P < 0.0001$
	Peritoneal dialysis	29.6	26.0	26.4	
	Transplant	8.8	5.5	4.4	

If not otherwise indicated, numbers are percentages of column totals.
[a]Of those on treatment and still registered with UKRR at each time period.

Table 5. Treatment-related intermediate outcomes in dialysis patients—results in the fourth quarter after starting RRT

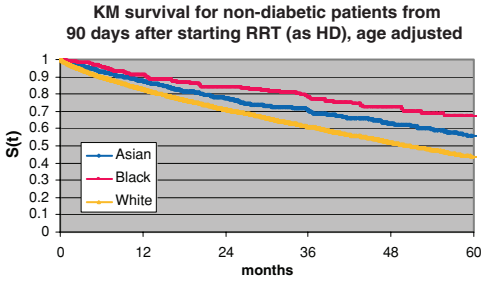
	Caucasian	South Asian	Black	*P*-value
Haemoglobin g/dl				
Mean (SD)	11.6 (1.7)	11.4 (1.6)	11.2 (1.8)	$P < 0.0001$
N	14214	1377	708	
Phosphate mmol/l				
Mean (SD)	1.7 (0.6)	1.6 (0.6)	1.5 (0.5)	$P < 0.0001$
N	14296	1387	702	
Calcium mmol/l				
Mean (SD)	2.42 (0.20)	2.36 (0.21)	2.34 (0.19)	
N	14331	1389	708	$P \leq 0.001$
PTH pmol/l				
Median (IQR)	15.3 (6.7–31.8)	19.3 (7.4–41.2)	31.0 (11.0–57.6)	$P \leq 0.001$
N	8907	856	416	
Urea reduction ratio[a] %				
Mean (SD)	67.2 (9.0)	69.2 (9.0)	65.9 (8.4)	$P < 0.0001$
N	7992	821	372	
Systolic BP mmHg[b]				
Mean (SD)	136 (25)	138 (27)	142 (28)	$P = 0.0014$
N	7781	715	335	
Diastolic BP mmHg[b]				
Mean (SD)	74 (14)	76 (14)	78 (15)	$P < 0.0001$
N	7780	715	335	

[a]URR in haemodialysis only.
[b]Post-dialysis in HD patients.

Table 6. Crude and adjusted effects of ethnicity on long-term survival after 90 days of patients on haemodialysis compared to Caucasians

		South Asians			Black		
	N	HR	95% CI	*P*-value	HR	95% CI	*P*-value
Unadjusted	17 578	0.62	0.55–0.70	<0.0001	0.40	0.33–0.47	<0.0001
Age sex	17 578	0.79	0.69–0.91	0.001	0.53	0.46–0.61	<0.0001
Age sex, PRD, PRD* age[1], deprivation, year of start	16 027	0.68	0.59–0.78	<0.0001	0.48	0.41–0.56	<0.0001
Age sex, PRD, PRD* age[1], deprivation, year of start, transplant as time dependent	16 027	0.67	0.59–0.77	<0.0001	0.46	0.39–0.54	<0.0001
Age sex, PRD, PRD* age[1], deprivation, year of start, transplant as time dependent, comorbidity data available but not fitted	6229	0.65	0.51–0.84	0.0009	0.51	0.37–0.69	<0.0001
Age sex, PRD, PRD* age[1], deprivation, year of start, transplant as time dependent, comorbidity in model	6229	0.70	0.55–0.89	0.003	0.56	0.41–0.75	0.0001

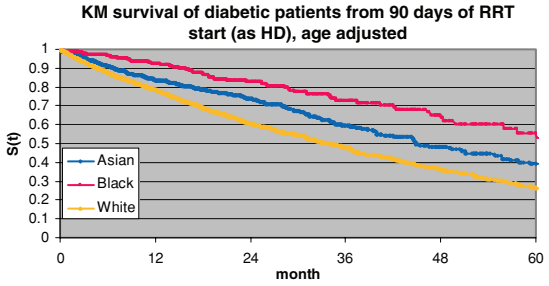
[1]Adjusted for interaction between PRD and age.
PRD = primary renal disease (Diabetic nephropathy vs other causes).



Numbers alive over time by ethnic group

Month	0	6	12	24	36	48	60
South Asian	921	788	672	466	322	218	156
Black	455	391	321	216	150	88	48
White	11758	9597	7924	5413	3601	2299	1384
Total	13134	10776	8917	6095	4073	2605	1588

Fig. 1. Kaplan–Meier (KM) plots of age-adjusted survival on haemodialysis after Day 90 by ethnic group for patients without diabetes as primary renal disease.



Numbers alive over time by ethnic group

Month	0	6	12	24	36	48	60
South Asian	573	479	393	257	150	86	47
Black	258	228	185	117	63	31	10
White	2456	1976	1568	1004	599	332	169
Total	3287	2683	2146	1378	812	449	226

Fig. 2. Kaplan–Meier (KM) plots of age-adjusted survival on haemodialysis after Day 90 by ethnic group for patients with diabetes as primary renal disease.

