

CKD and ESRD in US Hispanics

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Hispanics are the largest racial/ethnic minority group in the United States, and they experience a substantial burden of kidney disease. Although the prevalence of chronic kidney disease (CKD) is similar or slightly lower in Hispanics than non-Hispanic whites, the age- and sex-adjusted prevalence rate of end-stage renal disease is almost 50% higher in Hispanics compared with non-Hispanic whites. This has been attributed in part to faster CKD progression among Hispanics. Furthermore, Hispanic ethnicity has been associated with a greater prevalence of cardiovascular disease risk factors, including obesity and diabetes, as well as CKD-related complications. Despite their less favorable socioeconomic status, which often leads to limited access to quality health care, and their high comorbid condition burden, the risk for mortality among Hispanics appears to be lower than for non-Hispanic whites. This survival paradox has been attributed to a complex interplay between sociocultural and psychosocial factors, as well as other factors. Future research should focus on evaluating the long-term impact of these factors on patient-centered and clinical outcomes. National policies are needed to improve access to and quality of health care among Hispanics with CKD.

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Introduction

The term “Hispanic” or “Latino” describes a group of individuals sharing a common cultural heritage and frequently a common language, but it does not necessarily denote a race or a common ancestry.¹ Although Hispanics are considered to be a single ethnic group that can self-identify as any race as defined by the US Census, they represent a heterogeneous mixture of Native American, European, and African ancestries.² It is estimated that 57.5 million Hispanics currently reside in the United States, making Hispanics the largest minority in the country, and this number is projected to double in the next 20 years.³ Chronic kidney disease (CKD) is a major public health problem that affects 8% to 16% of the population worldwide,⁴ including 1 in 7 adults in the United States.⁵ In this review, we discuss the epidemiology of CKD and related comorbid conditions in US Hispanics, address health disparities that affect this segment of the population, and highlight potential areas for future research.

Epidemiology of CKD in US Hispanics

Incidence

More than 17,000 US Hispanics entered the Medicare end-stage renal disease (ESRD) program in 2014. An increased incidence of ESRD in Hispanics compared with non-Hispanics was first reported in the 1980s in Texas and subsequently confirmed by studies at the national level.^{6,7} Based on the US Renal Data System (USRDS) 2016 data report, adjusted ESRD incidence rates among Hispanics have been stable or somewhat declining since 2001. However, although the absolute difference in incident ESRD rates between Hispanics and non-Hispanics has declined over the years, the age-, sex-, and race-adjusted rate remains nearly 35% higher among Hispanics compared with non-Hispanics (456 vs 337 per million population).⁸

Less is known about incidence rates of earlier CKD stages. Among participants in the Multi-Ethnic Study of

Atherosclerosis (MESA), compared with whites, Hispanics had higher rates of incident CKD (defined as estimated glomerular filtration rate [eGFR] < 60 mL/min/1.73 m² and a decline in eGFR ≥ 1 mL/min/1.73 m² per year): 0.30 versus 0.09 per year among participants with baseline eGFRs > 90 mL/min/1.73 m² and 2.32 versus 1.85 per year among those with baseline eGFRs of 60 to 90 mL/min/1.73 m². However, these differences were not statistically significant in multivariable models adjusting for sociodemographic factors (age, sex, income, and education) and baseline eGFR. Moreover, although Mexican/Central American and South American Hispanics had similar rates of eGFR decline compared with whites, the authors found faster eGFR declines among Dominicans and Puerto Ricans compared with whites (0.54 and 0.47 mL/min/1.73 m² per year faster, respectively, *P* < 0.05 for each). These differences were statistically significant even after adjusting for sociodemographic and clinical factors.⁹ In another study of 10,420 patients with hypertension in an inner-city health care delivery system, the risk for incident CKD (defined as eGFR < 60 mL/min/1.73 m² for at least 3 months) and the rate of eGFR decline over time were similar in Hispanics compared with whites.¹⁰ Of note, this retrospective study did not evaluate Hispanics by country of origin, which might explain the apparent discordant findings.

