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Chapter 16: Patients with Diabetic Nephropathy in Established Renal Failure: Demographics, Survival and Biochemical Variables

Summary

- Of the 20,532 patients who started RRT from 1997 to 2004, 19% were reported as having diabetic nephropathy (DN). Of these, the majority (77%) were White. There were many missing data on ethnicity, referral, co-morbidity, cholesterol and HbA1c.

- 20% of patients with DN were referred <3 months before starting RRT and 46% within a year. This is disappointing in patients under regular medical supervision. The National Service Framework for Renal Services advocates referral within a year of established renal failure.

- There was evidence that patients with diabetic nephropathy from socially deprived areas were referred later than those from more affluent areas, both in crude and age and gender adjusted analyses (chi-sq p < 0.0001, Mantel–Haenszel: p = 0.0026).

- 19% of diabetic nephropathy patients were recorded as smokers at the start of RRT.

- Incident patients with DN were significantly more likely to be from a socially deprived area than others, even within the White population alone (p < 0.0001).

- Patients with DN were less likely to receive a transplant.

- After adjusting for age, ethnicity, social deprivation and co-morbidities including cardiovascular disease, long-term survival was significantly worse for DN patients than for other patients on RRT. The difference in crude survival was greatest in younger patients (5-year survival 56% in 18–54 year olds compared to 85% of others of the same age (p-value for interaction <0.001)).

- Blood pressure data were only available for about 40% of the patients. Diabetic nephropathy patients on HD had higher blood pressures than other patients, but there was no difference for other treatment modalities.

- Data on cholesterol were missing in 60% of patients. Overall, patients with DN had lower cholesterol values than other patients on PD and HD.

- HbA1c data were missing in a high proportion of the incident DN cohort although reporting had improved in recent years. Glucose control was worse in PD than HD patients.

Introduction

Diabetic nephropathy is now the most common renal disease leading to renal replacement therapy in developed countries[1,2,3,4]. Within the UK, the number of DN patients accepted for RRT rose steadily in the 1990s[5] especially in the African–Caribbean and South Asian populations[3,4,5,6]. This may be related to the increased prevalence of Type 2 diabetes in the general population, the ageing population and the liberalisation of attitudes to acceptance for RRT[5,7]. The overall rise has slowed in the last 4 years[8]. DN patients starting RRT are likely to have more co-morbidity than other patients, in particular cardiovascular disease, and consequently worse survival on RRT[9,10,11]. In recent years there has been some reduction in the high mortality of such patients, so the prevalence of diabetic nephropathy patients on RRT (currently lower than the percentage of incident patients, see Chapter 3) might increase[12,13].

The National Service Frameworks for Diabetes[14] and for Renal Services[15] have highlighted the importance of the primary prevention of DN in diabetic patients by early detection and aggressive management of hypertension, glucose control and cardiovascular risk factors and of the timely referral (recommendation >1 yr before RRT) of those with progressive renal disease in order to plan for RRT.

There is a key policy drive to reduce health inequalities in England[16]. In the UK there is evidence that diabetic patients in more socially deprived areas have higher all cause mortality even after adjustment for smoking and blood pressure[9], and lower rates of attendance at GP and hospital clinics[17]. The UK Renal Registry 2003 Report highlighted the possible role of social deprivation in the context of DN.

This chapter examines the characteristics of patients developing established renal failure from DN, their access to modalities of treatment and their survival on RRT relative to other incident patients. It also includes data on quality of care (HbA1c, cholesterol and blood pressure).

These analyses were undertaken before individual patient data from the Scottish Registry became available and therefore only includes England and Wales.

Methods

Use of incident patients in analyses

As prevalent patients represent a complex mixture of incident patients and survivors, only incident patients commencing RRT between 1997 and 2004 in centres reporting to the UKRR were included. It was not possible to distinguish accurately between Type 1 and 2 diabetes, most are Type 2.

Measure of social deprivation

All postcodes were validated against the patient's full address using a commercial software package (QAS). The Townsend index of social deprivation was calculated from the 2001 UK Census. This index is based on the percentages of unemployed, households without a car, overcrowding, and non owner occupied homes in each output area[18], a high Townsend score indicating greater social deprivation. The Census output area for each patient's postcode of residence was identified, and the patients were then allocated into five equally sized quintiles according to their estimated level of deprivation. For the 5% of postcodes which cross a Census output area boundary and which therefore have more than one Townsend score, the mean value was taken.

