Chapter 20: Analysis of Characteristics and Survival of Incident Patients from Different Ethnic Groups starting Renal Replacement Therapy

Summary

- Within the cohort of 6599 incident patients starting RRT with a completed ethnic code in 27 units with good data returns, 87% were White, 7% Indo-Asian, 2% African-Caribbean, 0.5% Chinese and 0.9% Other.

- There was considerable variation in ethnicity breakdown between units; at the Hammersmith/Charing Cross only 44% of incident were White compared with 100% at others.

- Whilst Indo-Asian and White patients had predominantly males on RRT (58% and 62% respectively), far more women were represented in the African-Caribbean cohort (52% female, $p < 0.05$).

- Indo-Asian and African-Caribbean patients were significantly younger than Whites (median ages 59, 60 and 64.8 respectively, $p < 0.001$).

- Fewer Whites have diabetes as their underlying primary renal disease (16%) compared to Indo-Asians (33%) and African-Caribbeans (31%).

- Whites tended to have a lower eGFR at start of RRT compared with the ethnic minority groups. In all groups, irrespective of treatment modality, older patients tended to have a higher eGFR at start.

- Patients on PD had higher haemoglobin levels at start compared to HD patients in all ethnic groups. African-Caribbeans had the lowest Hb levels of all the ethnic groups.

- Indo-Asians were significantly more likely to be referred to nephrology services a year or more prior to starting RRT (53%, $p < 0.05$) compared with African-Caribbeans (38%) and Whites (45%). African-Caribbeans were the most likely to be referred late (44%).

- Ethnicity had no impact on the choice of modality at day 90 of treatment.

- Co-morbidity differences between the ethnic groups revealed that significantly more Whites were smokers at the start of RRT ($p < 0.001$), and probably as a consequence were more likely to have COPD ($p = 0.004$). Malignancy was also significantly more common in Whites ($p < 0.001$).

- Diabetes present as co-morbidity or the underlying cause of a patient's renal disease was significantly more common in Indo-Asians and African-Caribbeans than Whites ($p < 0.001$).

- Significantly more ethnic minority ERF patients had higher social deprivation scores compared to Whites ($p < 0.05$).

- African-Caribbeans had a significantly lower risk of death at 90 and 1-year after 90 days compared with Whites ($p = 0.03$). This was not true of the Indo-Asian group, where death rates were similar.

Introduction

Established, or End stage, renal failure (ERF) is 4–6 times more common in the Indo-Asian and African-Caribbean ethnic minority groups than in the White population. USRDS data show better survival amongst African-Caribbeans, native Ameri-

cans and South East Asians, but few data are available for Indo-Asians, who make up an increasing proportion of patients starting renal replacement therapy (RRT) in the UK. UK Renal Registry data were analysed to compare the characteristics, and survival on RRT, of incident patients in different ethnic groups.

Table 20.1. Centres included in the analyses

Centre	Number of patients by year					Total
	1998	1999	2000	2001	2002	
Bristol	109	115	144	139	123	630
Carlisle	0	0	0	0	28	28
Carsh	0	101	0	0	0	101
Covnt	0	80	82	93	75	330
Exeter	0	72	69	0	0	141
Glouc	0	0	0	0	57	57
Guys	111	108	119	96	111	545
Hammers	0	0	0	0	97	97
Heart	71	80	85	85	58	379
L'pool	0	0	0	0	130	130
Leic	163	161	173	179	149	825
Mbro	0	0	0	0	94	94
NewC	0	0	0	0	104	104
Notts	122	125	114	120	85	566
Oxford	0	0	0	0	145	145
Plym	69	66	57	60	79	331
Ports	0	0	0	0	130	130
Preston	0	0	115	130	112	357
Redng	0	45	47	64	43	199
Sheff	0	129	134	151	153	567
StJms	0	0	79	0	0	79
Stevn	0	0	0	0	96	96
Sthend	0	0	36	0	0	36
Sund	40	44	44	0	51	179
Wolve	0	0	77	73	99	249
Words	0	43	40	34	25	142
York	0	0	0	0	62	62
Total	685	1169	1415	1224	2106	6599

Methods

Data from annual cohorts of patients from 27 renal units with ≥85% complete ethnicity data during any year since 1998 were included in the analysis (Table 20.1). In most centres, data completeness was consistent year on year, but as can be seen, some centres were excluded for certain years if their data returns fell below 85%.

To ensure there was no selection bias associated with selecting those patients with an ethnic code compared to those without, age, gender and primary diagnosis of 315 patients with a missing ethnic code in any of the centres included were analysed. There was no significant difference except that more patients in the cohort without an ethnic code also had a missing primary diagnosis code.

Using these criteria a cohort of 6599 incident patients over a 5-year period was obtained. Ethnic groups were categorised as White, African-Caribbean, Indo-Asian, Chinese or Other. Due to the small number of Chinese (35 patients) or Other (62 patients) ethnic minorities over the 5 years, these were excluded from the statistical analyses.

