Perspective

Clinical and Molecular Characteristics and Burden of Kidney Cancer Among Hispanics and Native Americans: Steps Toward Precision Medicine

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Abstract

Cancer disparities in Native Americans (NAs) and Hispanic Americans (HAs) vary significantly in terms of cancer incidence and mortality rates across geographic regions. This review reports that kidney and renal pelvis cancers are unevenly affecting HAs and NAs compared to European Americans of non-Hispanic origin, and that currently there is significant need for improved data and reporting to be able to advance toward genomic-based precision medicine for the assessment of such cancers in these medically underserved populations. More specifically, in states along the US-Mexico border, HAs and NAs have higher kidney cancer incidence rates as well as a higher prevalence of kidney cancer risk factors, including obesity and chronic kidney disease. They are also more likely to receive suboptimal care compared to European Americans. Furthermore, they are underrepresented in epidemiologic, clinical, and molecular genomic studies of kidney cancer. Therefore, we maintain that progress in precision medicine for kidney cancer care requires an understanding of various factors among HAs and NAs, including the real kidney cancer burden, variations in clinical care, issues related to access to care, and specific clinical and molecular characteristics.

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Introduction

Kidney and renal pelvis cancer is the sixth most common cancer in men and the tenth most common cancer in women, resulting in an estimated 63,990 new cases and 14,400 deaths in 2017.[1] Additionally, it can unevenly affect racial/ethnic minority groups. Despite the large number of Hispanic and Latino Americans (HAs) in the United States, however, there is not enough research illuminating their actual kidney cancer burden or related clinical and molecular characteristics. Similarly, few studies understand the cause of higher differential incidence and mortality rates in Native Americans (NAs).[2]

HAs are the fastest-growing and largest racial/ethnic minority group in the United States. According to the 2012 US census, they account for approximately 17% of the total population. They are also a heterogeneous group. Many are Mexican, Cuban, or Puerto Rican, and the number of migrants from other Latin American countries is increasing. Likewise, Spanish cultural and European genomic contributions vary greatly across and within Latin American nations.[3-5] Importantly, HA subgroups have differing levels of health care access in the United States, and Mexican Americans and HAs of Central and South American origin are less likely to utilize health care services.[6] As US citizens, Puerto Ricans are eligible for Medicare and Medicaid. Cuban immigrants receive medical care benefits as refugees. Legal documentation is required for Mexican immigrants to receive health insurance. Thus, without legal status, undocumented immigrants face great barriers to health care.[7] Cancer incidence rates also vary depending on country of origin and nativity status.[8,9]

NAs and Alaskan Natives (ANs) are a smaller racial/ethnic group that accounts for only about 1% to 2% of the US population. A large proportion of NAs reside in California, Arizona, and the Southwest. With over 500 federally recognized tribes, NAs are also a culturally and socially heterogeneous group. Those living on reservations or in urban areas face varying degrees of structural, cultural, physical (or geographic), and economic barriers to health care.[10,11] There is also regional variation in cancer incidence and mortality rates among NAs.[12]

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Here we review the epidemiologic, clinical, and molecular genomic data available for NAs and HAs, two socially, culturally, and biologically heterogeneous racial/ethnic groups that are often underrepresented in biomedical studies. Furthermore, we evaluated whether there is a sufficient information in the literature currently as a foundation for kidney cancer care precision medicine, particularly in regard to selecting a renal-cell carcinoma (RCC) treatment regimen based on molecular genomic information.

We reviewed kidney cancer incidence rates at the national and regional level, focusing on 4 US-Mexico border states (Arizona, California, New Mexico, and Texas). Because of their social, cultural, and genetic heterogeneity, it is important to understand the kidney cancer burden in HAs and NAs at both the national and regional level. In the border states, there is a large number of NAs as well as a high proportion of HAs who are Mexican Americans. HAs and NAs have a higher incidence of kidney and renal pelvis cancer than European Americans (EAs) of non-Hispanic origin (ie, non-Hispanic whites). Kidney cancer may also have a greater impact on the lives of HAs and NAs than is generally appreciated. However, our literature review reveals that HAs and NAs are underrepresented in clinical and molecular genomic studies on kidney cancer. Thus, we maintain that as we move toward genomic-based precision medicine for kidney cancer care, it is imperative that we first understand the real kidney cancer burden and variations in the clinical care, issues related to access to care, and clinical and molecular characteristics in these medically underserved populations.