Measures of ethnicity, co-morbidity and referral

Ethnicity was recorded in the renal units largely by self-ascription, and grouped into African–Carribean, South Asian and White descent. To obtain high quality data the analyses in the incident cohort were confined to centres which returned information on ethnicity on at least 85% of patients. Within this restricted group of patients there was a high proportion of missing data on co-morbidity at start of RRT and on referral date; to strike a balance between data quality and quantity for these items, slightly less stringent cut-offs were chosen for inclusion, with centres returning more than 75% referral data and more than 80% co-morbidity data included. For analysis of co-morbidities, 'cardiac disease' included those patients recorded as having angina, previous myocardial infarction, coronary artery by-pass grafts or angioplasty and 'peripheral vascular disease' (including claudication, ischaemic and neuro-pathic ulcers, non-cardiac angioplasty and amputations due to ischaemia). Late referral was defined as referral to a nephrologist within 90 days of starting RRT; referral within 1 year of RRT was also examined.

Measures of quality of care in patients with DN: blood pressure, HbA1c and cholesterol

For HD patients post-dialysis blood pressure was analysed. In patients on PD and those who were transplanted, blood pressure measured at clinic visits was used. HbA1c measures were only included from laboratories whose assays were validated to ensure comparability between centres; more details on the HbA1c measurements and their validation can be found in the 2003 UKRR Report, Chapter 19[19]. For analyses of changes over time the first available measurement, the measurement at 90 days, and the measurement at 1 year after start of RRT were used. For analyses of prevalent patients the most recent measurement of blood pressure, cholesterol and HbA1c were used.

Survival analyses

Chi-square, Chi-square for trend and Kruskal Wallis tests were performed to identify associations between diabetes and potential predictors

of survival. Mantel–Haenszel tests were used if effects were examined in different strata of age and sex. As there is variability in defining whether patients who die early have acute or chronic renal failure, which would affect early death rates, survival up to 90 days of RRT was assessed separately from survival after 90 days. Follow up was continued until 31st December 2004. Patients were not censored at time of renal transplant. For descriptive analyses of survival in DN incident patients, Kaplan-Meier graphs, life-table methods, and log-rank tests were used where appropriate. Cox's proportional hazards model was then used to explore the independent effect of variables on survival. Age was entered as a linear variable, social deprivation as a categorical variable using the aforementioned quintiles, late referral, diabetes and gender as binary variables. As there was a cohort effect up to 90 days on RRT, all models were adjusted for year of onset of RRT, though this variable had no significant effect on survival after 90 days.

Four different cohorts were used in the analysis.

Cohort 1: patients with available baseline information on Townsend Scores, treatment modality, gender, age, and primary renal disease (n = 20,532 patients, n = 49 units).

Cohort 2: as 1 but restricted to Whites (n = 9,810 patients, n = 24 units), to assess the effect of adjusting for social deprivation independent of ethnicity.

Cohort 3: as 1 but restricted to those with data on co-morbidities at start of RRT (n = 4,530 patients, n = 16 units), to examine whether these were the main mediators of worse outcome of diabetic nephropathy patients while adjusting for social deprivation and all other variables.

Cohort 4: as 3 but restricted to Whites (n = 2,760 patients, n = 10 units).

Prior knowledge and both crude and adjusted analyses suggested the presence of an interaction between DN and age in models after 90 days RRT, both on continuous age-scale as well as using age-categories. For simplicity, the effect in different age categories is reported (18–54 years, 55–64 years and above 65 years of age). However, because of remaining residual confounding due to age, each category was adjusted for age. The assumption of proportionality was investigated by using graphical methods (Nelson–Aalen Plots) and the final model using Schoenfeld tests.

Results

Baseline characteristics of incident RRT patients

Of new patients starting RRT 19% had DN, the most common cause of ERF in the UK (see Chapter 3): just over 60% of both these and other patients were male (Table 16.1). Although DN is common in South Asian and African–Caribbean ethnic minorities within the UK, White diabetic nephropathy patients represent the main burden of ERF. DN patients were younger at the start of RRT when compared with other RRT patients. There may be competing risks as older diabetics are more likely to die of cardiovascular disease (CVD) before RRT than younger ones[19], and it is possible there is a degree of selection.