Discussion

In England and Wales, the use of national Registry data showed striking differences in the characteristics and better survival of South Asians and Blacks on dialysis compared to Caucasians. The age of patients starting RRT was significantly lower in both ethnic minorities reflecting their population age structure [2]. The male/female ratio was blunted in Blacks suggesting a high rate of ERF in Black females, as seen in the USA [20]. The cause of ERF varied, with a much higher proportion of diabetic ERF seen in South Asians and Blacks, especially over age 55 and above. Hypertensive renal disease was commonest in Blacks and an 'unknown cause' in South Asians [1,21,22] though hypertension maybe over-ascribed in Blacks [23]. Late referral was not different in the ethnic minority group contrary to a previous study from a single region in the UK [12]. There was also no evidence that these ethnic groups started RRT later than Caucasians as indicated by eGFR.

Both ethnic minority groups were more likely to be treated by HD than PD, in contrast to a Canadian study that found an increased likelihood of PD for South Asians [24]. The reasons for these inter-country differences are not clear. There were lower transplant rates in both ethnic minorities despite their over-representation on transplant waiting lists [14]. The reasons are complex and mostly studied in South Asians, but include blood and tissue-type group differences, and low rates of retrieval and donation [25,26]. In the USA, access to kidney transplantation is also reduced in Blacks, due not only to reduced chances of transplantation for those on the waiting list, but also to reduced patient interest in transplantation and less clinical work-up [7,27–29]. This does not seem to apply in the UK. Substantial efforts are being made to target ethnic minorities in the UK to improve donation rates. Survival of transplants seems to be similar to Caucasians for South Asians in the UK and for Black Europeans in France, though poorer for US Blacks [30–32]. To take account of selection bias arising from differing ethnic transplant rates, our main survival analysis was performed without censoring at transplantation.

Blacks had the best survival on haemodialysis with nearly 50% lower risk of mortality after Day 90; South Asians had a 30% mortality reduction. Potential confounders were taken into account; co-morbidity data were incomplete but the findings were unchanged when restricting analysis to renal units with a high level of completeness. We also modelled transplantation as a time-dependent variable; this had a small effect of improving ethnic survival that would fit with the lower rates of transplantation in ethnic minorities. Deprivation *per se* had little effect on survival as has been shown previously using UK Renal Registry data [33].

There are no other substantive comparable UK data for Blacks. Extensive data in US Blacks have shown better survival on RRT associated in particular with reduced cardiovascular mortality, despite a higher mortality in the general population and a higher diabetic ERF prevalence, a risk factor for poor survival on RRT [7,34,35] and many clinical parameters of RRT being poorer [7,36]. US Blacks on RRT have been shown to have a higher proportion referred late, a low eGFR at start of RRT [37,38], a lower haemoglobin on RRT despite higher EPO doses, higher BP and lower KT/V [39] though the relationship between KT/V and survival may be weaker in Blacks [38]. In the Toronto Regional Dialysis Registry study of almost 4000 patients, 319 were Black, and they had improved survival [9]. The explanation is uncertain. Blacks have a lower prevalence of CHD at start of RRT [40,41] and there is a lower incidence of new myocardial infarction and of new or recurrent vascular events on RRT (even after adjusting for traditional CVD risk factors and dialysis-associated factors) [42,43]. Why Blacks on RRT have such reduced vascular risk is uncertain but may partly relate to biological factors such as higher HDL and to a lower smoking prevalence [44]. There might also be better adaptation to dialysis as evidenced by higher quality of life, better perceived social support and lower withdrawal rates in Blacks [39,45–47]. We had no data on quality of life or social support. The causes of death data were incomplete (50% missing), so we could not reliably assess dialysis stopping as a marker of adaptation; there was no difference in withdrawal rates between natives and immigrants in the Dutch study [10]. The only favourable treatment parameter found was a lower phosphate [48]. Recently, it has been shown in a study in the USA that treatment with activated vitamin D, which is more widely prescribed in Blacks because of their higher PTH, may explain their improved survival; this requires further confirmation [49]. PTH levels were highest in Blacks in our study (and calcium and phosphate low), but we had no vitamin D data. Another explanation might be selection bias in starting RRT such that only fitter patients from ethnic minorities were accepted [50]. This has been shown for younger Blacks in the USA though it was largely explained by socio-economic circumstances and healthcare access. No such data are available in the UK. Although we adjusted for a range of baseline prognostic factors, one would have to speculate that there were unmeasured factors associated with better prognosis in the ethnic minorities that we were not able to take into account. Moreover, any selection bias would have to be despite higher acceptance rates onto RRT in ethnic minorities.