The breakdown by ethnic group (White, African-Caribbean, Indo-Asian) within centres as shown in Table 20.2, shows considerable variation between units. At the Hammersmith unit only 44% of incident patients on RRT are white compared with 100% at Carlisle, Gloucester and York units. Overall, 87% of the cohort were White, 7% Indo-Asian, 5% African-Caribbean, 0.5% Chinese and 0.9% Other. Within the UK population as a whole, 92% are White and 7.9% belong to an ethnic minority (4% Indo-Asian, 2% African-Caribbean and 1.6% other).[1] Within the UK as a whole, there is wide geographical variation in the distribution of ethnic minorities (Figure 20.1), with 48% living in London, 1% in Wales and 2% in Scotland. Table 20.3 shows the ethnic breakdown by region and correlations are clearly seen between the distribution of the population as a whole, and renal patients.

The following characteristics were studied in the three main ethnic groups: age, gender, primary diagnosis, pre-dialysis estimated GFR, pre-dialysis haemoglobin, time of referral, treatment modality at day 90, co-morbidity and survival. The SAS statistical package was used with proportional Hazard Ratios for comparing survival risk, Fishers exact and chi-square test for analysing small number groupings, and Wilcoxon Rank sums for median age distributions.

Table 20.2. Ethnicity by centre

Centre	Ethnic group No. %			Total
	Asian	Black	White	
Bristol	3% (18)	4% (23)	93% 583	630
Carls	0	0	28 (100)	28
Carsh	5% (5)	4% (4)	84% (85)	101
Covnt	14% (45)	3% (11)	83% (274)	330
Exeter	0	1% (1)	99% (140)	141
Glouc	0	0	100% (57)	57
Guys	4% (21)	24% (132)	70% (383)	545
Hammer	24%(23)	11% (11)	45% (44)	97
Heart	16% (59)	5% (20)	77% (291)	379
L'pool	0	1% (1)	95% (123)	130
Leic	14% (112)	2% (13)	84% (691)	825
Mbro	2% (2)	0	96% (90)	94
NewC	4% (4)	1% (1)	94% (98)	104
Notts	5% (29)	5% (26)	89% (506)	566
Oxford	3% (5)	2% (3)	94% (136)	145
Plym	1% (3)	2% (8)	96% (319)	331
Ports	3% (4)	1% (1)	95% (124)	130
Preston	11% (39)	2% (6)	87% (311)	357
Redng	9% (18)	7% (13)	82% (164)	199
Sheff	4% (22)	1% (6)	93% (530)	567
StJms	8% (6)	1% (1)	90% (71)	79
Stevn	7% (7)	3% (3)	88% (84)	96
Sthend	0	3% (1)	97% (35)	36
Sund	1% (1)	1% (2)	98% (175)	179
Wolve	14% (34)	6% (14)	80% (198)	249
Words	6% (9)	0	94% (133)	142
York	0	0	100% (62)	62
Total	7.1% (466)	4.6% (301)	86.9% (5735)	6599

Results

Age & Gender

Overall 61% of the patients were male, comparable with total Renal Registry data. White and Indo-Asian ethnic groups had similar proportions of male patients, but African-Caribbean patients were more evenly distributed between the genders (52% males, 48% females Table 20.4) with significantly more females with ERF ($p < 0.05$).

In the UK as a whole, 16% of the general population are aged ≥65 years compared with 51% of incident ERF patients on the UK Renal Registry database. This varied considerably between ethnic groups in the general population with only 2% of African-Caribbeans and 3% of Indo-Asians aged ≥65 years, compared with 16% of Whites. In the ERF cohort, 47% of patients were aged ≥65 years and this varied significantly by ethnic group (Figure 20.2). In the White cohort, there were roughly equal proportions of patients in the two age groups (51% <65 years, 49% ≥65 years), but in both ethnic minority groups, significantly more patients were aged <65 years (69% Indo-Asians, 65% African-Caribbeans, $p < 0.001$). When split further into 3 age bands (Figure 20.2) there were widely varying patterns between the three ethnic groups. African-Caribbeans had similar proportions of patients within the three age bands, slightly increasing with increasing age; Indo-Asians on RRT were mainly in the 45–64 year age group; whilst Whites have significantly increasing proportions of patients on RRT with increasing age. The median age of Whites was significantly older than that of African-Caribbeans and Indo-Asians (64.8 v 60 v 59 years respectively, $p < 0.001$). Gender had no effect on the trend of age distribution by ethnic group.

Primary Diagnosis

Type 2 diabetes is known to occur more frequently in Indo-Asians and African-Caribbeans, and this was reflected in the Registry cohort (16% v 33% & 31% respectively p = < 0.001). Analysis initially included all ages (Table 20.5) and then analysed by aged above and below 65 years (Tables 20.6 and 20.7).

Diabetes appeared proportionately more common in the ≥65 year old African-Caribbeans and to a lesser extent in Whites, but age had little impact on the distribution of diabetes in the Indo-Asian population. This may reflect a difference in the underlying type of diabetes leading to ERF between ethnic groups.