Incident patients with DN had higher Townsend scores (greater social deprivation) than others. Given the strong association of social deprivation with ethnicity (odds ratio 3.15, 95% CI: 2.81, 3.53; p < 0.0001) Whites alone were analysed: a significantly higher proportion of White DN patients were from a more socially deprived background compared to other White patients (p < 0.0001) (Figure 16.1). The observed differences in social deprivation in diabetic nephropathy patients and others may be due to the increased incidence of obesity and metabolic syndrome and consequently of Type 2 diabetes in more socially deprived groups[20]. Social deprivation and young age are also associated with poorer diabetic control, poor CVD risk management[9,17,21,22,23] and a high rate of smoking.

Late referral was less common in DN patients than others, but nevertheless 20% of this group of patients under regular medical surveillance who needed RRT were referred less than 90 days from starting RRT and only half within one year. Whilst diabetic nephropathy patients were referred to renal units earlier than others, there remains much scope for improving referral to nephrologists, especially given the difficulties of establishing vascular access in

Table 16.1: Demographics of diabetic nephropathy and other patients

	DN		Others		Total		
	n	**%**	**n**	**%**	**n**	**%**	**p-value**
Number of patients	3,959	19.3	16,573	80.7	20,532	100.0	0.6076
Gender							
Male	2,427	61.3	10,233	61.8	12,660	61.7	
Female	1,532	38.7	6,340	38.3	7,872	38.3	
Total	**3,959**	**100.0**	**16,573**	**100.0**	**20,532**	**100.0**	
Age (years)							<0.0001
Median age start RRT		60.7		65.1		64.1	
Interquartile range	48.8	69.2	50.5	74.3	50.1	73.5	
Age distribution at start of RRT							<0.0001
18–54	1,463	37.0	5,166	31.2	6,629	32.3	
55–64	988	25.0	3,074	18.6	4,062	19.8	
65+	1,508	38.1	8,333	50.3	9,841	47.9	
Total	**3,959**	**100.0**	**16,573**	**100.0**	**20,532**	**100.0**	
Townsend scores							
Distribution of social deprivation quintiles							<0.0001
1	515	13.0	3,064	18.5	3,579	17.4	
2	622	15.7	3,315	20.0	3,937	19.2	
3	728	18.4	3,136	18.9	3,864	18.8	
4	968	24.5	3,635	21.9	4,603	22.4	
5	1,126	28.4	3,423	20.7	4,549	22.2	
Total	**3,959**	**100.0**	**16,573**	**100.0**	**20,532**	**100.0**	
Ethnicity[See note 1]							<0.0001
White	1,707	76.9	8,103	89.3	9,810	86.9	
South Asian	322	14.5	558	6.2	880	7.8	
African-Caribbean	122	5.5	242	2.7	364	3.2	
Other	70	3.2	167	1.8	237	2.1	
Total	**2,221**	**100.0**	**9,070**	**100.0**	**11,291**	**100.0**	
Treatment modality at start of RRT							<0.0001
HD	2,728	68.9	11,616	70.1	14,344	69.9	
PD	1,187	30.0	4,580	27.6	5,767	28.1	
Tx	44	1.1	377	2.3	421	2.1	
Total	**3,959**	**100.0**	**16,573**	**100.0**	**20,532**	**100.0**	
At day 90							<0.0001
HD	2,218	63.3	9,123	63.5	11,341	63.5	
PD	1,237	35.3	4,755	33.1	5,992	33.5	
Tx	49	1.4	493	3.4	542	3.0	
Other[See note 2]	34		106		140		
Died before 90 days	220		1,312		1,532		
Not on RRT for 90 days	201		784		985		
Total	**3,959**	**100.0**	**16,573**	**100.0**	**20,532**	**100.0**	
At one year							<0.0001
HD	1,521	61.3	6,265	59.1	7,786	59.5	
PD	845	34.1	3,335	31.4	4,180	31.9	
Tx	116	4.7	1,007	9.5	1,123	8.6	
Other[See note 3]	37		121		158		
Died before 90 days	596		2,504		3,100		
Not on RRT for 90 days	844		3,341		4,185		
Total	**3,959**	**100.0**	**16,573**	**100.0**	**20,532**	**100.0**	

