Ethnic differences in survival on dialysis in Europe

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The role of psychosocial factors in ethnic differences in survival on dialysis in the Netherlands

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ABSTRACT

Background Ethnic minority patients on dialysis are reported to have better survival rates relative to Caucasians. The reasons for this finding are not fully understood and European studies are scarce. This study examined whether ethnic differences in survival could be explained by patient characteristics, including psychosocial factors.

Methods We analysed data of the Netherlands Cooperative Study on the Adequacy of Dialysis study, an observational prospective cohort study of patients who started dialysis between 1997 and 2007 in the Netherlands. Ethnicity was classified as Caucasian, Black or Asian, assessed by local nurses. Data collected at the start of dialysis treatment included demographic, clinical and psychosocial characteristics. Psychosocial characteristics included data on health-related quality of life (HRQoL), mental health status and general health perception. Cox proportional hazards analysis was used to explore ethnic survival differences.

Results One thousand seven hundred and ninety-one patients were Caucasian, 45 Black and 108 Asian. The ethnic groups differed significantly in age, residual glomerular filtration rate, diabetes mellitus, erythropoietin use, plasma calcium, parathormone and creatinine, marital status and general health perception. No ethnic differences were found in HRQoL and mental health status. Crude hazard ratios (HRs) for mortality for Caucasians compared to Blacks and Asians were 3.1 [95% confidence interval (CI) 1.6-5.9] and 1.1 (95% CI 0.9-1.5), respectively. After adjustment for a range of potential explanatory variables, including psychosocial factors, the HRs were 2.5 (95% CI 1.2-4.9) compared with Blacks and 1.2 (95% CI 0.9-1.6) compared with Asians.

Conclusion Although patient numbers were rather small, this study demonstrates, with 95% confidence, better survival for Black compared to Caucasian dialysis patients and equal survival for Asian compared to Caucasian dialysis patients in the Netherlands. This could not be explained by patient characteristics, including psychosocial factors.

INTRODUCTION

Ethnic minority patients with end-stage renal disease (ESRD) undergoing dialysis are reported to have improved survival compared to Caucasian dialysis patients.[1-4] While an increasing amount of data on ethnic survival inequalities on dialysis are available from the USA and Canada, there is a paucity of evidence from European countries. However, more research on non-Caucasian dialysis patients in Europe is desperately needed.[5] Limited European data show better survival for Black and South Asian dialysis patients compared to Caucasians in the UK[6] and better survival for immigrant dialysis patients compared to native Dutch patients in a single centre in the Netherlands.[7]

Different explanations for the better survival of ethnic minority patients have been suggested. Firstly, selection biases have been proposed, like higher mortality rates for non-Caucasians in early stages of chronic kidney disease (CKD)[8] and lower renal transplantation rates for non-Caucasians.[9] In addition, therapy with activated vitamin D agents[10] and ethnic differences in the burden of systemic atherosclerosis[11] might be potential explanations for ethnic survival disparities on dialysis.

It is hypothesized that better survival for ethnic minorities could also be due to psychosocial factors.[6;7;12-14] Favourable psychosocial conditions have been reported in ethnic minorities on dialysis treatment, such as better health-related quality of life (HRQoL)[15-17] and mental health.[18] These factors are independently associated with mortality in chronic dialysis patients.[19;20] Furthermore, general health perception may vary across ethnic groups and impact survival. General health perception is known to be an independent predictor of mortality in incident dialysis patients. It might influence health behaviour which in turn affects health status through poorer self-care and non-compliance with treatment.[21;22] To our knowledge, no study has systematically examined the role of psychosocial factors in ethnic differences in survival on dialysis.

The aim of this study was to determine the possible influence of ethnicity on survival of dialysis patients in the Netherlands and to investigate whether ethnic survival differences could be explained by different patient characteristics, including psychosocial factors. We used data of the Netherlands Cooperative Study on the Adequacy of Dialysis (NECOSAD) study, a follow-up study of incident dialysis patients in the Netherlands, in which demographic, clinical and psychosocial data are carefully collected.