Adult polycystic kidney disease accounted for a lower proportion of renal disease in the ethnic minority groups compared with Whites (0% Indo-Asians, 4% African-Caribbeans v 7% Whites) irrespective of age. Reno-vascular disease accounted for a higher proportion in Indo-Asians and Whites aged 65+, but in the African-Caribbean population was roughly equally distributed across the two age bands. Amongst all groups many patients had an uncertain diagnostic code (19–29%).

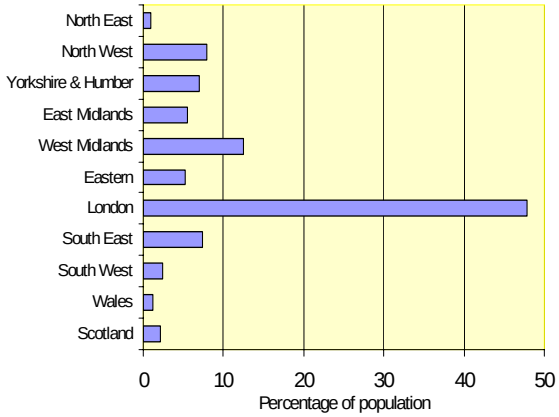

Figure 20.1. Regional distribution of ethnic minorities in the general population of GB

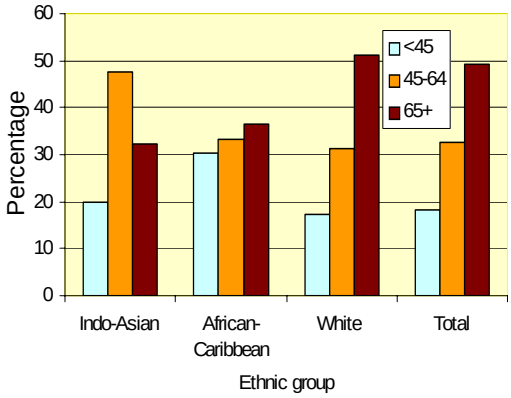

Figure 20.2 Age bands by ethnic groups

Table 20.3. Regional distribution of UK population by ethnic group

	White	Afr-Carib	Indo-Asian	Chinese	Non-White	Other
N.East	98.3	0.1	1.1	0.1	1.7	0.3
N. West	94.8	0.8	3.3	0.3	5.2	0.9
Yorks & Humb	93.7	0.7	4.4	0.2	6.3	1.0
E.Mids	94.1	1.1	3.8	0.2	5.9	0.7
W.Mids	89.3	2.0	7.0	0.3	10.7	1.4
Eastern	95.7	0.8	2.0	0.2	4.3	1.1
London	70.7	11.3	12.1	0.9	29.3	5.0
S.East	95.8	0.6	2.0	0.3	4.2	1.2
S.West	97.8	0.5	0.7	0.2	2.2	0.8
Wales	98.1	0.2	0.8	0.2	1.9	0.7
Sct	98.1	0.5	1.0	0.2	1.9	0.4
Eng	91.2	2.4	4.3	0.3	8.8	1.6
E&W	91.6	2.3	4.2	0.3	8.4	1.5

Table 20.4. Gender by ethnic group

Gender	Ethnic group % (number)			Total
	Indo-Asian	African-Carib	White	
Male	58% (268)	52% (157)	62% (3555)	61% (3980)
Female	42% (198)	48% (144)	38% (2180)	59% (2522)
Total	466	301	5735	6502

Table 20.5. Primary diagnosis by ethnic group all ages

Primary diagnosis	Ethnic group % (number)			
	Asian	Black	White	Total
Diabetes	33% (155)	31% (94)	16% (935)	1184
GN	12% (55)	10% (31)	13% (728)	814
PKD	0% (1)	4% (11)	7% (409)	421
Pyelonephritis	7% (31)	3% (8)	9% (544)	583
Reno-vascular	7% (33)	15% (45)	14% (797)	875
Other	8% (38)	12% (36)	15% (861)	935
Uncertain	29% (133)	21% (63)	19% (1087)	1283
Missing	4% (20)	4% (13)	7% (374)	407
Total	466	301	5735	6502

Table 20.6. Primary diagnosis by ethnic group aged <65 yrs

Primary diagnosis	Ethnic group % (number)			
	Asian	Black	White	Total
Diabetes	34% (109)	24% (47)	21% (594)	750
GN	15% (50)	14% (27)	16% (472)	549
PKD	0% (0)	5% (9)	11% (314)	323
Pyelonephritis	7% (23)	3% (5)	10% (286)	314
Reno-vascular	4% (14)	16% (32)	8% (235)	281
Other	9% (29)	14% (28)	16% (454)	511
Uncertain	27% (88)	21% (42)	14% (402)	532
Missing	3% (10)	4% (7)	5% (141)	158
Total	323	197	2898	3418