Table 16.1: (continued)

	DN		Others		Total		
	n	%	n	%	n	%	p-value
Referral[See note 4]							<0.0001
0 to 89 days	179	20.3	1,129	29.2	1,308	27.5	
90 to 365 days	232	26.2	699	18.1	931	19.6	
More than 365 days	473	53.5	2,042	52.8	2,515	52.9	
Total	**884**	**100.0**	**3,870**	**100.0**	**4,754**	**100.0**	
Co-morbidity[See note 5]							
Number of pats with at least one co-morbidity at start	442	59.1	1,623	55.8	2,065	56.5	0.1067
Cardiovascular disease	360	48.1	930	32.0	1,290	35.3	<0.0001
Cardiac disease	230	30.8	671	23.1	901	24.7	<0.0001
Myocardial infarction	121	16.2	335	11.6	456	12.5	0.0006
CABG/angioplasty	44	5.9	142	4.9	186	5.1	0.2763
Angina	190	25.5	523	18.0	713	19.6	<0.0001
PVD	180	24.1	315	10.9	495	13.6	<0.0001
Cerebrovascular disease	105	14.0	290	10.0	395	10.8	0.0015
Malignancy	32	4.3	404	13.9	436	12.0	<0.0001
Smoker	131	18.2	468	16.9	599	17.1	0.3945
COPD	46	6.2	243	8.4	289	7.9	0.0448
Liver disease	14	1.9	68	2.3	82	2.3	0.4378

Note 1: Only centres with ⩾85% ethnicity completeness.

Note 2:

	DN	Others	Total
	n	n	n
Other modalities	34	106	140
Patient transferred out	16	54	70
Treatment stopped	15	49	64
Patient declines RRT	1	1	2
Clinical decision not to offer RRT	0	1	1
Patient lost to follow up	2	1	3

Note 3:

Other modalities	37	121	158
Patient transferred out	29	91	120
Treatment stopped	6	26	32
Patient declines RRT	0	1	1
Patient lost to follow up	2	3	5

Note 4: Only centres with ⩾75% referral completeness.

Note 5: Only centres with ⩾80% comorbidity completeness.

Cardio vascular disease include any one of the following: cardiac disease, PVD, cerebrovascular disease.

Cardiac disease include any one of the following: angina, myocardial infarction at any time, angioplasty/vascular graft.

Peripheral vascular disease (PVD) include any one of the following: claudiation, ischaemic/neuropathic ulcer, angioplasty/vascular graft (non-coronary), amputation.

CABG = coronary artery bypass grafting or coronary angioplasty.

COPD = chronic obstructive pulmonary disease.

Myocardial infarction included previous MI within the past 3 months and MI more than 3 months ago.

diabetics. There was evidence that patients with diabetic nephropathy from socially deprived areas were referred later than those from more affluent areas, both in crude and age and gender adjusted analyses (chi-sq $p < 0.0001$, Mantel–Haenszel: $p = 0.0026$).

Incident DN patients starting RRT are a high-risk group. About half suffer from manifest cardiovascular disease, although malignancy was much less common. Smoking was equally common in DN and other patients (in about a fifth). When adjusted for age and sex, there was a borderline association between social deprivation and CVD (Mantel–Haenzel: $p = 0.050$). Another 270 patients (9.3%) with other causes of ERF also had diabetes but are not included with the DN patients in the survival analyses that follow below; 55% of these patients also had CVD. Renal impairment has been recognised as an independent CVD risk factor[24] and CVD risk reduction and CVD
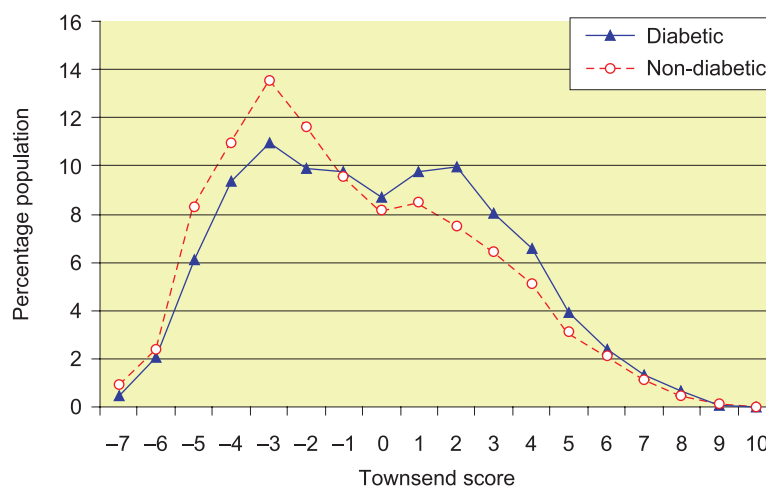
Figure 16.1: Age and sex adjusted distributions of Townsend scores in incident diabetic nephropathy and other White patients in England and Wales