MATERIALS AND METHODS

Study design

The NECOSAD-II is an observational prospective cohort study in the Netherlands in which ESRD patients who started dialysis treatment in 38 dialysis centres throughout the Netherlands between January 1997 and January 2007 were enrolled. Patients were eligible for the study if they were at least 18 years of age, started renal replacement therapy for the first time and were able to understand the Dutch language. Baseline is defined as 90 days after the start of dialysis treatment since patient characteristics are usually not yet stabilized at the start of dialysis treatment. All patients gave written informed consent before inclusion. The NECOSAD study was approved by the medical ethical committees of all participating centres.

Demographic and clinical characteristics

The following demographic and clinical data were collected at the start of dialysis treatment: age, gender, ethnicity, pre-dialysis treatment, primary cause of renal disease, smoking status and co-morbidity status. Three months after the start of dialysis treatment, the following additional data were obtained: dialysis modality, residual glomerular filtration rate (rGFR), dialysis dose (Kt/V), body mass index (BMI), mean arterial pressure, drug use and laboratory parameters. Data on ethnicity were recorded by local nurses. Patients were classified into the ethnicity categories Caucasian, Black, Asian or 'other', based on perceived ethnicity and if needed corroborated by direct patient inquiry. Patients originating from European countries, Turkey and Morocco were classified as Caucasians. Patients from Suriname were classified as either Asians (Hindustani) or Blacks (Creoles). Pre-dialysis treatment was defined as being in the care of a nephrologist at least 1 year prior to the start of dialysis treatment. The primary cause of kidney disease was classified according to the European Renal Association-European Dialysis and Transplantation Association (ERA-EDTA) codes.[23] Co-morbid conditions were determined by the patients' nephrologist and scored according to Davies' comorbidity index. Patients were classified as having no, intermediate or severe co-morbidity based on the type and number of co-morbid conditions present.[24] The rGFR was calculated as the mean renal clearance of urea and creatinine corrected for body surface area (mL/min/1.73 m²). The dialysis dose was expressed as total Kt/V urea per week and was calculated as urea clearance corrected for the urea distribution volume according to Watson *et al*.[25] Laboratory parameters were derived from routine blood laboratory

investigations determined in the dialysis centres. For haemodialysis (HD) patients, blood samples were taken prior to a dialysis session.

Psychosocial characteristics

The following psychosocial characteristics were obtained at the start of dialysis treatment: marital status, whether or not they had children, educational level and employment status. Three months after the start of dialysis, HRQoL, mental health status and general health perception were determined using self-reported questionnaires. HRQoL was assessed using the 36-item Short Form Health Survey Questionnaire (SF-36). The SF-36 measures eight dimensions of quality of life. In each dimension, the scores of the items create a subscale score on a 0-100 scale, with higher scores implying better HRQoL. Subscale scores were further combined to create physical (PCS) and mental (MCS) component summary scores. Mental health status was measured using the score of the SF-36 mental health dimension: the mental health score.[26;27] General health perception was determined using a single item from the SF-36: 'How would you say your health is in general?', which had five possible responses ranging from 1 (excellent) to 5 (poor). As the first two responses (excellent and very good) had both a low frequency, these categories were merged.

Cause of death

Cause of death was classified using the ERA-EDTA coding system.[23] Cardiovascular mortality was defined as death due to the following causes: myocardial ischaemia and infarction, hyperkalaemia, hypokalaemia, cardiac arrest, (hypertensive) cardiac failure, fluid overload, cerebrovascular accident, haemorrhage from a ruptured vascular aneurysm, mesenteric infarction and cause of death uncertain/unknown.