Prevalence

Until a few years ago, information regarding the prevalence of CKD in US Hispanics had been limited to analyses of data from the National Health and Nutrition Examination Survey (NHANES), which by design includes predominantly Mexican Americans, with minimal representation of the other major US Hispanic background groups.¹¹ Based on these data, compared with non-Hispanic whites, Hispanics were found to have a lower prevalence of decreased eGFR^{11,12} and higher prevalence of albuminuria, even after accounting for the presence of diabetes.¹³⁻¹⁵

More recently, the prevalence of CKD was estimated in the population-based Hispanic Community Health Study/Study of Latinos (HCHS/SOL), which includes more than 16,000 US Hispanic adults with representation of the major Hispanic background groups.¹⁶ Among women, the prevalence of CKD, defined as eGFR < 60 mL/min/1.73 m² or albuminuria based on sex-specific cut points, was 13.0%, and it was lowest in South Americans (7.4%) and highest in Puerto Ricans (16.6%). In men, the prevalence of CKD was 15.3%, and it was lowest in South Americans (11.2%) and highest in those who identified their Hispanic background as “other” (16.0%). However, the overall prevalence of CKD (14%) was similar to that in non-Hispanic whites in NHANES 2007 to 2010.¹⁷

These findings are in contrast to the higher prevalence of ESRD in Hispanics compared with non-Hispanics. According to the USRDS, there were more than 85,000 Hispanics in the United States receiving dialysis treatment in 2014, which corresponds to a prevalent rate nearly 40% higher in Hispanics compared with non-Hispanics (2,917 vs 1,847 per million population).⁸ The higher rate of ESRD despite a similar prevalence of CKD in Hispanics versus non-Hispanics suggests that Hispanics may be at increased risk for CKD progression, or alternatively that the mortality rate before the onset of ESRD is lower in Hispanics than in non-Hispanic whites.¹⁸ As discussed next, findings from the Hispanic Chronic Renal Insufficiency Cohort (Hispanic CRIC) Study suggest the former.

CKD Progression in Hispanics

Several studies have evaluated the relationship between race/ethnicity and CKD progression,¹⁸⁻²³ with some but not all reporting higher risk for ESRD in Hispanics compared with non-Hispanic whites (Table 1). In a study of nearly 40,000 adults with stage 3 or 4 CKD enrolled in Kaiser Permanente of Northern California, relative to non-Hispanic whites, Hispanic ethnicity was independently associated with higher risk for progression to ESRD (dialysis or kidney transplantation) during the 4-year mean follow-up period (adjusted hazard ratio [HR], 1.33; 95% confidence interval [CI], 1.17-1.52).²⁰ Similarly, compared with non-Hispanic whites, participants in the Hispanic CRIC Study experienced higher rates of progression to ESRD during a mean follow-up of 5 years (2.6 vs 1.4 per 100 person-years).²³ In multivariable analyses, the risk for CKD progression was 81% higher in Hispanics compared with non-Hispanic whites (HR, 1.81; 95% CI, 1.34-2.45) after adjustment for important sociodemographic and clinical characteristics. However, this excess risk was attenuated and no longer statistically significant (HR, 1.32; 95% CI, 0.96-1.81) after accounting for differences in urine protein excretion regardless of diabetes status; of note, the median 24-hour urine protein excretion at study entry was 0.71 g in Hispanics and 0.12 g in non-Hispanics.²³ Importantly, compared with non-Hispanic whites, Hispanics in this study were less likely

to achieve recommended goals for CKD management, including blood pressure control, secondary prevention of cardiovascular disease, and angiotensin-converting enzyme inhibitor/angiotensin receptor blocker use.^{24,25} These disparities in CKD care may have contributed to the higher protein excretion and disease progression among Hispanics. Moreover, at study entry, Hispanic CRIC participants were found to have more unfavorable metabolic biomarker concentrations and a greater burden of left ventricular hypertrophy.^{24,25}

Risk Factors for CKD and Comorbid Conditions in Hispanics

Diabetic Kidney Disease

During their lifetimes, >50% of US Hispanics are expected to develop type 2 diabetes.²⁶ Although incidence rates for ESRD attributed to diabetes have stabilized or slightly declined during the past 10 years, diabetes remains the main cause of ESRD among US Hispanics.⁸ Furthermore, the risk for ESRD attributed to diabetes has been found to be greater in Hispanics versus non-Hispanic whites.^{8,19} Racial/ethnic differences in protein excretion among persons with diabetes have also been observed.^{23,27} Environmental and genetic factors have been proposed as potential mechanisms to explain these differences.²⁸