management are important aspects of quality of care[15]. More systematic management of CVD risk factors, including more incentives to reduce the high rate of smoking, is required.

DN patients were slightly more likely to receive peritoneal dialysis and half as likely to be transplanted in the first year of RRT in both the full and White only cohorts, even having adjusted for age and sex (each $p < 0.001$). There is a low rate of transplantation in DN patients, even after adjusting for ethnicity, despite the fact that renal transplantation has been shown to offer the best survival for them[25]. Approaches to pre-emptive and speedy transplant listing vary widely between renal units[26,27], and diabetic patients are not uniformly targeted for transplantation: transplant outcomes are less good than in other patients and many are unfit for major surgery, especially due to CVD.

Survival on dialysis

Survival in first 90 days of RRT

Up to day 90, 1,532 died over 5,010 person-years. 1,125 patients who stopped treatment within 3 months were censored of whom 21% ($n = 235$) had DN. Survival in the first 90 days of RRT improved in recent years.

Even after adjustments for age, gender, modality and deprivation, DN patients had similar or better survival than others at 90 days of RRT. The slight crude survival advantage was due to confounding from earlier referral

and less malignancy at start of RRT (Table 16.2). In support of this, malignancies accounted for a significantly higher proportion of deaths in the first 90 days in non-DN patients (9% vs 0%, $p < 0.001$).

Survival after 90 days of RRT

After 90 days, the Kaplan-Meier curves show crude survival of patients with DN was lower than other patients in all age groups (Figure 16.2). The estimated crude mortality rate in DN was 19.3 deaths/100 person-years and in non-diabetics 13.3 deaths/100 person-years. However the difference varied by age (p-value for interaction: $p < 0.0001$). Although older patients had a higher mortality, the difference between DN patients and others was greatest in the young with a tripling of crude hazard in those less than 55 years. At one year after 90 days RRT, the proportion of 18–54 year old DN patients surviving had already dropped to 90%, with only 56% alive at 5 years after commencing RRT, compared with 96% and 85% respectively of others in the same age group (log-rank $p < 0.0001$).

Survival after 90 days RRT was examined with adjustment for social deprivation, late referral and the presence of co-morbidities (cardiovascular, peripheral vascular, smoking, malignancy, chronic obstructive pulmonary disease) (Tables 16.3 and 16.4). DN remained a significant predictor of death with a doubling of hazard for the age groups below 65 compared to others on RRT, even when adjusted for all known co-morbidities and time of referral. In

Table 16.2: Crude and adjusted effects of diabetic nephropathy on survival in the first 3 months after initiation of RRT in the full cohort and the cohort restricted to White patients, with and without available data on co-morbidity and referral (all adjusted for year of onset of RRT)

Effect of diabetic nephropathy on survival at 90 days	HR	95% CI	p-value
Full cohort			
Crude	0.70	0.61–0.81	<0.0001
Adjusted for:			
Age, gender, deprivation, modality	0.86	0.74–0.99	0.0396
Age, gender, deprivation, modality, co-morbidities*	1.05	0.79–1.40	0.7349
Age, gender, deprivation, modality, referral**	0.99	0.75–1.30	0.9225
Age, gender, deprivation, modality, co-morbidities, referral***	1.44	0.93–2.23	0.0996
Restricted to White patients			
Crude	0.69	0.56–0.86	0.0008
Adjusted for:			
Age, gender, deprivation, modality	0.92	0.74–1.14	0.4475
Age, gender, deprivation, modality, co-morbidities	1.14	0.77–1.69	0.5162
Age, gender, deprivation, modality, referral	1.01	0.72–1.42	0.9581
Age, gender, deprivation, modality, co-morbidities, referral	1.48	0.88–2.50	0.1429