Statistical analysis

We used descriptive statistics as mean with SD or median with interquartile range, depending on the underlying distribution. Analysis of variance F and Kruskal-Wallis tests were used to compare continuous variables between the three ethnic groups and the Pearson´s chi-square test was used to compare categorical variables. Survival time was defined as the time between the start of dialysis treatment and the date of death or censoring. Death was ascribed to patient's initial treatment modality (intention-to-treat analysis). Patients were treated as censored when they underwent a renal transplantation, had a return of kidney function, refused further study participation, were lost to follow-up or reached the end of the study period at January 2008. Competing risk analysis was applied to

calculate cumulative incidence curves for renal transplantation and for mortality, taking account of mortality and renal transplantation, respectively, as competing end points.[28;29] Cox proportional hazards analysis was used to determine the influence of ethnicity on mortality. Multivariable adjustment was done deliberately within the causal pathway in order to explore mechanisms, as most variables being a consequence of ethnicity and therefore in the causal pathway between ethnicity and survival. To explore the effect of psychosocial variables on ethnic survival differences, we firstly adjusted the crude hazard ratio (HR) for mortality for demographic and clinical variables, followed by additional adjustment for psychosocial variables. In order to create complete datasets for multivariate Cox analysis, missing values for both continuous and categorical baseline characteristics were imputed with multiple imputation techniques (10 repetitions). With multiple imputation techniques, missing data are imputed by a value that is predicted using the patient's available characteristics, under the condition of missing 'at random'. Missing 'at random' means that the probability of missingness depends on other observed patient characteristics. Multiple imputation results in unbiased estimates of study associations and correctly estimated standard errors and confidence intervals.[30] Ferritin, rGFR and parathormone (PTH) were square root transformed before entering the multiple imputation model since these variables were not normally distributed. Variables had <10% missing values, except for BMI (11%), use of phosphate binders (12%), cholesterol (17%), rGFR (22%), mental health score (22%), HRQoL (22%), general health perception (22%) and Kt/V (23%). Baseline characteristics were calculated on both the original and imputed dataset; as the results were not materially different, presented data are based on the original dataset. Significance levels were determined at P-value ≤ 0.05. All analyses were carried out with SPSS 18.0 for Windows statistical software.

RESULTS

Baseline characteristics

Two thousand and fifty-one incident ESRD patients were included in the NECOSAD study. From this cohort, seven patients were excluded because data on ethnicity were not available and six patients were excluded because they belonged to an ethnic group other than Caucasians, Blacks or Asians. In this particular study, an additional 94 patients were excluded since they died or were censored within the first 90 days of dialysis treatment. Of 1944 patients eligible for analyses, 1791 were Caucasians (92%), 45 Blacks (2%) and 108 Asians (6%).

Table 1 describes the demographic and clinical characteristics at baseline of Caucasian, Black and Asian dialysis patients. Sixty-five percent of Caucasians and Asians and 67% of Blacks underwent HD as initial treatment modality. Compared to Caucasians, Blacks and Asians were significantly younger (mean age for Caucasians was 61 years, for Blacks 50 years and for Asians 56 years), had a lower rGFR (median rGFR 3.5, 2.3 and 3.0 mL/min/1.73m^2 for Caucasians, Blacks and Asians, respectively), had more frequently diabetes and Blacks and Asians used more often erythropoietin. Blacks had lower calcium levels, higher PTH levels and higher creatinine levels than Caucasians.

Table 2 demonstrates the psychosocial characteristics at baseline of Caucasian, Black and Asian dialysis patients. Compared to Caucasians, ethnic minorities were less likely to be married or live together. The mental health dimension and the component summary scores revealed no ethnic differences. No ethnic differences were found in the other dimensions of HRQoL (data not shown). Blacks reported more often a fair instead of good general health perception.

Table 1. Demographic and clinical characteristics at baseline of Caucasian, Black and Asian dialysis patients.