Between-country comparisons need to consider differences in the funding and organization of services. In the UK, healthcare in this tax funded system is free and for dialysis patients their renal units deal with most problems including their primary care needs. This would reduce the impact of differences in the quality of primary care for different ethnic groups.

There are less data on survival in South Asians on RRT. Two Canadian Registry studies have found better survival. In Toronto, the relative risk of death was 1.36 (CI 1.07–1.73) for Caucasians compared with South Asians [9]. In Alberta the hazard ratio for South Asians was 0.63 (0.53–0.75) compared to Caucasians [51]. Previous UK data were based on smaller numbers and a limited number of units [52]. Prasad analysed 465 new patients (including 143 South Asians) starting HD in a London unit who survived the first 90 days, with censoring for transplants and PD [53]. There was no significant difference in 3-year survival once adjustment was made for age and dialysis adequacy [odds ratio 1.2 (0.6–2.3)]. In contrast, a study in four UK renal units of incident HD patients ($n = 761$ patients of which 115 were South Asian) showed that over 8-year follow-up South Asian mortality risk was lower, with the reported hazard ratio 0.61 (0.45–0.81), similar to our data [54]. The explanation is again unclear. The only dialysis parameter we measured that was significantly better in South Asians was adequacy. Prasad also showed that South Asians had the best Kt/V profile on HD [53]. Co-morbidity and risk profile differences may explain some of the survival benefits though the CHD prevalence was higher and there maybe residual confounding. As with Blacks, fruitful lines of further investigation in south Asians could include the study of psychosocial factors and medication with activated Vitamin D.

A strength of this study was the large national cohort of incident RRT patients from a diverse range of renal units. The measure of ethnicity was a simple but crude proxy for genetic, cultural and socio-economic diversity [55]. We supplemented the registry recording of ethnicity to improve power and generalizability across renal units. The Sangra method of classifying South Asians by surname has high accuracy but there will be some misclassification and the ascription of all patients living in predominantly Caucasian areas will also misclassify some patients. However, restricting analysis to UK Renal Registry ethnicity coding gave similar results. The limitations were lack of data on vascular access, nutritional status, inflammatory and cardiac biomarkers, medication, psychosocial factors, quality of life and incident comorbidity on RRT. The follow-up was relatively short, that needs to be extended to see if the survival benefit persists.

There is a paradox in that ethnic minority groups who have an increased risk of a high ERF prevalence of diabetic ERF and more health inequalities have better adjusted survival on RRT. This will impact on the prevalence of RRT especially in areas with large ethnic minority populations, disproportionately on dialysis provision given the limited supply of transplants for these ethnic groups. Further studies are needed to elucidate the factors associated with the improved survival, which may provide general insights applicable to other groups.

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Conflict of interest statement. None declared.

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Percutaneous dilation of the radial artery in nonmaturing autogenous radial-cephalic fistulas for haemodialysis

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Abstract

Background. Delayed maturation of radial-cephalic fistulas can be due to lesions of the radial artery that are amenable to percutaneous dilation.
Methods. Over a period of 7 years, 74 consecutive patients underwent angiography of an immature fistula that showed either stenosis or an insufficient enlargement of the radial artery that was treated by percutaneous dilation. Success, complications and secondary interventions were recorded according to consensus definitions. Patency following angioplasty was estimated with the Kaplan–Meier technique.
Results. The mean patient age was 70 years, 44% were women, 69% had diabetes, 23% were smokers, 76% had hypertension, 64% had coronary disease and 46% had peripheral artery occlusive disease. Concomitant venous stenosis was diagnosed in 53% of patients. Arterial stenosis was >5 cm long in 53 cases. Technical success was achieved in 73/74 cases following angioplasty. All but two fistulas were then successfully used for dialysis. Dilation-induced rupture occurred in 13 cases (17%) but required only two stent placements. Five cases (7%) of hand ischaemia within 1 month of dilation were treated successfully by ligation of the distal artery. Primary patency rates at 12 and 24 months were significantly better for pure arterial lesions, with 65% and 61% compared to 42% and 35% in cases of concomitant venous stenosis ($P < 0.04$). The secondary patency rates were 96% and 94% at 1 and 2 years, respectively.
Conclusion. Dilation of the radial artery yields higher patency rates than for veins. Surgeons might therefore be less demanding about the initial quality of the radial artery prior to creation of radial-cephalic fistulas.

Keywords: maturation; percutaneous transluminal angioplasty; stenosis; vascular access

Introduction

When the time arrives for creation of an arteriovenous access for dialysis, current recommendations indicate that native veins should be preferred over prosthetic material and that the arteriovenous communication should be performed as peripherally as possible [1–3]. The construction of a functional radial-cephalic fistula (RCF) can be challenging, and high initial failure rates have been reported [4–6]. The most frequent limitation to the creation of successful autogenous fistulas in the forearm is the poor quality of veins that have often been damaged by repeated punctures or cannulations. However, incident dialysis patients may present with preserved veins but poor quality arteries. This