HR = Hazard Ratio.
*n = 4,530.
**n = 5,777.
***n = 2,345.

contrast, in Whites above 65 years the effect of DN seemed to be due to co-morbidities. Social deprivation affected survival in White patients with an estimated gender, age and modality adjusted hazard ratio (HR) of 1.16 of the highest versus the lowest quintile (95% CI: 1.03, 1.32; p = 0.0125), which disappeared after further adjustment for co-morbidities (HR 0.93; 95% CI: 0.74, 1.20; p = 0.61). In all analyses, adjustment for referral only increased the effect of DN. This suggests DN has an even stronger association with poor survival despite earlier medical surveillance.

It remains unclear why young and middle-aged patients with DN have such increased mortality after adjusting for co-morbidity and smoking at the start of RRT. It may be that conventional cardiovascular interventions are either less well applied or are less beneficial in diabetics compared to non-diabetics[28]. Asymptomatic undetected coronary artery disease is also more common in DN patients at the start of RRT[29].

The main limitation of these analyses is incomplete data on co-morbidity. Data on vascular access were lacking. However, as data were only analysed from centres with a high data return, and because of the consistency of the findings across different subsets of the data, the results appear robust.

Factors amenable to influence

Reliance is placed on intermediate variables such as cholesterol, blood pressure and HbA1c to indicate cardiovascular risk and the quality of care. However, there is only limited knowledge of their role on outcome in patients on HD and PD. Current guidelines extrapolate from findings from the general population and the population with diabetes that are not yet needing RRT. There has been some recent evidence that cholesterol and blood pressure measurements are inversely associated with mortality in patients on HD and PD[30,31]. Similar observations were made by the UKRR in the 2003 Report[19]. These observations do not show cause and effect, but describe the situation given the limits of current dialysis practice: for example they may reflect that fitter patients feel well and eat more. Thus the following analyses must be interpreted with this in mind, as the optimal standards for HD and PD patients are not clear.

Blood pressure

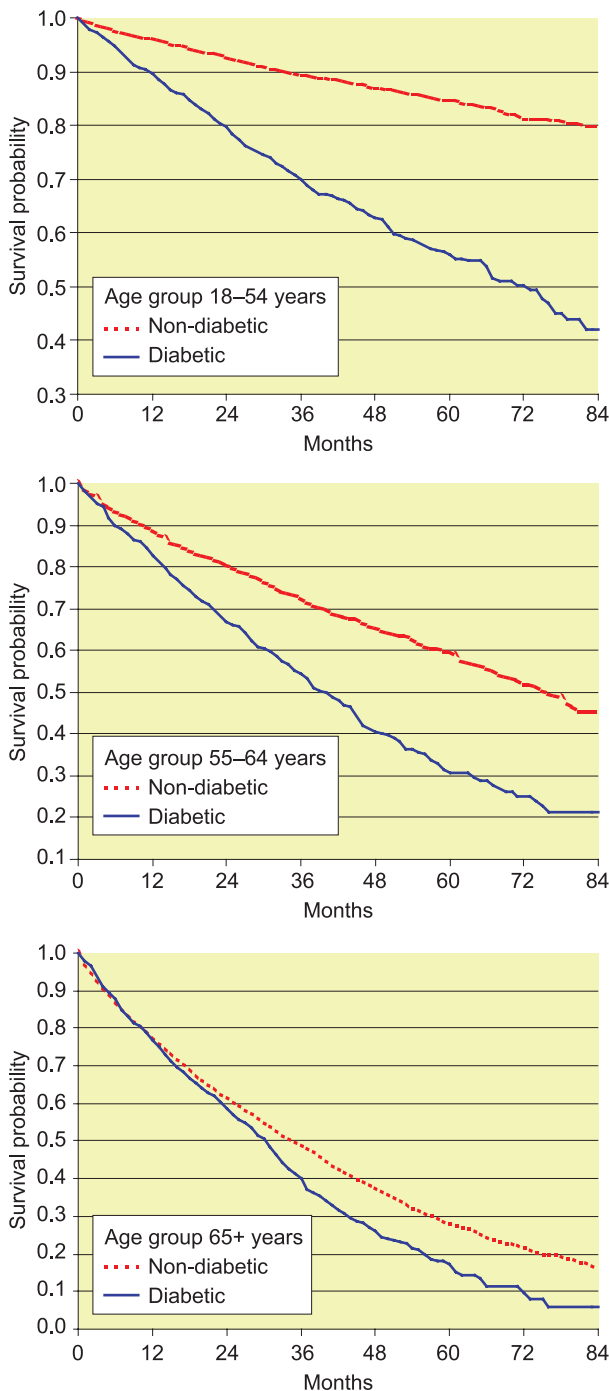Blood pressure was reported in 60% of patients at the start of RRT, in 50% at 90 days and in

