CHRONIC KIDNEY DISEASE IN UNITED STATES HISPANICS: A GROWING PUBLIC HEALTH PROBLEM

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Hispanics are the fastest growing minority group in the United States. The incidence of end-stage renal disease (ESRD) in Hispanics is higher than non-Hispanic Whites and Hispanics with chronic kidney disease (CKD) are at increased risk for kidney failure. Likely contributing factors to this burden of disease include diabetes and metabolic syndrome, both are common among Hispanics. Access to health care, quality of care, and barriers due to language, health literacy and acculturation may also play a role. Despite the importance of this public health problem, only limited data exist about Hispanics with CKD. We review the epidemiology of CKD in US Hispanics, identify the factors that may be responsible for this growing health problem, and suggest gaps in our understanding which are suitable for future investigation. (*Ethn Dis*. 2009;19:466–472)

Key Words: Chronic Kidney Disease, Hispanics, Health Care Disparities

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INTRODUCTION

Between 2004 and 2005, the number of Hispanic in the United States grew by 3.6 percent to reach a total of 42.7 million (representing nearly 15% of the total US population), making this the fastest growing segment of the population in the country.[1] A large increase has also occurred in the Hispanic end stage renal disease (ESRD) population. According to United States Renal Data System (USRDS), in 2005, there were 12,000 new cases of ESRD treated with dialysis or transplant in Hispanics, representing an increase of 63% since 1996. Hispanics have an incidence rate of ESRD which is 1.5 times greater than for non-Hispanics Whites.[2] This increase in ESRD cases not only translates into an increased burden to our health care system, but also emphasizes the importance of better understanding risk factors for chronic kidney disease (CKD) in Hispanics. In this review, we examine the epidemiology of CKD in US Hispanics, explore potential reasons for this growing public health problem, and highlight potential areas for future research.

Hispanics have an incidence rate of ESRD which is 1.5 times greater than for non-Hispanics Whites.[2]

METHODS

We performed a qualitative review of the literature utilizing a PubMed search for the following keywords: chronic kidney disease, Hispanics, Latinos, end stage renal disease, diabetes, dialysis, transplantation, and health care disparities. In addition, we reviewed data from the USRDS[2,3] and the Organ Procurement and Transplantation Network.[4] For the purpose of this review, the term Hispanic ethnicity refers to all persons of Latin American origin living in the United States, unless indicated otherwise. Hispanics are culturally, socioeconomically, and genetically heterogeneous and represent a wide variety of national origins and social classes.[5] In terms of ancestry, US Hispanics originate from three populations: European settlers, Native Americans, and West Africans. The breakdown for the US Hispanic population is as follows: 64% Mexican, 9% Puerto Rican, 3.5% Salvadoran and 2.7% Dominican.[1] The remainder is of Central American, South American or other Hispanic or Latino origin.

EPIDEMIOLOGY OF CKD IN HISPANICS

Glomerular filtration rate (GFR) estimating equations have been used to determine the prevalence of CKD in the United States. The abbreviated Modification of Diet in Renal Disease (MDRD) equation has been considered to be the most accurate available estimating equation for GFR and has been used widely in the literature and by a growing number of clinical laboratories.[6] Though the equation has been demonstrated to have validity across a spectrum of different subgroups,[7] there are no data regarding its validity in

Hispanics. This is a relevant concern because the serum creatinine concentration, which is used in the MDRD equation to calculate estimated GFR (eGFR), has been demonstrated to differ by racial/ethnic groups. In an analysis of serum creatinine levels in the National Health and Nutrition Examination Survey (NHANES) III, Mexican Americans had lower mean serum creatinine levels than non-Hispanic Whites or non-Hispanic Blacks.[8] The reasons for these differences are unknown. Similarly, a recent NHANES analysis of serum cystatin C, a potentially more sensitive marker of early kidney dysfunction than serum creatinine, reported lower levels of cystatin C in Mexican Americans compared with other racial/ethnic groups studied.[9] These differences in the distribution of serum creatinine and cystatin C levels in Hispanics reinforce the importance of rigorously evaluating the accuracy of GFR estimating equations in Hispanics.[10]