Table 20.7. Primary diagnosis by ethnic group aged ≥65 yrs

Primary diagnosis	Ethnic group % (number)			
	Asian	Black	White	Total
Diabetes	32% (46)	45% (47)	12% (341)	434
GN	4% (5)	4% (4)	9% (256)	265
PKD	1% (1)	2% (2)	3% (95)	98
Pyelonephritis	6% (8)	3% (3)	9% (258)	269
Reno-vascular	13% (19)	13% (13)	20% (562)	594
Other	6% (9)	8% (8)	14% (407)	424
Uncertain	31% (45)	20% (21)	24% (685)	751
Missing	7% (10)	6% (6)	8% (233)	249
Total	143	104	2837	3084

Table 20.8. eGFR (by MDRD) prior to start of RRT

Age	Modality	eGFR (no. of obs)			
		Indo-Asian	African-Caribbean	White	All
<65	HD	8.06 (174)	8 (65)	7.6 (1228)	7.67 (1468)
	PD	7.13 (95)	7.72 (71)	7.43 (1032)	7.42 (1198)
	Tx	6.77 (1)	10.71 (4)	7.82 (80)	7.94 (85)
65+	HD	8.34 (83)	9.44 (54)	8.24 (1561)	8.28 (1698)
	PD	8.97 (21)	8.71 (24)	7.64 (613)	7.72 (658)
	Tx	.	.	6.27 (2)	6.27 (2)

Estimated GFR (eGFR) prior to start of RRT

To assess whether there were any differences between ethnic groups in the pre-dialysis period, GFR, haemoglobin (Hb), and patterns of referral time were studied. The effect of age, first established treatment modality and gender were also analysed.

The eGFR was calculated using the abbreviated MDRD formula, with validated adjustments made for the African-Caribbean.[2] No adjustments were required for the Indo-Asian cohort.[3] To calculate the MDRD, the last creatinine reading taken no longer than 14 days prior to treatment start was used. The cohort size as a consequence of these restrictions was reduced to 5108.

There were few pre-emptive transplants within the cohort, reflecting the small numbers occurring generally within the renal population and so no statistical analysis was undertaken for this group.

In the majority of HD patients the eGFR at start was higher than in PD patients, irrespective of age and ethnic group, with the exception of Indo-Asians aged =65 (Table 20.8). In this latter group, Indo-Asians aged =65 on HD had an eGFR of 8.34 compared with 8.97 in PD patients. Between ethnic groups, the trend showed that Whites had a lower eGFR compared with the other ethnic minority groups. This reached statistical significance for the African-Caribbeans and Whites (p=0.002) although there was difference for the Indo-Asian and Whites (p=0.19), refuting sugges-

tions that ethnic minorities start late.[4] The older patients had a higher eGFR at start of RRT, irrespective of modality (p<0.0001).

Haemoglobin prior to start of RRT

As with the GFR calculation, haemoglobin measurements prior to initiation of RRT (taken no longer than 14 days prior to start) were used, reducing the cohort size to 5140. The mean haemoglobin levels were calculated (Table 20.9).

Within the White cohort, there was no difference in haemoglobin at start between the two age groups above and below 65 (11.1 g/dl). Within the African-Caribbean cohort, haemoglobin levels appeared lower at start in both PD (Hb 9.9 aged <65, Hb 9.6 aged =65) and HD (Hb 9.3 aged <65, Hb 9.8 aged =65) modality groups, irrespective of age, compared with the other two ethnic groups (p=0.0004 compared with Whites, p=0.018 compared with Indo-Asians). PD patients had significantly higher haemoglobin levels at start of RRT compared with HD patients(p<0.0001).

Referral patterns

It is well recognised that patients referred late to renal services have increased mortality rates that persist for at least 3 years. It has been suggested that ethnic minority groups have a higher proportion of late referrals than Whites: this was evaluated. The definition of late referral has varied between authors in the literature from 1 month to 6 months before initiation of RRT. The renal National Service Framework suggests that patients should be referred to a nephrologist 12 months prior to requiring RRT. For the purposes of this analysis, 3 months was used as the cut off for late referral (LR). The cohort size was reduced to 2736 as not all patients had both completed ethnicity and a completed date of referral.

Overall, patients were mainly referred a year or more prior to start of RRT (46% Table 20.10) but there were significant differences between the ethnic groups. More Indo-Asians were referred a year or more prior to start (53%, $p < 0.05$) compared with 38% of African-Caribbeans and 45% of Whites. Using 3 months as the definition of late referral, 34% of patients were referred late, Whites and Indo-Asians having similar proportions (34%) whilst 44% of African-Caribbeans were late referrals ($p = 0.1$). The number of African-Caribbeans in the cohort were small, thus reducing the power.