Genetic Factors

The Hispanic population within the United States is genetically diverse, with various proportions of Native American, African, and European genetic ancestry, depending on historical interactions with migrants from Europe and Africa and Native American populations.² Therefore, it is not surprising that prevalences of CKD and its risk factors (eg, hypertension, diabetes, and obesity) among Hispanics vary by country of origin.^{16,29-33} The proportion of African genetic ancestry, which is higher in the Caribbean (Puerto Rican, Dominican, or Cuban) than in the Mainland (Mexican or Central or South American) group, has been associated with risk for CKD.³⁴ A recent study from HCHS/SOL showed that the presence of 2 copies of APOL1 risk alleles, found in chromosomal regions of African ancestry, is associated with prevalent CKD among Hispanics.³⁵ Of note, in this study, Caribbean Hispanics had a 10-fold higher frequency (1% vs 0.1%) of 2 APOL1 risk alleles versus 0/1 copy compared with Mainland Hispanics. In another study, 2 APOL1 risk alleles predicted lower age of dialysis therapy initiation among Hispanics with non-diabetic ESRD.³⁶ Furthermore, studies have found an association between increased urine albumin excretion and Native American ancestry in Hispanics,^{1,30} which have been attributed to specific genetic variants found among Pima Indians.³⁷ Future studies should examine whether the genetic variants discussed are associated with incident and/or progression of CKD in the Hispanics.

Table 1. Studies Evaluating Incident ESRD in Hispanics Compared With Non-Hispanic Whites

Study	Participants	Setting	DM Prevalence	F/U, y	Outcome	Confounders	HR (95% CI)
Individuals Without Established CKD							
Young ¹⁹ (2003)	429,918; 6.2% Hispanic; 90% non-CKD	US veterans	100%	1	ESRD attributed to diabetes	Age, sex, HTN, CVD, nonservice connection, no. of visits, region	1.4 (1.3-1.4) ^a
Derose ¹⁸ (2013)	994,055; 33% Hispanic; entry eGFR > 60	KP Southern California	NA	5	Predicted eGFR < 15	Age, sex, entry eGFR	0.92 (0.89-0.94) ^a
Individuals With Established CKD							
Peralta ²⁰ (2006)	39,550; 31% Hispanic; CKD3-4	KP Northern California	15%	4	ESRD	Age, sex, income, education, language, HTN, CVD, DM, insulin, baseline eGFR, proteinuria, medications	1.33 (1.17-1.52)
Derose ¹⁸ 2013	125,761; 16% Hispanic; CKD3-4	KP Southern California	NA	5	Predicted eGFR < 15	Age, sex, entry eGFR	1.49 (1.42-1.56) ^a
Lewis ²² 2015	4,038; 13% Hispanic; CKD3-4	TREAT Study	100%	2	ESRD	Race, age, sex, BMI, insulin, eGFR, SUN, albumin, Hb, ferritin, CRP, proteinuria, AKI, duration of DM, systolic & diastolic BP, HbA _{1c} , CVD	1.01 (0.79-1.29)
Fischer ²³ 2016	3,785; 13% Hispanic; CKD3-4	CRIC Study	47%	5	ESRD	Age, sex, baseline eGFR, DM, education, health insurance, nephology care, smoking, systolic BP, ACEi/ARB use, BMI, HbA _{1c} , proteinuria	1.32 (0.96-1.81)

Abbreviations: ACEi/ARB, angiotensin-converting enzyme inhibitor/angiotensin receptor blocker; AKI, acute kidney injury; BMI, body mass index; BP, blood pressure; CI, confidence interval; CKD, chronic kidney disease; CRIC, Chronic Renal Insufficiency Cohort; CRP, C-reactive protein; CVD, cardiovascular disease; DM, diabetes mellitus; eGFR, estimated glomerular filtration rate (in mL/min/1.73 m²), ESRD, end-stage renal disease; F/U, follow-up; Hb, hemoglobin; HbA_{1c}, glycated hemoglobin; HTN, hypertension; HR, hazard ratio; KP, Kaiser Permanente; NA, not available; SUN, serum urea nitrogen; TREAT, Trial to Reduce Cardiovascular Events With Aranesp Therapy.
^aOdds ratio instead of HR.