INCIDENCE AND PREVALENCE OF CKD IN HISPANICS

Mild to Moderate CKD

Information regarding earlier stages of CKD in Hispanics is limited. Several investigators have reported a higher prevalence of microalbuminuria in Hispanics compared with non-Hispanic Whites.[11–13] In contrast to these findings, a recent analysis of NHANES III data suggests that the prevalence of CKD may be lower in Mexican Americans than in non-Hispanic Whites or non-Hispanic Blacks. In an analysis of NHANES III, moderately decreased kidney function (eGFR 30–59 mL/minute/1.73 m^2) was most prevalent among non-Hispanic Whites (4.8%) and non-Hispanic Blacks (3.1%) and least prevalent in Mexican Americans (1.0%).[14] Between NHANES 1988 to 1994 and 1994 to 2004, the prevalence of CKD rose among Mexican Americans but continued to be lower than that observed in non-Hispanic Whites and Blacks.[15]

These data are not consistent with the higher prevalence rates of ESRD in Hispanics. One potential explanation is that Hispanics have a higher risk of ESRD because of more rapid progression of CKD after its onset, rather than simply a larger pool of individuals with CKD. The findings could also be related to methodological issues related to the sample size or sampling bias. Furthermore, as discussed earlier, the validity of the MDRD equation has not been established in Hispanics and utilizing the equation in Hispanics could be an important potential source of error. Lastly, NHANES includes only Mexican Americans and these findings may not be generalizable to other Hispanic subgroups.

End Stage Renal Disease (ESRD)

It is well established that Hispanics have a higher prevalence of ESRD than non-Hispanic Whites. The increased prevalence of treated ESRD in Hispanics was first recognized in the 1980s. Using data from the state of Texas, Mexican Americans were found to have an excess of ESRD compared with non-Hispanic Whites with an incidence ratio of 3.[16] For diabetic ESRD, Mexican Americans had an incidence ratio of 6 compared with non-Hispanic Whites. The first study at a national level analyzed male Hispanics identified in Medicare ESRD program data files. Using common Spanish surnames to identify cases, it was found that Hispanics developed ESRD at a younger age than non-Hispanic Whites; and between 1980 and 1990, ESRD incidence rates increased more for Hispanics.[17] In 1995, the USRDS began to acquire data regarding Hispanic ethnicity. In 2006, the adjusted incidence rate for ESRD in Hispanics was 1.5 times higher than for non-Hispanic Whites.[2] Furthermore, between 1996 and 2005, the incidence rate for Hispanics increased by 63%.[2] In contrast, Burrows et al examined trends in age-adjusted ESRD rates and reported that the age-adjusted ESRD rate in Hispanics decreased by approximately 15%, from 2000 to 2005 (530.2 vs 448.9).[18] However, there was an overall increase in the age-adjusted incidence rates in Hispanics in 2005 as compared with 1995 (448.9 vs 395.0). It is apparent that a longer period of follow-up time is needed to better characterize trends. The leading causes of ESRD requiring dialysis in Hispanics and non-Hispanic Whites are described in Table 1. Diabetes accounts for 59% of prevalent cases of ESRD in Hispanic compared with 39% of cases in non-Hispanic Whites.[3] Unfortunately, data regarding causes of ESRD by Hispanic subgroup are not available.

Table 1. Leading causes of ESRD requiring dialysis in Hispanics and non-Hispanic Whites in 2000[3]

Primary disease	Hispanics	Non-Hispanic Whites
Diabetes	58.8%	38.8%
Hypertension/large vessel disease	16.2%	23.7%
Glomerulonephritis	9.1%	9.9%
Etiology uncertain	3.5%	4.0%
Other	12.4%	23.6%