Those aged <65 were proportionately more likely to be referred more than a year prior to start of RRT than those aged ≥65 (51% v 40% respectively, $p < 0.001$, Table 20.11). They were also less likely to be referred late (31% v 39% respectively, $p < 0.001$, Table 20.11). Within the ethnic groups aged ≥65, numbers were small in all

Table 20.9. Mean Hb prior to start of RRT

		Mean Hb prior to start (number)			
Age	**Modality**	**Indo-Asian**	**African-Carib**	**White**	**All**
<65	HD	9.73 (178)	9.26 (69)	9.8 (1214)	9.87 (1651)
	PD	10.1 (101)	9.9 (71)	10.35 (1057)	10.3 (669)
	Tx	9.2 (1)	11.8 (4)	11.12 (82)	11.15 (2)
65+	HD	9.75 (87)	9.78 (55)	9.9 (1538)	9.87 (1651)
	PD	11.33 (22)	9.64 (25)	10.3 (634)	10.3 (669)
	Tx	.	.	11.15 (2)	11.15 (2)

Table 20.10. Referral patterns by ethnic group

Time (days)	Ethnic group - % (number)			
	Asian	Black	White	All
0–89	34% (63)	44% (31)	34% (849)	34% (943)
90–179	7% (13)	4% (3)	9% (219)	9% (235)
180–364	6% (11)	14% (10)	12% (291)	11% (312)
365+	53% (100)	38% (27)	45% (1119)	46% (1246)
Total	187	71	2478	2736

except Whites, and meaningful analysis was not possible.

Gender had no effect on referral patterns except within the African-Caribbean cohort, where women were less likely to be referred late than males (33% v 56% respectively, p = 0.06).

Diabetes was postulated as a possible reason as to why some ethnic minority groups may have been referred earlier than Whites. A model was constructed with ethnic group, diabetes, age group (above/below 65), gender, and interactions between ethnic group and diabetes, ethnic group and age, ethnic group and gender for Analysis of Variance. The only significant interaction was ethnic group and diabetes (p = 0.0086). The least squared means from the ANOVA were tested (diabetic v non diabetic by ethnicity).

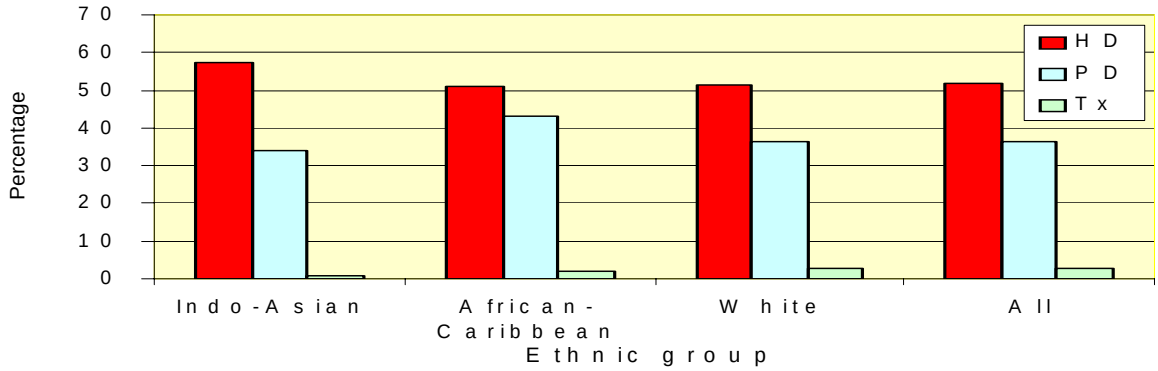

Figure 20.3. Treatment modality on Day 90 by ethnic group

Table 20.11 Referral patterns by ethnic group and age

Time (days)	Ethnic group % (number)							
	Indo-Asian		African-Caribbean		White		All	
	<65	65+	<65	65+	<65	65+	<65	65+
0 –89	34% (45)	34% (18)	46% (19)	40% (12)	30% (386)	39% (463)	31% (450)	39% (493)
90–179	5% (7)	11% (6)	5% (2)	3% (1)	8% (101)	10% (118)	8% (110)	10% (125)
180–364	6% (8)	6% (3)	10% (4)	20% (6)	12% (149)	12% (142)	11% (161)	12% (151)
365+	55% (74)	49% (26)	39% (16)	37% (11)	51% (652)	39% (467)	51% (742)	40% (504)
Total	134	53	41	30	1288	1190	1463	1273

Table 20.12. Referral patterns by diabetic status and ethnic origin

Time (days)	Ethnic Groups. % (Number)					
	Indo-Asian		African-Caribbean		White	
	Diabetes	Non-diabetes	Diabetes	Non-diabetes	Diabetes	Non-diabetes
0–89	29% (37)	44% (26)	52% (28)	18% (3)	36% (744)	25% (105)
90–179	5% (7)	10% (6)	6% (3)	0	8% (166)	12% (53)
180–364	7% (9)	3% (2)	4% (2)	47% (8)	11% (222)	16% (69)
365+	59% (75)	42% (25)	39% (21)	35% (6)	45% (921)	47% (198)
Total No.	128	59	54	17	2053	425

There were fewer diabetic African-Caribbean patients referred late compared with non-diabetics (18% v 52% respectively, p = 0.03, Table 20.12). Although there appeared to be a similar trend seen in Whites (25% of diabetics referred late compared with 36% of non-diabetics), the ANOVA analysis indicated this was not significant (p=0.9) . In the Indo-Asian group the trend was reversed with 44% of diabetics referred late v 29% of non-diabetics p = 0.002).