Cardiovascular Disease

Cardiovascular event rates are 2- to 5-times higher in patients with CKD compared with those without CKD.³⁸⁻⁴⁰ Whether the excess cardiovascular risk conferred by CKD is of the same magnitude among Hispanics as in non-Hispanics remains largely understudied. In a pooled analysis of 3 community-based cohorts, the excess risk for heart failure associated with CKD was large among Hispanics with CKD versus without CKD (adjusted risk difference per 1,000 person-years, 3.5; 95% CI, 1.5-5.5) compared with whites (adjusted risk difference per 1,000 person-years, 1.6; 95% CI, 0.6-2.6). Similar findings were observed for coronary heart disease in Hispanics with CKD versus without CKD (adjusted risk difference per 1,000 person-years, 12.9; 95% CI, 4.5-21.4), compared with whites (adjusted risk difference per 1,000 person-years, 2.0; 95% CI, 0.8-3.2).⁴¹ Of note, the number of Hispanics with CKD in these cohorts was only 109.

Studies evaluating the risk for cardiovascular disease in Hispanics versus non-Hispanics with CKD have shown heterogeneous results. In cross-sectional analyses of data from the CRIC Study, Hispanics had higher odds of left ventricular hypertrophy compared with non-Hispanic whites, even after adjusting for demographic and clinical variables, including blood pressure. However, the risk for coronary artery calcification was similar between the 2 groups.²⁵ In longitudinal analysis of the same cohort, Hispanics experienced almost a 2-fold higher crude rate of heart failure events than non-Hispanic whites, but this difference attenuated after multivariable adjustment. Furthermore, Hispanics were not at increased risk for atherosclerotic events compared with non-Hispanic whites.⁴² In contrast, 2 prior studies had shown that compared with non-Hispanic whites with CKD, Hispanics with CKD had lower risk for atherosclerotic events.^{20,22}

There continues to be limited data regarding cardiovascular disease in Hispanics with ESRD. In an analysis of more than 270,000 incident patients with ESRD, the risk for incident myocardial infarction among individuals with prevalent cardiovascular disease was observed to be significantly lower in Hispanics compared with non-Hispanic whites (relative risk, 0.72; 95% CI, 0.68-0.77).⁴³ In contrast, in another study of patients with incident ESRD attributed to lupus nephritis, Hispanics were found to have similar risk for atherosclerotic and heart failure events compared with non-Hispanic whites.⁴⁴ Additional studies of cardiovascular outcomes in Hispanics with ESRD are needed.

Mortality in Hispanics With CKD and ESRD

It is well established that US Hispanics with ESRD receiving dialysis have lower mortality risk than non-Hispanic whites (Table 2),^{44,45-49} with reported 2014 mortality rates per 1,000 person-years of 206 in non-Hispanic whites versus 127 in Hispanics.⁸ This is despite adverse

socioeconomic characteristics and higher comorbid condition burden among Hispanics, a phenomenon that has been referred to as the “Hispanic paradox,” given opposite observations in the US general population. Although this racial/ethnic disparity is poorly understood, it has been attributed to incomplete and/or suboptimal ascertainment of comorbid condition burden among Hispanics and non-Hispanics in the available studies (ie, measurement error and ascertainment bias), salmon bias (ie, return migration of Hispanics to country of origin to die), healthy migrant effect (ie, younger healthy Hispanic immigrants), differences in inflammation and nutrition, and psychosocial/sociocultural factors.^{50,51}

Among Hispanics with non-dialysis-dependent CKD, mortality risks have also been found to be lower than^{18,20} or similar to^{22,23,52} non-Hispanic whites (Table 2). Findings from the Hispanic CRIC Study suggest that proteinuria significantly modifies the relationship between race/ethnicity and mortality. Although at lesser levels of proteinuria Hispanics had similar mortality risk compared with non-Hispanic whites, their mortality risk was significantly lower at greater levels of proteinuria.²³ There are limited data regarding differences in mortality between Hispanic background groups. One study evaluating individuals randomly selected for the ESRD Clinical Performance Measures Project reported significantly lower 2-year mortality risk among Mexican Americans compared with non-Hispanics (adjusted HR, 0.79; 95% CI, 0.73-0.85). Mortality risk was similar in Puerto Ricans and Cuban Americans relative to non-Hispanics.⁵³