Characteristic	Caucasian (n=1791)		Black (n=45)		Asian (n=108)	
Demographic						
Age *years* ^^^	60.7	(15.0)	49.5	(16.5)	56.4	(14.1)
Sex *% men*	63		53		58	
Clinical						
Pre-dialysis treatment *% > 1 year*	70		68		69	
Treatment modality *% HD*	65		67		65	
Residual GFR *ml/min/1.73m²* * ^^	3.5	(1.8 – 5.5)	2.3	(0.7 – 4.2)	3.0	(1.5 – 4.8)
Body mass index *kg/m²*	24.7	(4.1)	25.1	(5.9)	24.5	(4.8)
Mean arterial pressure *mmHg*	102	(12)	103	(13)	103	(11)
Smoking *%* †	27		18		27	
Primary kidney disease %						
Diabetic nephropathy ^^^	13		29		28	
Glomerulonephritis	13		13		9	
Renal vascular disease	17		13		19	
Other ^^	57		44		44	
Co-morbidity %						
Davies co-morbidity score						
Intermediate	41		31		41	
Severe	9		11		12	
Diabetes mellitus ^^^	21		32		42	
Chronic heart disease ‡	25		26		25	
Peripheral vascular disease	15		8		11	
Drugs %						
Erythropoietin ^	85		93		94	
ACE-I / ARB §	32		33		31	
Phosphate binder	90		92		90	
Weekly Kt/V urea						
HD	3.5	(0.9)	3.1	(0.9)	3.4	(0.8)
PD	2.3	(0.6)	2.0	(0.7)	2.5	(0.7)
Laboratory investigations						
Hemoglobin *mmol/L*	6.9	(1.0)	6.7	(0.9)	6.8	(1.0)
Ferritin *µg/L*	141	(68 – 290)	163	(86 – 280)	136	(70 – 307)
Calcium *mmol/L* ‖ ^^	2.45	(0.25)	2.31	(0.30)	2.43	(0.28)
Phosphorus *mmol/L*	1.8	(0.5)	1.8	(0.6)	1.8	(0.6)
PTH *pmol/L* ^	13.5	(5.5 – 28.3)	24.7	(7.1 – 52.4)	17.7	(5.5 – 42.8)
Albumin *g/L*	36	(5)	37	(4)	36	(5)
Cholesterol *mmol/L*	5.0	(1.3)	4.6	(1.4)	5.1	(1.4)
Creatinine *µmol/L* ^^^	754	(239)	1007	(414)	800	(264)

Values are presented as mean (SD) or median (interquartile range) or percentage.

^ = *P* value > 0.01, ≤ 0.05, ^^ = *P* value > 0.001, ≤ 0.01, ^^^ = *P* value ≤ 0.001.

* Calculated as the mean renal clearance of urea and creatinine corrected for body surface.

† Current smoker or stopped smoking ≤ 3 months.

‡ Angina pectoris and/or myocardial infarction and/or congestive heart failure.

§ ACE inhibitor and / or AII receptor blocker.

‖ Corrected for albumin.

Table 2. Psychosocial factors at baseline of Caucasian, Black and Asian dialysis patients.

Characteristic	Caucasian (n=1791)		Black (n=45)		Asian (n=108)	
Social characteristics %						
Married / living together ^^^	72		42		60	
Low education *	57		47		53	
Not employed	80		82		80	
Having children	79		72		87	
Health related quality of life						
Mental health score	69	(20)	65	(18)	66	(23)
Mental component summary score	44	(11)	41	(12)	43	(12)
Physical component summary score	40	(10)	42	(8)	40	(10)
General health perception %						
Excellent/very good	5		4		1	
Good ^^	41		19		52	
Fair ^	47		67		37	
Poor	7		11		10	

Values are presented as mean (SD) or percentage.

^ = *P* value > 0.01, ≤ 0.05, ^^ = *P* value > 0.001, ≤ 0.01, ^^^ = *P* value ≤ 0.001.

* Low education: only primary school and/or lower vocational training.

