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Original Investigation

Ethnic Disparities in CKD in the Netherlands: The Healthy Life in an Urban Setting (HELIUS) Study

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Background: Evidence suggesting important ethnic differences in chronic kidney disease (CKD) prevalence comes mainly from the United States, and data among various ethnic groups in Europe are lacking. We therefore assessed differences in CKD in 6 ethnic groups living in the Netherlands and explored to what extent the observed differences could be accounted for by differences in conventional cardiovascular risk factors (smoking, physical activity, obesity, hypertension, diabetes, and hypercholesterolemia).

Study Design: Cross-sectional analysis of baseline data from the Healthy Life in an Urban Setting (HELIUS) cohort study.

Setting & Participants: A random sample of 12,888 adults (2,129 Dutch, 2,273 South Asian Surinamese, 2,159 African Surinamese, 1,853 Ghanaians, 2,255 Turks, and 2,219 Moroccans) aged 18 to 70 years living in Amsterdam, the Netherlands.

Predictors: Ethnicity.

Outcomes & Measurements: CKD status was defined using the 2012 KDIGO (Kidney Disease: Improving Global Outcomes) severity of CKD classification. CKD was defined as albumin-creatinine ratio $\geq$ 3 mg/mmol (category $\geq$ A2) or glomerular filtration rate $<$ 60 mL/min/1.73 m^2 (category $\geq$ G3). Comparisons among groups were made using prevalence ratios (PRs).

Results: The age-standardized prevalence of CKD was higher in all ethnic minority groups, ranging from 4.6% (95% CI, 3.8%-5.5%) in African Surinamese to 8.0% (95% CI, 6.7%-9.4%) in Turks, compared with 3.0% (95% CI, 2.3%-3.7%) in Dutch. Adjustment for conventional risk factors reduced the PR substantially, but ethnic differences remained for all ethnic minority groups except African Surinamese, with the PR ranging from 1.48 (95% CI, 1.12-1.97) in Ghanaians to 1.75 (95% CI, 1.33-2.30) in Turks compared with Dutch. Similar findings were found when CKD was stratified into a moderately increased and a combined high/very high risk group. Among the combined high/very high CKD risk group, conventional risk factors accounted for most of the ethnic differences in CKD except for South Asian Surinamese (PR, 2.60; 95% CI, 1.26-5.34) and Moroccans (PR, 2.33; 95% CI, 1.05-5.18).

Limitations: Cross-sectional design.

Conclusions: These findings suggest ethnic inequalities in CKD for most groups even after adjustment for conventional risk factors. These findings highlight the need for further research to identify other potential factors contributing to the ethnic inequalities in CKD.

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INDEX WORDS: Chronic kidney disease (CKD); CKD prevalence; ethnic disparities; health inequalities; ethnicity; ancestry; cultural heritage; risk factor; cardiovascular risk; conventional risk factors; lifestyle; public health; Healthy Life in an Urban Setting (HELIUS) cohort; Europe; the Netherlands.

Chronic kidney disease (CKD) is an important global public health burden that is associated with adverse health outcomes and high health care costs.[1-3] It can progress to end-stage renal disease (ESRD) and amplify the risk for cardiovascular complications. Patients with CKD stages 4 to 5, for example, have 2 to 4 times higher risk for cardiovascular complications compared with the general population, whereas patients with ESRD have 100 times higher risk independent from other risk factors.[4]

Evidence shows marked ethnic differences in the incidence of ESRD.[5-8] Incidence rates in Hispanic, Native American, and African American populations in the United States, for example, have been shown to be about 1.5, 1.8, and 3.6 times greater than the incidence in European Americans, respectively.[5] Similarly, the

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incidence of ESRD in South Asian and African Caribbean minority groups in the United Kingdom is 3- to 4-fold higher than in the UK general population.[7] Furthermore, evidence suggests significant differences in ESRD causes among the various ethnic groups.[5] Hypertensive nephropathy has been shown to be the most common cause of ESRD among African Americans, whereas diabetic nephropathy most commonly causes ESRD in other US ethnic groups.[5] Progression to ESRD has also been found to occur faster in ethnic minority groups than in the populations of European origin in the United States and United Kingdom.[6,8] Although the incidence is higher and progression to ESRD is faster in ethnic minority groups, US studies show similar levels of CKD among African American, Hispanic, and white Americans. These observations suggest that differences in factors such as awareness of CKD and access to health care may play a major role in ethnic differences in CKD-related health outcomes.[9,10]

Although ethnic inequalities in CKD-related outcomes are observed in the United States and United Kingdom, the situation in other European countries, including the Netherlands, is currently unknown. Ethnic compositions and the national contexts vary across countries. For example, evidence indicates a lower prevalence of CKD in the Netherlands compared to the United States.[11] We previously showed that major differences in risk factors, particularly hypertension and diabetes, exist among similar ethnic groups residing in different European countries.[12,13] In addition, CKD data for major ethnic groups such as Turks and Moroccans in Europe are currently lacking. The main aims of this study therefore were to assess differences in CKD in 6 ethnic groups and explore whether the observed differences could be accounted for by conventional cardiovascular risk factors (smoking, physical activity, obesity, hypertension, diabetes, and hypercholesterolemia) in the Netherlands using the Healthy Life in an Urban Setting (HELIUS) Study baseline data.