Disparities in Access to Care

Overview

More than 25% of US Hispanics report not having a regular health care provider,⁵⁴ which is more than double the proportion for non-Hispanic whites. This disparity is likely related to socioeconomic factors, including education, language, and lack of health insurance. Not surprisingly, Hispanics are less likely to receive pre-ESRD care than non-Hispanics. Hispanic participants in the CRIC Study were less likely to report prior contact with a nephrologist at study entry compared with non-Hispanic whites (odds ratio, 0.32; 95% CI, 0.22-0.47).⁵⁵ Moreover, the proportion of Hispanic patients with CKD receiving care from a nephrologist at least 12 months before the start of renal replacement therapy was lower, at 27.0%, compared to 36.7% in whites.⁸ This disparity in nephrology care partially explained the lower use of arteriovenous access for first outpatient hemodialysis compared with non-Hispanics.⁵⁶

Access to Kidney Transplantation

The proportion of US dialysis patients receiving a kidney transplant within 3 years of ESRD diagnosis is lower in Hispanics (11%) compared with non-Hispanics (14%).⁸ According to the US Organ Procurement and Transplantation

Table 2. Studies Evaluating All-Cause Mortality Risk in Hispanics Versus Non-Hispanics With CKD

Study	Participants	Setting	DM Prevalence	F/U, y	Confounders	HR (95% CI)
Pre-ESRD						
Peralta ²⁰ (2006)	39,550; 31% Hispanic; CKD3-4	KP Northern California	15%	4	Age, sex, income, education, language, HTN, CVD, DM, insulin, baseline eGFR, proteinuria, medications	0.71 (0.65-0.77)
Mehrotra ⁵² (2008)	2892; % Hispanic NA; CKD3-4	NHANES III	24%	9	Age, sex, HTN, cholesterol, BMI, DM, smoking, family history of premature CVD, stage of CKD	1.26 (0.84-1.90) ^a
Derose ¹⁸ (2013)	1,119,816 ^b ; 31% Hispanic	KP Southern California	— ^c	5	Age, sex, entry eGFR	0.67 (0.63-0.72) ^b
Lewis ²² (2015)	4,038; 13% Hispanic; CKD3-4	TREAT Study	100%	2	Race, age, sex, BMI, insulin, eGFR, SUN, albumin, Hb, ferritin, CRP, proteinuria, AKI, DM, BP, HbA _{1c} , CVD, medications, smoking, blood transfusion, heart rate, reticulocytes, WBC count, gout, GI bleeding, lung disease, treatment randomization	0.86 (0.66-1.10)
Fischer ²³ (2016)	3,785; 13% Hispanic; CKD3-4	CRIC Study	47%	5	Age, sex, baseline eGFR, DM, education, health insurance, nephology care, smoking, systolic BP, ACEi/ARB use, BMI, HbA _{1c} , proteinuria	0.89 (0.59-1.35)
ESRD						
Frankenfield ⁴⁵ (2003)	8,336; 12% Hispanic	ESRD CPM Project	40%	1	Age, sex, ethnicity, DM, years on dialysis, BMI, amputations, mean Kt/V, catheter access, Hb, albumin, ESRD Network	0.76 (0.60-0.96)
Murthy ⁴⁶ (2005)	100,618; 10% Hispanic	USRDS 1995-1997	42%	2	Age, sex, race, HTN, CVD, smoking, COPD, AIDS, cancer, alcohol dependence, BMI, serum albumin, Hct, eGFR, functional status, pre-ESRD EPO use	DM: 0.70 (0.66-0.74); no DM: 0.83 (0.77-0.91)
Yan ⁴⁹ (2013)	1,282,201; 12%-20% Hispanic	USRDS 1995-2009	15%-67%	2	Age, sex, insurance, BMI, lifestyle, immobility, cause of ESRD, dialysis modality, pre-ESRD use of ESAs, comorbid conditions	0.70 (0.69-0.70)
Arce ⁴⁷ (2013)	615,618; 17% Hispanic	USRDS 1995-2007	50%	— ^c	Age, sex, year, comorbid conditions, dialysis modality, insurance, BMI, eGFR	0.84 (0.83-0.86) ^d
Rhee ⁴⁸ (2014)	130,909; 16% Hispanic	Private US dialysis provider	43%	2	Age, sex, insurance, BMI, dialysis modality, DM, smoking, alcohol/drug dependence, HTN, CVD, COPD, cancer, functional status, eGFR, Kt/V, serum phosphate, albumin, TIBC, calcium, bicarbonate, creatinine, ferritin, Hb, WBC count, lymphocyte %, PCR	0.77 (0.73-0.81) ^e
Gómez-Puerta ⁴⁴ (2015)	12,533; 16% Hispanic; ESRD due to LN	USRDS 1995-2008	9%	3	Age, sex, year, insurance, BMI, eGFR, albumin, employment, area-level SES, US region, dialysis modality, smoking, HTN, DM, CVD, COPD, cancer	0.79 (0.71-0.88)