Treatment modality

Ethnicity had no effect on the choice of modality at day 90 of treatment (Figure 20.3). Haemodialysis (HD) was the commonest modality in all groups (52%) but appeared slightly more common in Indo-Asians (58%).

Co-morbidity

For this analysis, only those centres with annual cohorts of at least 85% ethnicity returns and 80% co-morbidity returns were included. As a consequence, only 6 centres were included (Bristol 1999–2001, Leicester 1998–1999 & 2001, Sheffield 2001, St. James 2000, Nottingham 2002 and Hammersmith/Charing Cross 2002), providing a cohort of 1153 patients (111 Indo-Asian, 34 African-Caribbean and 1008 White). The Fisher's exact test was used to calculate statistical significance as there were small numbers in the ethnic minority groups.

Although there was a trend towards more Whites having cardio-vascular or peripheral vascular disease, this did not reach statistical significance (Figure 20.4). Whites however were more likely than Indo-Asians or African-Caribbeans to be smokers at initiation of RRT (p < 0.001) and probably as a consequence more patients had chronic obstructive airways disease (COPD) (p = 0.004). Malignancy was also significantly more common in Whites (13%) than Indo-Asians (3%) and African-Caribbeans (6%) (p < 0.001).

The presence of diabetes as an associated co-morbidity, but not as the primary cause of renal failure, appeared more common in Indo-Asians (12%) and African-Caribbeans (9%) than Whites (7%), but this did not reach statistical significance. When considered present as either co-morbidity or underlying primary renal disease, this difference then reached statistical significance (p < 0.001).

Social deprivation

The Townsend index was used as the scoring system for social deprivation, which was derived from the patient's postcode. The Townsend index (calculated for the Registry from the 2001 census data, by Hannah Jordan of Southampton University) is a com-

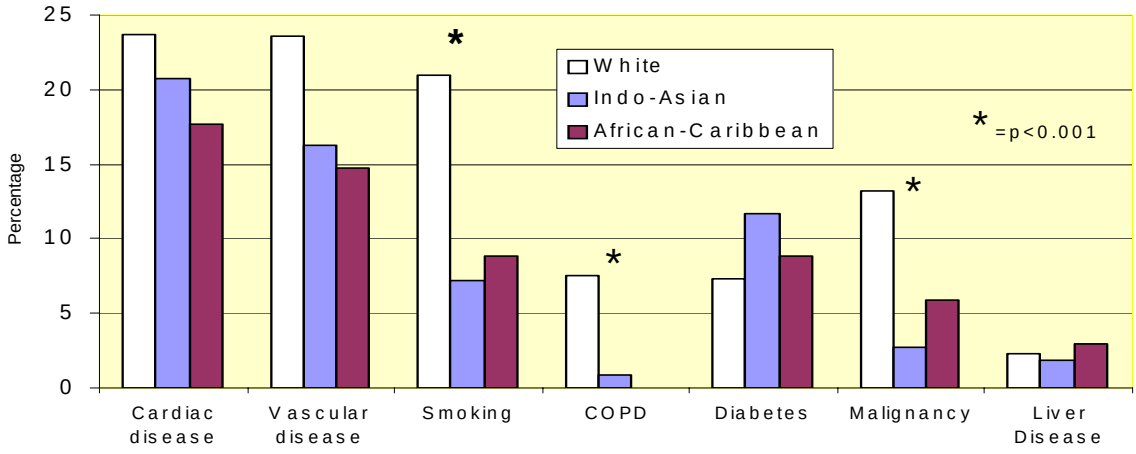

Figure 20.4. Co-morbidity by ethnicity

Table 20.13 Deprivation group by ethnicity

	Deprivation Group % (number)				
Ethnic group	**1**	**2**	**3**	**4**	**5**
Indo-Asian	8.3% (38)	5.5% (25)	12.5% (57)	30.4% (139)	43.3% (198)
African-Caribbean	3.1% (9)	4.4% (13)	6.8% (20)	24.2% (71)	61.6% (181)
White	17.5% (987)	17.7% (1000)	19.4% (1095)	22.8% (1286)	22.6% (1272)
All	16.2% (1034)	16.2% (1038)	18.3% (1172)	23.4% (1496)	25.8% (1651)

posite measure of deprivation based on total unemployment rate, no-car households, overcrowded households and not owner-occupier households based on the electoral ward as at the 2001 Census. The higher the Townsend index, the greater is the deprivation. For this analysis, the UK general population was divided into quintiles of deprivation (1 lowest, 5 highest).

Significant differences in the distribution quintiles of social deprivation scores were seen in the different ethnic groups on RRT (Table 20.13).