METHODS

Study Population

The HELIUS Study is a multiethnic cohort study conducted in Amsterdam, the Netherlands. The rationale, conceptual framework, design, and methodology of HELIUS have been described in detail elsewhere.[14] Briefly, the study began in 2011 and includes people aged 18 to 70 years from the 6 largest ethnic groups in Amsterdam, including those of African Surinamese, South Asian Surinamese, Turkish, Moroccan, Ghanaian, and Dutch origin. The HELIUS Study focuses mainly on 3 major disease categories, including cardiovascular disease, mental health, and infectious diseases. Participants were randomly selected from the Amsterdam municipal registers, stratified by ethnicity. Data were collected by questionnaire and physical examination. Biological samples were obtained during the physical examination. The Academic Medical Centre Ethical Review Board approved the study protocols (METC 10/100# 10.17.1729), and all participants provided written informed consent.

For the current study, baseline data that were collected until June 2014 were used, including 13,316 participants for whom questionnaire data as well as data for physical measurements are available. For the current analyses, participants with unknown ethnic origin (n = 26), unknown Surinamese ethnic origin (n = 141), Javanese Indonesian Surinamese origin (n = 137), and individuals with no data for CKD (n = 124) were excluded. This resulted in a data set of 12,888 participants, including 2,129 Dutch, 2,273 South Asian Surinamese, 2,159 African Surinamese, 1,853 Ghanaians, 2,255 Turks, and 2,219 Moroccans.

Measurements

Ethnic origin was defined according to participants' country of birth, as well as country of birth of their parents.[14] Specifically, participants are considered of non-Dutch ethnic origin if they fulfil either of the following criteria: (1) born abroad and have at least one parent born abroad or (2) born in the Netherlands but have both parents born abroad. The Surinamese origin population is made up of several ethnic groups. Hence, self-identification was also used to further distinguish Surinamese of African origin and South Asian origin from Surinamese of other origins. Educational level was based on the highest qualification gained either in the Netherlands or in the country of origin and was classified into 4 groups: those who have never been to school or had elementary schooling only, those with lower vocational schooling or lower secondary schooling, those with intermediate vocational schooling or intermediate/higher secondary education schooling, and those with higher vocational schooling or university. Smoking status was determined from the response to the question "Do you smoke at all?" and was classified into nonsmokers and current smokers. Physical activity was assessed using the Short Questionnaire to Assess Health-Enhancing Physical Activity (SQUASH) questionnaire[15] and was classified into 2 categories: achieving the international norm for recommended physical activity (at least 30 minutes of moderate- and high-intensity activity per day on at least 5 days per week) or not.

Weight was measured in light clothing with a seca 877 scale to the nearest 0.1 kg. Height was measured without shoes with a portable stadiometer (seca 217) to the nearest 0.1 cm. Body mass index was calculated as weight (kg) divided by height squared (m^2). Blood pressure (BP) was measured using a validated automated digital BP device (WatchBP Home; Microlife AG) on the left arm in a seated position after the person had been seated for at least 5 minutes. Both anthropometrics and BP were measured twice, and the mean of the 2 measurements was used in the analyses. Hypertension was defined as systolic BP $\geq$ 140 mm Hg, or diastolic BP $\geq$ 90 mm Hg, or being on antihypertensive medication treatment.

Fasting blood samples were drawn and plasma samples were used to determine glucose, lipid, and creatinine concentrations. Glucose concentration was determined by spectrophotometry, using hexokinase as the primary enzyme, and total cholesterol, by colorimetric spectrophotometry (Roche Diagnostics). Type 2 diabetes was defined as fasting glucose level $>$ 7 mmol/L and/or receiving medication for increased blood glucose level. Hypercholesterolemia was defined as total cholesterol level $\geq$ 6.22 mmol/L. Serum creatinine concentration (in μmol/L) was determined by a kinetic colorimetric spectrophotometric isotope-dilution mass spectrometry–calibrated method (Roche Diagnostics). Participants were asked to bring an early morning urine sample for direct analyses of albuminuria and creatinine levels. Urinary albumin concentration (in mg/L) was measured by an immunochemical turbidimetric method (Roche Diagnostics). Urinary creatinine concentration (in mmol/L) was measured by a kinetic spectrophotometric method (Roche Diagnostics). Estimated