Abbreviations: ACEi/ARB, angiotensin-converting enzyme inhibitor/angiotensin receptor blocker; BMI, body mass index; BP, blood pressure; CI, confidence interval; CKD, chronic kidney disease; COPD, chronic obstructive pulmonary disease; CPM, clinical performance measures; CRIC, Chronic Renal Insufficiency Cohort; CRP, C-reactive protein; CVD, cardiovascular disease; DM, diabetes mellitus; eGFR, estimated glomerular filtration rate; EPO, erythropoietin; ESA, erythropoiesis-stimulating agent; ESRD, end-stage renal disease; F/U, follow-up; GI, gastrointestinal; Hb, hemoglobin; HbA_{1c}, glycated hemoglobin; Hct, hematocrit; HTN, hypertension; HR, hazard ratio; KP, Kaiser Permanente; LN, lupus nephritis; NA, not available; NHANES, National Health and Nutrition Examination Survey; PCR, protein catabolic rate; SES, socioeconomic status; SUN, serum urea nitrogen; TIBC, total iron-binding capacity; TREAT, Trial to Reduce Cardiovascular Events With Aranesp Therapy; USRDS, US Renal Data System; WBC, white blood cell.

^aHR for age strata younger than 65 years.

^bHR of death among those with projected kidney failure during CKD stages 3 to 4.

^cNot applicable.

^dHR for age strata 60 to 79 years.

^eHR for age strata 60 to 70 years.

Network/Scientific Registry of Transplant Recipients 2015 Annual Report, Hispanics constituted 19.6% and whites constituted 36.5% of adults on the kidney transplant waiting list. However, Hispanics received only 17.2% of all kidney transplants in that year, compared with 46.2% in whites. The difference in percent of living kidney transplantation between Hispanics and whites was particularly striking (15.0% vs 65.7%).⁵⁷ Barriers to living kidney donation identified among Hispanics include knowledge deficit about the procedure and fear of financial and health-related long-term consequences of kidney donation.⁵⁸

A study of 388 Hispanics undergoing dialysis in December 1994 in Arizona and New Mexico found that despite similar kidney transplantation referral rates, Hispanics were less likely to be placed on a waiting list compared with non-Hispanic whites.⁵⁹ In contrast, another study of 417,801 patients who initiated dialysis therapy in the United States between 1995 and 2007 found no differences in the time from dialysis therapy initiation to placement on the transplant waitlist between Hispanics and non-Hispanic whites.⁶⁰ However, when waitlisted, Hispanics were less likely to undergo deceased donor kidney transplantation, even after taking into account the survival advantage among Hispanics (HR, 0.79; 95% CI, 0.77-0.81). Adjustment for blood type and organ procurement organization explained this disparity, suggesting that the Hispanic population tends to live in high-population-density organ procurement organizations with limited availability of organs.⁶⁰ As discussed in the next section of the review, limited access to kidney transplantation among Hispanics is more pronounced among those who are considered unauthorized immigrants. After transplantation, graft and patient survival among recipients of kidney transplants appears to be similar or higher among Hispanics compared with whites.⁶¹⁻⁶³