Figure 16.2: Age-dependent survival of diabetic nephropathy patients and others on RRT after 90 days

Table 16.5. These are mostly clinically very small differences, even if sometimes statistically significant. URR is a little lower in DN patients, possibly due to the difficulties in establishing good vascular access. However post-dialysis systolic blood pressure is considerably higher in diabetic nephropathy patients.

In view of the unclear effect of lowering BP on survival in HD and PD, the implications of relatively poor achievement of BP targets are unknown.

Serum cholesterol

At the start of RRT, cholesterol was reported in only 36% of HD patients, in 47% of PD patients and in 44% of those who were transplanted. The reporting of cholesterol for incident dialysis patients has improved over the years; current (2004) 90 day figures are 65% in HD and 71% in PD patients. Data were less complete at 12 months: HD 50%, PD 55%. Cholesterol was reported in 65% of transplanted patients at 12 months.

In most instances, more diabetic nephropathy patients than other patients had a cholesterol level below 5 mmol/L. At the start of RRT the figures for HD were 74% (overall 70%, p = 0.143), for PD 63% (overall 56%, p = 0.002) and for transplants 67% (overall 52%, p = 0.25). All the day 90 results and the 12 month HD results were similar, whereas the 12 month result for PD had fallen to 54% (overall 46%, p = 0.001) and the transplant result to 42% (with no difference in DN patients).

HbA1c

HbA1c was not reported in 70% of both HD and PD patients with DN at the start of RRT, but the percentages of missing values decreased from 1997 (95% and 88% missing values for HD and PD respectively) to 2004 (64% missing values for all HD and PD patients). HbA1c values were reported for 11 of the 44 pre-emptively transplanted patients with DN. At 90 days, HbA1c data were reported on 46% of PD and HD patients with similar figures at 12 months. From 1997 to 2004, there was a substantial improvement in reporting of HbA1c values, from 23% of patients in 1997 to 62% of patients in those who had started RRT in 2003.

45% at 12 months. There was no difference between DN patients and others. On average, patients showed small decreases of blood pressure from 90 days to 1 year of RRT, with median values of −1 to −3 mmHg.

There are differences between patients with DN and others established on dialysis in some standard markers of good care, as shown in

Table 16.3: Crude and adjusted effects of diabetic nephropathy on survival in the full cohort with and without available data on co-morbidity and referral (all adjusted for year of onset of RRT) stratified by age-category

Effect of diabetic nephropathy	HR	95% CI	p-value
On survival in 18–54 year old patients			
Crude	3.27	2.85–3.75	<0.0001
Adjusted for:			
Age, gender, deprivation, modality	2.91	2.54–3.35	<0.0001
Age, gender, deprivation, modality, co-morbidities	1.87	1.32–2.65	0.0005
Age, gender, deprivation, modality, referral	3.30	2.57–4.23	<0.0001
Age, gender, deprivation, modality, co-morbidities, referral	2.03	1.17–3.50	0.0112
On survival in 55–64 year old patients			
Crude	1.91	1.68–2.17	<0.0001
Adjusted for			
Age, gender, deprivation, modality	1.83	1.61–2.09	<0.0001
Age, gender, deprivation, modality, co-morbidities	1.74	1.30–2.33	0.0002
Age, gender, deprivation, modality, referral	1.98	1.56–2.50	<0.0001
Age, gender, deprivation, modality, co-morbidities, referral	1.70	1.10–2.62	0.0160
On survival in patients aged 65 years and above			
Crude	1.20	1.10–1.31	<0.0001
Adjusted for:			
Age, gender, deprivation, modality	1.30	1.19–1.42	<0.0001
Age, gender, deprivation, modality, co-morbidities	1.15	0.94–1.40	0.1682
Age, gender, deprivation, modality, referral	1.38	1.16–1.64	0.0002
Age, gender, deprivation, modality, co-morbidities, referral	1.21	0.90–1.61	0.1995

HR = Hazard Ratio.