Follow-up and outcomes

Table 3 demonstrates the duration of follow-up and incidence rates of different outcomes. The death rates were 148 for Caucasians, 51 for Blacks and 133 for Asians per 1000 patient-years. Compared to Blacks and Asians, Caucasians were more likely to die because of refusal of further ESRD treatment or because of suicide. Caucasians were more prone to receive a renal transplant (incidence rates for renal transplantation 100, 79 and 60 per 1000 patient-years for Caucasians, Blacks and Asians respectively), which is also illustrated by the cumulative incidence curves for transplantation (Figure 1a).

Table 3. Median follow-up time and outcomes of Caucasian, Black and Asian dialysis patients.

	Caucasian (n=1791)		**Black (n=45)**		**Asian (n=108)**	
Follow-up *months; median (IQR)*	29.3	(14.7 – 50.4)	48.0	(22.0 – 69.7)	33.6	(17.9 – 58.3)
Outcomes *incidence rates; per 1000 patient-years*						
Death	148	(n = 786)	51	(n = 9)	133	(n = 49)
Death due to suicide or refusal of treatment	17	(n = 92)	6	(n = 1)	5	(n = 2)
Transplanted	100	(n = 534)	79	(n = 14)	60	(n = 22)
Lost to follow-up	3	(n = 14)	11	(n = 2)	11	(n = 4)
Patient refused further study participation	34	(n = 181)	51	(n = 9)	24	(n = 9)
Other	23	(n = 121)	6	(n = 1)	22	(n = 8)

Survival

The cumulative mortality curves for Black, Asian and Caucasian dialysis patients during 10 years of follow-up showed a lower mortality for Blacks and a similar mortality for Asians relative to Caucasians (Figure 1b). Renal transplantation was taken into account as a competing end point. After 1, 2 and 5 years of follow-up, respectively, 87, 73 and 33% of the Blacks, 80, 64 and 20% of the Asians and 75, 53 and 15% of the Caucasians were on dialysis treatment.