The incidence and severity of diabetes are important factors in the excessive incidence of diabetic ESRD observed in Hispanics. The prevalence of diabetes in Hispanics has been estimated to be approximately 1.5 to 3 times that seen in the non-Hispanic White population and its incidence is rising.[19] Moreover, Hispanics have been found to have lower rates of glucose self-monitoring and poorer glycemic control compared with non-Hispanic Whites.[20] Hispanics with diabetes may be at increased risk to develop diabetic nephropathy. Mexican American diabetics in San Antonio, Texas had a higher prevalence of proteinuria than non-Hispanic White diabetics from Wisconsin.[21] However,

no such difference was observed in the San Luis Valley.[22] The importance of non-diabetic CKD in Hispanics is not completely understood. Though hypertension is less prevalent in Hispanics, Mexican Americans had the highest rate of uncontrolled hypertension in NHANES III.[23] Data from Texas and the USRDS demonstrate a higher incidence of ESRD due to hypertension in Hispanics than in non-Hispanic Whites.[16,24]

Progression of CKD in Hispanics

Only limited information is available regarding progression rates and risk factors for CKD in Hispanics. In a multivariable retrospective analysis of a cohort of 263 type 2 diabetic ESRD patients, Mexican ethnicity and female sex were found to hasten the decline of renal function.[25] A post hoc analysis of the Reduction of Endpoints in NIDDM with the Angiotensin II Antagonist Losartan Study (RENAAL) found that Hispanics had the highest risk for ESRD compared with Blacks and Whites.[26] However, the majority of Hispanics in this study were from Latin American countries and therefore, the findings may not be applicable to US Hispanics. A recent analysis of patients enrolled in Kaiser Permanente of Northern California, a large integrated healthcare delivery system, has clarified the risk of ESRD in US Hispanics with CKD.[27] In 39,550 patients with stage 3 to 4 CKD, Hispanic ethnicity was associated with almost a two-fold increased risk for ESRD when compared with non-Hispanic Whites. This increased risk was attenuated to 33% after adjustment for diabetes, medication use, and other characteristics. Thus, the risk for progression to ESRD in Hispanics is only partially explained by diabetes.

Even less is known about progression rates and risk factors for non-diabetic CKD in Hispanics. Some reports suggest that certain glomerular diseases may be more severe and progress more often in Hispanics than in non-Hispanic Whites.[28–30] In a recent examination of rates of progression in 128 patients with proliferative lupus nephritis, Barr et al. found that Hispanic ethnicity was independently associated with progression of CKD.[30] Another study examining patients with lupus found that Texan-Hispanic ethnicity was more likely to be associated with nephritis than Puerto Rican ethnicity.[31] This suggests that outcomes can vary by Hispanic subgroup.

US Hispanics have been poorly represented in large prospective CKD studies. The ongoing NIDDK-sponsored Hispanic Chronic Renal Insufficiency Cohort Study (HCRIC) is investigating risk factors for CKD and cardiovascular disease (CVD) progression in a cohort of 326 Hispanics with CKD. This study is based at the University of Illinois at Chicago and is an ancillary study to the NIDDK-sponsored CRIC Study.[32]

Metabolic Syndrome and CKD

Recent analyses of NHANES III data found that metabolic syndrome affects over 47 million Americans and that the problem is more pronounced in Hispanics.[33,34] Mexican Americans have the highest age-adjusted prevalence of metabolic syndrome (31.9%) compared with non-Hispanic Whites (23.8%) and Blacks (21.6%).[33] There is now emerging evidence supporting a relationship between metabolic syndrome and CKD.[35–38] In a prospective cohort study of Native Americans without diabetes, metabolic syndrome was associated with an increased risk for developing CKD.[39] In non-diabetic subjects with normal kidney function enrolled in the Atherosclerosis Risk in Communities Study (ARIC), investigators found an adjusted odds ratio of developing CKD in participants with metabolic syndrome of 1.43 compared with participants who did not have the syndrome.[38] These data suggest that metabolic syndrome could be an important factor in the Hispanic CKD population.