Social Determinants of Health

Overview

Sociocultural and psychosocial factors may play an important role in CKD progression in Hispanics and account for racial/ethnic disparities in CKD-related health outcomes. The conceptual model presented in Figure 1 is adapted from the Lifespan Biopsychosocial Model.^{64,65} This model suggests that sociocultural factors, including socioeconomic status and acculturation, may influence psychosocial factors, some of which are adverse (eg, chronic stress and depression), and others, protective (eg, social support and family cohesion). These sociocultural and psychosocial factors may in turn have direct and indirect effects on health outcomes. The model also takes into account other potentially important factors such as access to health care, health behaviors, risk factor control, and biological/genetic factors. Several studies have found that Hispanics born in the United States have a greater

prevalence of cardiovascular risk factors than first-generation immigrants,^{33,66} suggesting that acculturation (ie, adoption of values and lifestyle associated with the US culture)⁶⁷ may be associated with adverse health outcomes.⁶⁷ However, Hispanics who are undocumented immigrants face a unique set of personal and familial stressors that might affect their health. In contrast, it has also been postulated that factors such as family cohesion and social support may be partially responsible for the lower mortality rates observed in Hispanics compared with non-Hispanic whites.^{50,68} Next we discuss 2 of the most relevant factors pertaining to Hispanics in the United States: acculturation and immigration status.

Acculturation

Acculturation refers to cultural modification that occurs as one takes on attitudes, customs, traditions, and behaviors of another culture.⁶⁹ While acculturation is difficult to ascertain, it may provide insight into health disparities among Hispanics. There are conflicting data for the role of acculturation on chronic diseases in this ethnic group. For example, less acculturation has been associated with a lower prevalence of hypertension and diabetes, but also with poorly controlled blood pressure and a higher prevalence of cardiovascular risk factors.⁷⁰⁻⁷² Studies evaluating the role of acculturation in kidney function among Hispanics are scarce. Among Hispanics enrolled in MESA, greater acculturation (speaking mixed Spanish/English at home compared to Spanish only) was associated with lower eGFRs and higher albumin-creatinine ratios. Furthermore, US-born Hispanics had lower eGFRs compared with those who were foreign born.⁷³ Additional studies examining the association between acculturation and CKD among Hispanics are needed.

Impact of ESRD on Undocumented Persons

Of the nearly 58 million Hispanics currently living in the United States, approximately 11 million are considered “unauthorized immigrants.”⁷⁴ Although the true prevalence of ESRD in this population is unknown, it has been estimated that there are more than 6,000 undocumented immigrants with ESRD in the United States,⁷⁵ and the majority of them are of Hispanic origin.⁷⁶ Due to their lack of legal status, these individuals are not eligible for federal insurance programs and less than a third of them are able to acquire private health insurance through their employer.⁷⁷ Unfortunately, a national policy addressing the provision of renal replacement therapy to this vulnerable population does not exist.⁷⁸ Therefore, the care for undocumented patients with ESRD varies from state to state and is often suboptimal. Some states, such as California and Illinois, have been able to secure funding to provide standard maintenance hemodialysis. However, in other states such as Georgia and Texas, dialysis is provided on an emergency-only basis.⁷⁵ Novel strategies such as the purchase of health care plans off the government-sponsored health insurance marketplace exchange have