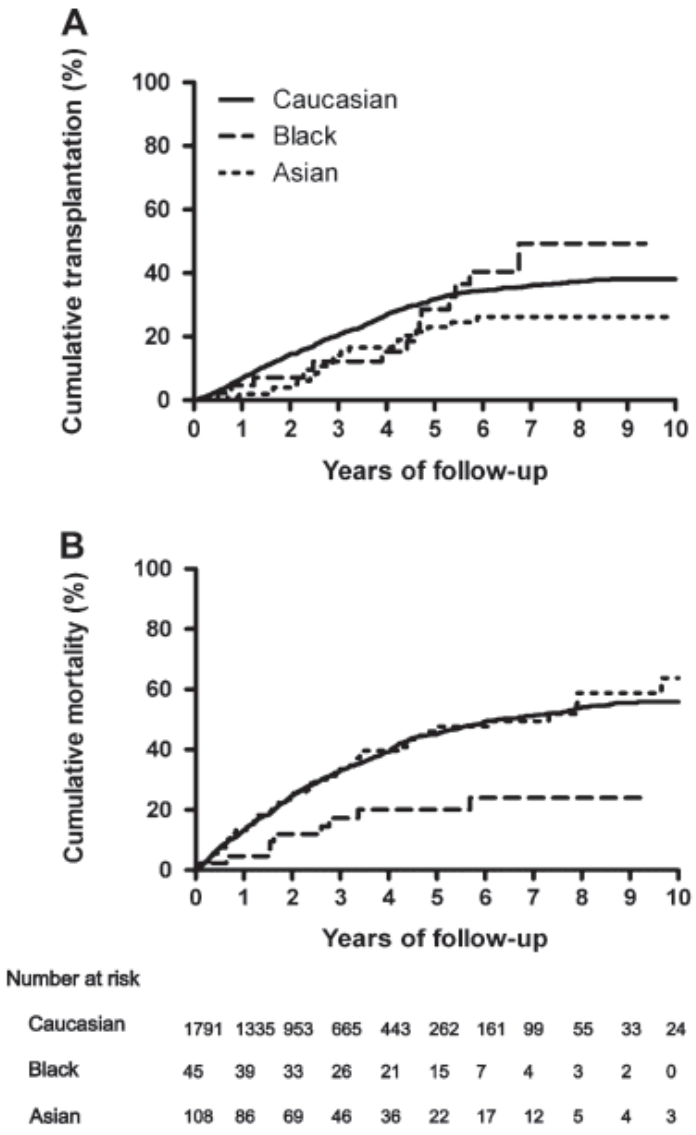

Figure 1. (A) Cumulative renal transplantation curves during 10 years of follow-up for Caucasian, Black and Asian dialysis patients, taking into account mortality as a competing endpoint. (**B)** Cumulative mortality curves during 10 years of follow-up for Caucasian, Black and Asian dialysis patients, taking into account renal transplantation as a competing end point.

The crude HR for mortality [95% confidence interval (CI)] for Caucasians versus Blacks was 3.1 (95% CI 1.6-5.9) and for Caucasians versus Asians 1.1 (95% CI 0.9-1.5). After adjustment for age and gender, HRs were 2.0 (95% CI 1.4-2.8) and 0.9 (95% CI 0.8-1.1), respectively. After additional adjustment for demographic and clinical characteristics, HRs were 2.5 (95% CI 1.2-4.8) and 1.2 (95% CI 0.9-1.6), respectively (Model 7, Table 4). Further adjustment for social characteristics, PCS, MCS, mental health status and general health perception did not further influence the HRs (Models 8-9, Table 4).

Table 4. Hazard ratios for mortality for Caucasian versus Black and Caucasian versus Asian dialysis patients, adjusted using gradually more complex multivariate models.

Model		**Caucasian vs. Blacks**		**Caucasian vs. Asian**		**Variables tested**
		HR	**(95% CI)**	**HR**	**(95% CI)**	
1.	Unadjusted	3.1	(1.6 – 5.9)	1.1	(0.9 – 1.5)	Ethnicity
2.	Demographic	2.0	(1.4 – 2.7)	0.9	(0.8 – 1.1)	Model 1 *plus* age, age*age, gender
3.	Clinical	2.5	(1.3 – 5.0)	1.2	(0.9 – 1.6)	Model 2 *plus* BMI, pre-dialysis treatment, rGFR, dialysis modality, primary kidney disease, MAP, smoking
4.	Co-morbidity	2.5	(1.3 – 4.9)	1.2	(0.9 – 1.6)	Model 3 *plus* Davies co-morbidity score
5.	Laboratory investigations	2.4	(1.2 – 4.7)	1.2	(0.9 – 1.7)	Model 4 *plus* haemoglobin, calcium, albumin, phosphorus, PTH, ferritin, cholesterol, creatinine, creatinine*dialysis modality
6.	Dialysis dose	2.4	(1.2 – 4.7)	1.2	(0.9 – 1.7)	Model 5 *plus* Kt/Vurea, Kt/Vurea*dialysis modality
7.	Drug use	2.4	(1.2 – 4.8)	1.2	(0.9 – 1.7)	Model 6 *plus* use of erythropoietin, ACEi/ARB, phosphate binders
8.	Social characteristics	2.5	(1.3 – 4.9)	1.2	(0.9 – 1.6)	Model 7 *plus* marital status, education level, employment, children
9.	Quality of life	2.5	(1.2 – 4.9)	1.2	(0.9 – 1.6)	Model 8 *plus* mental health score, MCS score, PCS score, general health perception

Abbreviations: BMI = body mass index; rGFR = residual glomerular filtration rate; MAP = mean arterial pressure; PTH = parathormone; ACEi/ARB = ACE inhibitor and / or AII receptor blocker; MCS = mental component summary; PCS = physical component summary.