In all three ethnic groups there was a tendency for increasing deprivation to be associated with an increased incidence of ERF. There was a marked difference between the patterns seen in Whites and non-Whites. Approximately 74% of Indo-Asians and 86% of African-Caribbeans on RRT were in deprivation group 4 or 5, compared with 45% of Whites. In the African-Caribbean population, there were significantly higher proportions of people in group 5 (62%, $p < 0.05$). African-Caribbean patients were likewise represented the least in group 1 (3%) closely followed by Indo-Asians with 8% and 18% of Whites in comparison ($p < 0.05$).

The Office for National Statistics has not yet released the 2001 Census information on deprivation by ethnicity. It is therefore not possible to know to what extent the above differences may reflect greater deprivation in the ethnic minority UK population or be related to an increased burden of renal disease.

Survival Analyses

Survival was analysed at 90 days and 1 year after 90 days. In the first 90 days there were 484 (8%) deaths in the incident cohort, 27 Indo-Asian (6%), 9 African-Caribbean (3%), and 448 White (8%). In the 1-year after 90 days, there were 172 (12%) deaths, (11% Indo-Asian, 8% African-Caribbean, 16% White). Adjustments were made for age and hazard ratios (HR) were calculated for the ethnic minorities as compared with Whites (Table 20.14). African-Caribbeans had a significantly lower risk of death in the first 90 days (HR 0.48, 95%CI 0.25–0.94, $p = 0.03$) compared to Whites, whilst Indo-Asian rates were similar (HR 0.68, 95%CI 0.68–1.49, $p = 0.97$). At 1 year after 90 days, this survival advantage persisted (HR 0.575, 95%CI 0.349–0.947, $p = 0.03$).

To assess the impact of primary renal diagnosis, time of nephrological referral, haemoglobin immediately before RRT, and eGFR prior to start of RRT, a multivariate analysis was undertaken on the survival data (Tables 20.15 and 20.16).

Table 20.14. Survival hazard ratios by age and ethnicity; Whites as reference

	90 days	**1 year after 90 days**
Variable	**Hazard Ratio (95% HR CI)**	**Hazard Ratio (95% HR CI)**
Age	1.056 (1.048–1.065)	1.050 (1.043–1.058)
African-Caribbean	0.484 (0.25–0.937)	0.575 (0.349–0.947)
Indo-Asian	1.007 (0.681–1.489)	0.919 (0.642–1.317)

Those patients coded with a ‘missing’ primary renal diagnosis had a significantly higher risk of death (HR 4.23, 95%CI 1.33–

Table 20.15. 90 day survival; White and GN as reference

Variable	Hazard ratio	95% Hazard ratio	Confidence
Age	1.059**	1.040	1.079
Male gender	1.141	0.761	1.713
African-Caribbean	0.347	0.048	2.511
Indo-Asian	0.617	0.224	1.700
Diabetes	1.573	0.643	3.849
PKD	0.640	0.132	3.105
Pyelonephritis	1.806	0.671	4.862
Reno-vascular	1.824	0.776	4.287
Missing	4.226*	1.328	13.446
Other	1.697	0.693	4.158
Uncertain	1.414	0.610	3.279
Hb pre RRT	1.066	0.936	1.214
eGFR pre RRT	1.068 *	1.015	1.124
Late Referral	1.589	1.056	2.393

Table 20.16. 1 year after 90 days survival; White and GN as reference

Variable	Hazard ratio	95% Hazard ratio	Confidence
Age	1.045**	1.032	1.059
Male gender	0.858	0.622	1.185
African-Caribbean	0.314	0.077	1.279
Indo-Asian	0.669	0.324	1.379
Diabetes	4.135**	1.938	8.820
PKD	0.935	0.247	3.538
Pyelonephritis	1.377	0.516	3.675
Reno-vascular	2.394*	1.092	5.245
Other	4.854**	2.265	10.400
Missing	6.661**	1.982	22.386
Uncertain	1.920	0.888	4.152
Hb pre RRT	0.934	0.847	1.031
eGFR pre RRT	1.085**	1.042	1.129
Late Referral	1.345	0.967	1.870

* $p < 0.05$; ** $p < 0.001$

13.45, p = 0.01 at 90 days, and HR 6.66, 95%CI 1.98–22.39 at 1-year after 90 days), although confidence limits were large due to small numbers.

Haemoglobin prior to start of RRT, did not affect survival rates but the higher the eGFR at initiation of RRT, the higher the likelihood of death within 90 days (HR 1.07, 95%CI 1.02–1.12, p = 0.01) and 1-year after 90 days (HR 1.09, 95%CI 1.04–1.13, p < 0.001).

At 1 year after 90 days, primary renal diagnosis had a significant impact on survival. Patients with diabetes as a primary diagnosis had a significantly higher chance of death in the year after 90 days (HR 4.14, 95%CI 1.94–8.82, p < 0.001), as did those with reno-vascular disease (HR 2.39, p = 0.03) or a missing diagnostic code (HR 6.66, p = 0.002). Despite these factors, African-Caribbean patients still had a significantly lower risk of death but only at 1 year after 90 days.