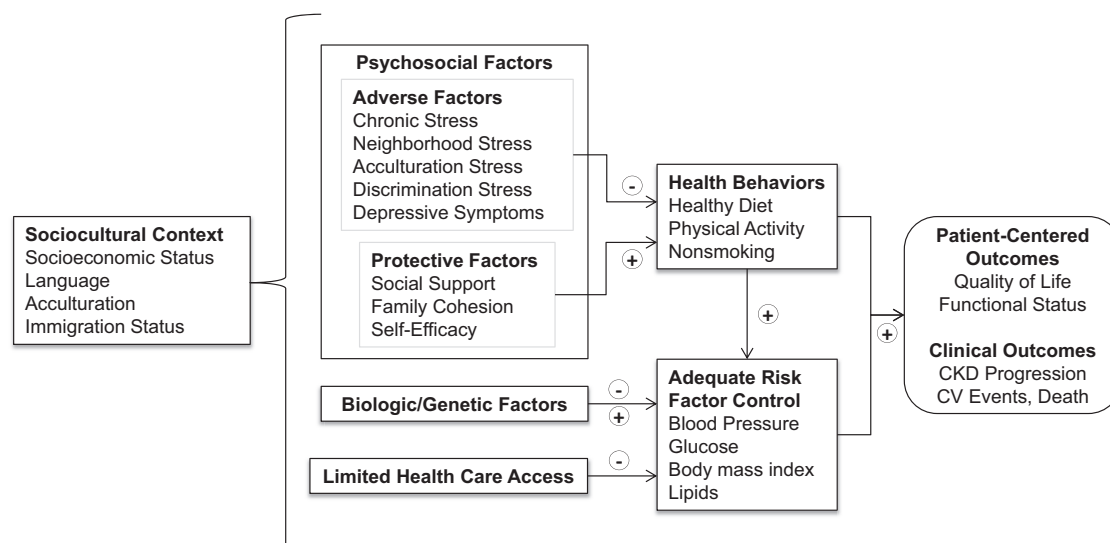


Figure 1. Conceptual model for health outcomes in Hispanics with chronic kidney disease (CKD). Abbreviation: CV, cardiovascular.

benefited some undocumented patients with ESRD.^{77,79} However, the sustainability of these programs is uncertain and more definitive policies at the national level are urgently needed.

As might be expected, outcomes of patients receiving dialysis “as needed” are worse compared with those receiving standard of care. In a recent retrospective cohort study of 211 undocumented patients with ESRD, those receiving emergency-only hemodialysis had more than 14-fold higher mortality and spent more days in the hospital compared with those who received thrice-weekly treatment.⁸⁰ Furthermore, based on a qualitative study of 20 undocumented patients with ESRD and no access to scheduled hemodialysis in Colorado, emergency-only hemodialysis results in debilitating physical symptoms and marked psychosocial distress among patients and their families.⁸¹ This clearly represents an ethical challenge for nephrologists who are confronted with patients in desperate need, but a health care system without the appropriate resource allocation.⁷⁶

Access to kidney transplantation is even more limited for these patients because undocumented immigrants are not eligible for federal subsidies to pay for the procedure and most lack the economic resources to pay out of pocket. Although kidney transplantation results in better quality of life and longer patient survival and is a more cost-effective treatment for ESRD than dialysis, the majority of undocumented immigrants are deprived of this opportunity because of nonmedical reasons.^{78,82} One of the arguments to exclude undocumented immigrants from access to kidney transplantation is that the risk for graft failure would be higher compared with legal persons due to the risk for deportation and lack of resources to pay for posttransplantation care, including immunosuppression medications. This argument has been recently disputed by

clinical research.⁸² In a recently published retrospective cohort study, Shen et al⁸² compared all-cause transplant loss among all-adult Medicaid patients in the USRDS by citizenship status. Of 10,495 patients who received a kidney transplant between 1990 and 2011, a total of 3% were nonresident aliens (assumed to be undocumented immigrants) who were younger, healthier, and more likely to have a living donor. The study showed that the adjusted risk for kidney allograft loss was significantly lower among nonresident aliens compared with Medicaid US citizens (HR, 0.67; 95% CI, 0.46-0.94).⁸² Although additional prospective studies should be conducted to better understand the complexities of this issue, these findings are encouraging and should be taken into consideration when drafting health policy.

Research Priorities and Conclusions

Based on the data summarized in this review, the observed higher risk for ESRD among Hispanics appears to be explained largely by potentially modifiable factors, in particular urine protein excretion. Therefore, future research should focus on the implementation of cost-effective strategies for the early detection and management of albuminuria among Hispanics. In addition, longitudinal studies evaluating the impact of sociocultural and psychosocial factors, including acculturation, on clinical and patient-centered outcomes such as quality of life and disease progression among Hispanics with CKD are needed.

In summary, Hispanics are a culturally, socioeconomically, and genetically heterogeneous segment of the US population with a high burden of CKD and its risk factors, but paradoxically have higher overall survival rates compared with non-Hispanic whites. Most of the studies currently available suggest that the excess risk for kidney

function decline among Hispanics compared with non-Hispanics is in part attributable to socioeconomic and clinical factors. These findings might indicate that disparities in CKD progression between Hispanics and non-Hispanic whites are potentially modifiable. Given the high prevalence of diabetes and obesity among US Hispanics, as well as the limited access to adequate medical care, public health initiatives for primary and secondary prevention of CKD among Hispanics should have a positive impact in this population.

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