Subgroup analyses

Several subgroup analyses were performed, selected a priori based on clinical relevance.[5;6] Firstly, we tested whether HRs for mortality for Caucasians relative to both ethnic minority groups were different for HD and peritoneal dialysis (PD) patients. The increased mortality risk for Caucasians compared to Blacks was present among HD patients but absent among PD patients [age and gender adjusted HRs 3.1 (95% CI 1.9-4.8) for HD patients and 0.7 (95% CI 0.3-1.9) for PD patients]. The HR for Caucasians versus Asians was somewhat increased in HD patients relative to PD patients [age and gender adjusted HRs 1.0 (95% CI 0.9-1.3) for HD patients and 0.7 (95% CI 0.4-1.2) for PD patients].

Secondly, a subanalysis by age group (> and ≤ 65 years) showed a higher risk for mortality for Caucasians compared to Blacks in older versus younger dialysis patients [crude HRs 2.8 (95% CI 1.7-4.7) and 2.2 (95% CI 0.9-5.0), respectively]. Equal HRs for mortality for Caucasians compared to Asians were found in old and young patients [crude HRs 1.1 (95% CI 0.9-1.4) and 0.9 (95% CI 0.6-1.3), respectively].

Finally, it was tested whether ethnic differences in survival differed by gender. The increased mortality risk for Caucasians compared to Blacks was higher for males than for females [crude HRs 3.9 (95% CI 2.4-6.4) and 2.4 (95% CI 1.5-3.7), respectively]. The risk of mortality for Caucasians versus Asians was not different for both genders [crude HRs 1.0 (95% CI 0.7-1.5) and 1.3 (95% CI 0.8-2.1) for males and females, respectively].

DISCUSSION

This observational study examined differences in survival between 1791 Caucasian, 45 Black and 108 Asian patients who started dialysis in the Netherlands between 1997 and 2007 and studied whether ethnic differences in survival could be explained by patient characteristics, in particular by psychosocial factors. Black patients were found to have a three-fold better survival rate compared to Caucasians. The increased mortality for Caucasians relative to Blacks was only present among HD patients but absent among peritoneal dialysis (PD) patients. Baseline characteristics did not explain this survival disparity. Asians had a survival comparable to Caucasians, also after adjusting for baseline characteristics. In particular, no indication has been found that ethnic differences in survival on dialysis could be due to psychosocial factors.

In the interpretation of these results, several factors need to be taken into account. Firstly, in the NECOSAD study, ethnicity was measured in broad categories and data on specific country of origin within a region were not available. Secondly, ethnicity was assessed by local nurses, which might reflect both genetic components and cultural aspects. For examining these components separately, data on genetic factors, migration history, religion, and cultural orientation are needed, which are not present in the NECOSAD database. Thirdly, although the SF-36 is a generic, reliable and valid HRQoL instrument that is extensively used and has been reported to predict mortality risk in dialysis patients[26;27], the results may be subject to cultural bias as the interpretation of the questions might have been different among the different ethnic groups. However, SF-36 has been used frequently in Blacks in the USA, also in a dialysis setting.[17] Fourthly, the exclusion of patients who were not able to understand the Dutch language may have resulted in selection of a subgroup that is more culturally adapted to the Western society. As a result, this subgroup would likely more closely resemble the original Dutch population with regard to health behaviour and consequent mortality.[12] This, however, would imply that our results are in fact an underestimation of the real effect. Finally, due to sample size limitations, we did not enter interaction terms in the multivariate Cox proportional hazards model, implying that the effect of a covariate on mortality is assumed to be equal among different ethnic groups.[31;32] Further research is needed to examine the role of effect modification in ethnic survival disparities on dialysis.

The better survival for Black compared to Caucasian dialysis patients is extensively described. A nationwide study from the UK has found a 2.5-fold higher mortality risk for White compared to Black incident dialysis patients. After adjusting for sociodemographic and clinical conditions, White dialysis patients retained an 80% (HD) and 60% (PD) higher risk of mortality.[6] To our knowledge, in other European countries, data on survival of Black dialysis patients are lacking. In Canada and the USA, similar results, though smaller point estimates, have been found.[1-3] Different explanations for the better survival for Blacks have been proposed, like differences in mineral and bone disorders[10;33], mortality risks in early stages of CKD[8;34], burdens of systemic atherosclerosis[11] and incidences of vascular events and myocardial infarction during renal replacement therapy.[35;36] However, these factors do not completely explain survival differences.