Table 16.4: Crude and adjusted effects of diabetic nephropathy on survival in the White cohort with and without available data on co-morbidity and referral (all adjusted for year of onset of RRT) stratified by age-category

Effect of diabetic nephropathy	HR	95% CI	p-value
On survival in 18–54 year old patients			
Crude	3.54	2.92–4.28	<0.0001
Adjusted for:			
Age, gender, deprivation, modality	3.23	2.66–3.91	<0.0001
Age, gender, deprivation, modality, co-morbidities	2.67	1.75–4.07	<0.0001
Age, gender, deprivation, modality, referral	3.58	2.69–4.75	<0.0001
Age, gender, deprivation, modality, co-morbidities, referral	2.61	1.39–4.93	0.0003
On survival in 55–64 year old patients			
Crude	2.03	1.68–2.44	<0.0001
Adjusted for:			
Age, gender, deprivation, modality	2.00	1.66–2.42	<0.0001
Age, gender, deprivation, modality, co-morbidities	1.94	1.30–2.89	0.0011
Age, gender, deprivation, modality, referral	2.16	1.63–2.86	<0.0001
Age, gender, deprivation, modality, co-morbidities, referral	1.97	1.17–3.31	0.0106
On survival in patients aged 65 years and above			
Crude	1.18	1.03–1.34	0.0135
Adjusted for:			
Age, gender, deprivation, modality	1.26	1.11–1.44	0.0005
Age, gender, deprivation, modality, co-morbidities	1.03	0.78–1.35	0.8466
Age, gender, deprivation, modality, referral	1.36	1.11–1.67	0.0034
Age, gender, deprivation, modality, co-morbidities, referral	1.02	0.71–1.46	0.9018

HR = Hazard Ratio.

Table 16.5: Median values for some markers of quality of care in patients with DN and non DN

Median	DN		Non-DN		Total		p-value
URR*		66.0		68.0		68.0	<0.0001
Interquartile range	59.0	70.0	62.4	73.0			
Number of patients		1,038		4,215		5,253	
Phosphate		1.59		1.61		1.60	0.3928
Interquartile range	1.29	1.95	1.27	2.00	1.27	2.00	
Number of patients		2,331		9,624		11,955	
Haemoglobin		11.4		11.6		11.5	<0.0001
Interquartile range	10.3	12.5	10.4	12.7	10.4	12.6	
Number of patients		2,317		9,578		11,895	
Diastolic BP**		75.0		76.0		76.0	0.0334
Interquartile range	65.0	84.0	66.0	85.0	66.0	85.0	
Number of patients		1,200		5,137		6,337	
Systolic BP**		143.0		135.0		136.0	<0.0001
Interquartile range	125.0	162.0	119.0	153.0	120.0	154.0	
Number of patients		1,200		5,139		6,339	

*Where treatment is HD.
**Post dialysis in HD patients.

At the start of RRT, the HbA1c value was below 7.5% in 58% of HD patients, in 44% of PD patients, and in 5 of the 11 pre-emptively transplanted patients with available HbA1c data. The 90 day figures were very similar but at 1 year, the difference between HD and PD patients was greater, with HbA1c below 7.5% in 54% of HD patients and 31% of PD patients with available data.

Conclusion

At the start of RRT most patients with DN were White; all cohorts had significantly worse long-term survival on RRT compared with other patients. The observed differences in survival were greatest in younger patients, which was not fully explained by known co-morbidity or social deprivation. Currently, the value of these findings is considerably limited by the poor reporting of co-morbidity, time of referral, blood pressure, serum cholesterol and HbA1c. It is hoped that improved data submission to the UKRR will improve audit and knowledge of the role of HbA1c, cholesterol and blood pressure targets in the survival of these patients.

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