DISPARITIES IN HEALTH CARE AND PREVALENCE AND PROGRESSION OF CKD

The importance of healthcare disparities in CKD has received increased recognition,[40] but little is known regarding the impact of healthcare disparities on health outcomes in Hispanics with CKD. It is well substantiated that there are considerable disparities in health care for Hispanics.[20] According to a report by the Commonwealth Fund, nearly two-thirds (65%) of working-age Hispanics with low incomes were uninsured for all or part of the year in 2000.[41] Using NHANES III data, Harris evaluated healthcare access and utilization, and health status and outcomes for patients with type 2 diabetes.[20] Mexican Americans below age 65 years had lower rates of health insurance coverage than non-Hispanic Whites and Blacks (66% vs 91% and 89%, respectively). Furthermore, Mexican Americans with private insurance or a high school education or more were more likely to have normoalbuminuria.[20] The quality of care received by Hispanics may also play a role in the progression of kidney disease. Hispanics with diabetes are less likely to report having had a foot exam or glycosylated hemoglobin testing.[42] As noted earlier, Mexican American in NHANES III had the highest rate of uncontrolled hypertension.[23] Lastly, Ifudu et al reported that non-Whites, including Hispanics, are more likely to receive a late referral to a nephrologist for CKD management.[43] This study was limited by the low number of Hispanics in the analysis. These findings suggest that quality of care may play a role in the high prevalence of ESRD in this population.

Patient-centered factors may play a particularly important role for Hispanics include language, health care literacy, acculturation, social support, and trust in healthcare providers. Hispanics who are recent immigrants face a number of potential barriers to health care, includ-

ing lack of familiarity with the healthcare system and language barriers. Spanish-speaking Hispanics are less likely to be insured, have access to care and use preventive health services.[41,44] Trust in the healthcare system is another important factor because it has been found to be significantly related to adherence.[45] Doescher et al found that Hispanics reported significantly less trust in their physician than non-Hispanic Whites.[46] Finally, social support, defined as resources provided by a network of individuals or social groups, has been found to have direct effects on health status and health service utilization.[47] There have been no published studies to date focusing on patient-centered factors in Hispanics with CKD. However, it seems reasonable to speculate that these factors amplify CKD and associated CVD risk.

CARDIOVASCULAR DISEASE IN HISPANICS WITH ESRD AND EARLIER STAGES OF CKD

Several studies have found that Hispanics may have lower all-cause and CV mortality rates than non-Hispanic Whites.[48–50] The term, Hispanic paradox, has been used to describe the lower than expected mortality rates despite the increased incidence of diabetes and obesity, lower socioeconomic status, and barriers to health care.[51] A number of explanations have been proposed, including socio-cultural factors, ethnic misclassification, incomplete ascertainment of deaths, and the healthy migrant effect.[36,52] In the ESRD population, Hispanics, Blacks, and Asians have a lower risk of death than non-Hispanic Whites, regardless of diabetes status.[24,53–55] In a recent analysis of a national, random sample of hemodialysis patients, Hispanics had an adjusted 12-month mortality risk that was 25% lower than non-Hispanic Whites.[53] The reasons for the lower ESRD mortality rates are not completely understood, but differences in survival have been noted among Hispanic subgroups with Mexican-Americans, Cuban Americans and Hispanic-other having an increased survival advantage compared with Puerto Rican Americans.[56] These findings suggest that sociocultural or genetic differences may play a role in these lower ESRD mortality rates and demonstrating the importance of examining health outcomes in subgroups of Hispanics.

Less is known regarding CVD risk and disease in Hispanics with earlier stages of CKD. An analysis of mortality rates of adults with CKD in NHANES found no difference in CVD or all-cause mortality in Mexican Americans compared with non-Hispanic whites.[57] In contrast, Hispanic veterans with diabetic CKD experienced a lower 18-month mortality rate than non-Hispanic Whites.[58] Though Hispanics in Kaiser Permanente of Northern California had an increased rate of ESRD, Hispanic ethnicity was associated with 29% lower adjusted mortality rate and 19% lower adjusted rate of CVD events as compared with non-Hispanic Whites, even after accounting for major cardiovascular risk factors, comorbidities and use of preventative therapies.[27] Again, the reasons for these differences are not known.