Asians had comparable survival to Caucasians. Data from the UK show a 1.6 times higher risk for mortality for Caucasians compared to Asians, decreasing to 1.4 after full adjustment.[6]

Studies from the USA and Canada have also found better survival for Asians, with HRs similar to the UK study.[2;3;37;38] This discrepancy might be explained by a different composition of the Asian groups. In the present study, Asians from diverse origins were included, including Suriname Hindustani, while in the UK study, only patients originating from the Indian subcontinent, including Pakistan, India, Bangladesh and South Asian mixed were included. In the Canadian studies, the Asian groups consisted of Southeast, South and Oriental Asians. In the US studies the composition of the Asian groups was not described. Unpublished data from a Dutch study (by Tessa O. van den Beukel, Friedo W. Dekker and Carl E.H. Siegert) in which the survival of native and immigrant incident dialysis patients was compared[7] revealed a 5.1 (95% CI 1.1-24.0)-fold higher mortality for Suriname Hindustani (n=22) compared to patients originating from the Asian continent (n=18). The inclusion of Suriname Hindustani in the Asian group might therefore have diminished the difference in survival between Caucasians and Asians.

As in previous studies, ethnic minorities were found to have better psychosocial factors,[15-18] it was hypothesized that these factors play a role in ethnic survival disparities on dialysis.[6;7;12-14] We did not find better psychosocial factors for ethnic minority patients. This might be due to the fact that our cohort comprises incident dialysis patients: it has been suggested that differences in HRQoL between ethnic groups become more apparent when patients' dialysis vintage increases.[39] An increase in access to good quality health care after the initiation of dialysis for ethnic minorities, which might improve the perception of quality of life,[40] could be an underlying reason for more apparent differences in HRQoL between ethnic groups during their course on dialysis. Studies on psychosocial factors of ethnic minority patients on dialysis in Europe are limited. In the UK, it was found that Asian HD patients had equal HRQoL compared to White HD patients, while Asian PD patients had lower HRQoL compared to White PD patients.[41] It is hard to compare these findings with the present study, as the composition of both Asian groups is likely to be different and in the UK study, patients were matched for age, gender and diabetes status.

No evidence was found for psychosocial factors being an explanation for ethnic differences in survival on dialysis. Feroze *et al*[42] recently showed data suggesting that psychosocial factors (mental health) have equal effect on mortality among African Americans and non-African Americans. Although the authors did not report the effect of race on mortality and the effect of adjustment for psychosocial factors (mental health), their data suggest that the effect of psychosocial factors (mental health) on mortality is the same for both ethnic

groups. This finding supports our results that psychosocial factors are not the explanation of ethnic differences in survival.

Our finding of a lower rate of withdrawal from dialysis for ethnic minorities is consistent with the results of prior studies[2;43-46] and might partly explain ethnic survival disparities. Different coping mechanisms with ESRD may play a role. Indications have been found that Blacks are more likely than Caucasians to use spirituality and religiosity to cope with CKD.[47-49] The impact of these coping mechanisms on the general outcome of different ethnic groups on dialysis should be a topic of further research.

CONCLUSION

Although the number of Black and Asian patients were relatively small, this study demonstrated, with 95% confidence, better survival for Black compared to Caucasian dialysis patients, and similar survival for Asian compared to Caucasian dialysis patients in the Netherlands. No evidence was found for psychosocial factors being an explanation for ethnic differences in survival on dialysis. Further research is needed to explore ethnic survival inequalities, especially in European countries where none have thus far been collected. Detailed information about ethnic origin, cultural aspects, coping mechanisms and effect modification are essential factors to take into account. Further research may provide knowledge for improving survival of all dialysis patients and may yield insights to adapt current clinical guidelines for specific ethnic groups.

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