In this subgroup analysis of ethnicity (unlike the total late referral cohort analysis in Chapter 16), being referred late to nephrology services did not statistically affect survival at 1 year after 90 days (p = 0.07), its

inclusion in the multivariate analysis did render any survival advantage in African-Caribbeans non-significant (HR 0.31, 95%CI 0.08–1.28, p = 0.1). This is possibly due to the large drop in cohort size to 1411 of which only 202 were African-Caribbean. The multivariate analysis excluding adjustments for referral time (*n* = 2863) suggested African-Caribbeans had a survival HR of 0.44 (95%CI 0.22–0.86, p = 0.016).

Co-morbidity was not factored into our survival analyses, as cohort numbers became very small.

Discussion

These data show differences between the three major ethnic groups in the UK in demographic characteristics, initial treatment, haemoglobin, and survival rates, particularly at 1 year after 90 days. Current analyses are under way to look at the Kaplan–Meier survival curves over the longer term to see if this survival advantage persists, as has been reported from the USA.

Median age in Whites was much higher than in the ethnic minorities. This may reflect the younger age of ethnic minorities within the UK population as a whole although primary diagnosis may also influence this. Diabetes is the commonest identifiable cause of ERF in all ethnic groups, but is far more frequent in Indo-Asians and African-Caribbeans. It has been postulated that Type 2 diabetes tends to have an earlier onset in Indo-Asian minorities than in Whites, possibly contributing to the lower median age at start in non-Whites. In African-Caribbeans, ERF secondary to Type 2 diabetes typically presents in the 5th and 6th decade. In this cohort however, Indo-Asian and African-Caribbean diabetic renal patients were significantly older than their non-diabetic counterparts (p < 0.001); the reverse was true in Whites (Table 20.17).

Table 20.17. Median age of patients by ethnic group and diabetes status

Diabetes status	Indo-Asian	African-Caribbean	White
Diabetic	61.1	63.3	62.0
Non-diabetic	49.4	58.3	65.2

Diabetes may also contribute to the gender differences between the African-Caribbean population and the Whites and Indo-Asians. African-Caribbean males had twice the incidence of diabetes as White males, but in females the difference was four-fold.

Although many African-Caribbeans starting RRT were diabetic and as a consequence had regular surveillance, it was surprising that a larger proportion of these patients were referred late. This may be a consequence of a combination of the above factors with social deprivation. The African-Caribbean cohort had the largest proportion of patients in social group 5, although analyses in Chapter 16 have shown no significant relationship between high deprivation and late referral.

Haemoglobin levels were higher prior to starting RRT in PD patients than HD patients. In African-Caribbeans, haemoglobin levels are lower than in other groups, but as they are more likely to be referred late, this may simply be a reflection of inadequate pre-dialysis anaemia management.

Estimated GFR was higher in patients starting HD than those starting PD. The older patients tended to have a higher eGFR at start of RRT.

Numerous factors affect survival on RRT including age at onset of RRT,[5,6] co-morbid disease prior to start of RRT,[5] and primary renal diagnosis.[6,7,8] None of these factors have been shown to account for the survival differences apparent in some ethnic minority groups. Suggested reasons in the litera-

ture have included the low voluntary withdrawal rates in ethnic minorities,[5,9] but the percentage of deaths explained by this means are relatively small, accounting for only up to 23% of the difference in 1 year survival rates between whites and African-Caribbean.[10]

Lower co-morbidity rates in ethnic groups have led to suggestions that sicker patients in these groups may not be offered RRT. Whites were significantly more likely to have malignancy, COPD and to smoke than the ethnic minorities. In the literature, white smokers with symptomatic cardiovascular disease at the start of RRT were at very high risk of death.[11] Despite these possibilities, non-smoking Whites still have a tendency to an increased risk of death compared with Indo-Asians and African-Caribbean, suggesting that smoking is not the only factor influencing survival.

In our study, although there was a trend for White patients compared with the ethnic minorities to have cardiac disease at initiation of RRT, this did not reach statistical significance. Pei *et al.* found that although the prevalence of cardiovascular disease as co-morbidity at the start of RRT was higher in Whites,[11] this did not explain the survival difference between the ethnic groups. There may be a differential susceptibility to cardiovascular complications that is environmentally or genetically controlled.

Within the US general population, there is also a longer life span in African-Caribbeans when compared with the White population. No such general data are available for the UK ethnic minorities, but there may be genetic factors unrelated to any associated renal condition that provides African-Caribbeans with a survival advantage.

Conclusion

These data demonstrate that patients starting RRT from different racial groups show differences in many demographic and other characteristics, and survival rates, particularly at 1 year after 90 days. Current analyses are under way to look at the Kaplan–Meier survival curves over the longer term to see if this survival advantage persists, as has been reported from the USA.

Ethnicity is an important variable that must be taken into account when determining equity of provision and outcomes between renal centres. The Registry needs to work with renal units to achieve improved reporting levels of ethnicity. These data will both aid further analyses and also facilitate planning adequate provision of RRT services in differing communities.

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