END-STATE RENAL DISEASE CARE IN US HISPANICS

Dialysis

Analysis of USRDS data reveals that Hispanics are 1.47 times more likely than non-Hispanic Whites to have late initiation of dialysis.[59] At the start of dialysis, Hispanics tend to have slightly lower hematocrit levels and are 13% less likely to be on erythopoeisis stimulating agents compared with non-Hispanic Whites.[60] An analysis of a random sample of Medicare eligible adults on hemodialysis in 1997 revealed that, compared with non-Hispanic Whites, Hispanics on hemodialysis are more likely to be female, younger, and have diabetes.[61] Hispanics tend to have higher albumin levels and similar hematocrit levels compared to non-Hispanic Whites.[53,61,62]

Little is known about ESRD care in the United State for unauthorized immigrants. Of the 11.8 million unauthorized immigrants in the United States, more than 8.46 million are Hispanic.[63] The incidence rate for ESRD for this population is unknown. Many of these undocumented aliens do not receive systematic care before initiation of dialysis. The quality and availability of pre-ESRD care for unauthorized immigrants has not been systematically studied. A small study of undocumented ESRD patients initiating dialysis in New York City found that these patients had higher serum creatinine concentration and lower eGFR, higher systolic blood pressure, and greater costs for the hospitalization associated with the initiation of dialysis.[64] However, a limitation of this study was that it only included 33 Hispanics. An important issue regarding the dialysis of unauthorized immigrants is the compensation for dialysis, which varies by individual state and may limit the availability of long-term dialysis for undocumented aliens who are then forced to receive dialysis on an emergent basis only.[65] The cost of care for undocumented ESRD patients receiving dialysis on an emergent basis is 3.7 times higher than for those unauthorized immigrants receiving long-term maintenance dialysis.[66] End-stage renal disease in unauthorized immigrants is of great public health and economic concern and warrants future research and re-evaluation of current policies.

Transplantation

Limited data exist that suggest that Hispanics are equally likely to be referred for renal transplantation but are less likely to progress beyond the early stages of the transplant evaluation

with some of the reasons including financial concerns, fear of the surgery, and preference for dialysis.[67] Perhaps for this reason, Hispanics are underrepresented on kidney waiting lists relative to the prevalence of CKD in this population.[68] Once placed on the transplant wait list, Hispanics have a longer unadjusted median time to transplant than non-Hispanic Whites.[4] Factors that potentially contribute to the longer time on the wait list include lower rates of organ donations in Hispanics relative to Whites,[69,70] less knowledge and more fear-related barriers to living organ donation,[71] and ethnic differences in the frequency of HLA alleles coupled with current allocation policies.[72] Data regarding graft survival in Hispanics have not been uniform, with some studies suggesting that Hispanics and non-Hispanic Whites have similar rates of graft survival,[73,74] while other studies have demonstrated poorer rates of graft survival in Hispanics.[75] More recently, Gordon et al found better patient and graft survival in Hispanics compared with non-Hispanics.[76] Further studies are needed to clarify whether Hispanic ethnicity influences post-transplant outcomes. In addition, policies are needed to address specific barriers within the transplant evaluation process for Hispanics to ensure appropriate access to this important therapy.

Compared with non-Hispanics Whites, Hispanics have an increased incidence of ESRD that appears independent of known clinical risk factors.

CONCLUSION

Chronic kidney disease is a growing and under-recognized health problem for US Hispanics. Compared with non-Hispanics Whites, Hispanics have an increased incidence of ESRD that appears independent of known clinical risk factors. Furthermore, among patients starting at the same level of CKD, Hispanics are at increased risk for progression to ESRD. Interestingly, data from NHANES suggest that the prevalence of CKD with decreased eGFR, at least in Mexican Americans, is lower than in non-Hispanic Whites. The reason for this discrepancy is unclear but could be related to more rapid progression of CKD. Many questions remain unanswered including: factors influencing CKD progression and CVD outcomes; the validity of current GFR estimating equations; insights into differences in outcomes among Hispanic subgroups; and the impact of health care disparities on CKD. For these reasons, future research is needed to better understand the epidemiology and complications of CKD in US Hispanics. Furthermore, it is essential that adequate numbers of US Hispanics are included in future interventional trials to provide the necessary evidence base to guide prevention and therapeutic strategies for CKD and ESRD.

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