Epidemiology of Kidney Cancers in HAs and NAs

Among the malignances of the urinary system, kidney cancer is the third most common after prostate and bladder cancer.[1] RCC is the most common type of adult kidney cancer and accounts for more than 90% of kidney cancer cases. Globally and nationally, the incidence of kidney cancer has increased since the 1980s. This rise can be attributed not only to an increase in the prevalence of obesity, a risk factor for kidney cancer, but also with the increased use of cross-sectional imaging, which has led to a greater number of incidental findings of kidney tumors.[13,14] During this period, there was a significant increase in the incidence of localized tumors but a decrease or relatively slower rate of increase in the incidence of advanced stage kidney cancer.[15,16] However, the rate of increase was greater in younger age groups (20-39 years) than older age groups (≥ 40 years) and for grade II and III tumors than grade I tumors.[16]

Between 2008 and 2012, the kidney cancer incidence rate was 37% higher in NA and AN men and 56% higher in NA and AN women than in EAs.[1] It also increased at a much faster rate in NAs than in EAs between 2001 and 2009.[17] Among NAs living in Indian Health Service–designated Contract Health Service Delivery Area counties, the Northern Plains Indian Health Service region has the highest incidence, rate with an age-adjusted incidence rate of 26.8 per 100,000 and a NA/EA incidence rate ratio (IRR) of 2.10, while the East Indian Health Service region has the lowest incidence rate (15.0 per 100,000).[17] On the basis of data from the North American Association of Central Cancer Registries (NAACCR), age-adjusted kidney cancer incidence rates for NAs in the US-Mexico border states between 2009 and 2013 also vary. NA rates were significantly higher than EA rates in Arizona and New Mexico, but were lower in California (Table 1). When stratified by age (ie, the older Medicare-eligible age group and the younger age group), NAs had consistently higher kidney cancer incidence rates than EAs, and the 2 age groups had similar IRRs. The IRR between NAs and EAs was 1.91 (95% confidence interval [CI], 1.66-2.21) and 2.03 (95% CI, 1.64-2.52) for the younger age group (< 65 years) in Arizona and New Mexico, respectively (Table 2). In Arizona, the difference in the incidence rate between NAs and EAs was smaller in the older age group (≥ 65 years), but NAs had a significantly higher kidney cancer incidence rate than EAs (IRR = 1.45; 95% CI, 1.19-1.76). The two age groups had very similar IRRs between NAs and EAs in New Mexico.

Nationally, HAs and EAs have similar kidney cancer incidence rates (20.7 and 21.9 per 100,000 in HA men and EA men, respectively; and 11.9 and 11.3 per 100,000 in HA women and EA women, respectively).[1] In Florida, Cubans, Puerto Ricans, and Mexican American women have similar kidney cancer incidence rates as EAs, while Mexican American men have a slightly lower incidence rate than EA men (not statistically significant).[8] In general, within the United States, NAACCR data show that EAs have a higher kidney cancer incidence rate than HAs, but in the US-Mexico border states, HAs have a significantly higher rate than EAs. The younger age group in New Mexico has the highest IRR (IRR = 1.43, 95% CI, 1.23-1.66). Texas has the highest kidney cancer incidence rate for HAs and EAs among the 4 border states. In the older age group, HAs have a rate of 85.8 per 100,000, while EAs have a rate of 72.8 per 100,000. Incidence ratios between HAs and EAs and between NAs and EAs are similar in older and younger age groups.

For EAs in the United States, the kidney cancer mortality rate declined from 1990 to 2009.[17] However, it did not change for NAs, who had a significantly higher rate than EAs. The likelihood of death from kidney cancer was almost twice as high in NAs as EAs. NA men from the Southern Plains (Texas, Oklahoma, and Kansas) had the highest mortality rate (13.7 per 100,000). The gap in the mortality rate between NAs and EAs was the greatest in the Southwest in adults aged 20 to 49 years (mortality rate ratio of 3.1). Nationally, HAs had similar or slightly better kidney cancer mortality rate and 5-year cancer-specific survival than EAs, and adjusted relative risk of cancer death from kidney cancer was not statistically different between them.[1,18] Still, given the substantial variability in mortality rates for other cancers among Hispanic subgroups,[19,20] kidney cancer mortality rates are also likely to vary among them. However, this has not been investigated or reported in the literature.

Variation in Clinical Characteristics and Disparities in Kidney Cancer Care

Established risk factors for kidney cancer include obesity, hypertension, tobacco smoking, and family history.[13] Other potential risk factors include diabetes, hypertension, chronic kidney disease, end-stage renal disease, kidney transplant, lack of physical activity, and occupational and environmental exposures. Hypertension is not as prevalent in HAs and NAs as in African Americans (AAs), and HAs and NAs have a slightly lower hypertension prevalence than EAs.[21] However, obesity is more prevalent among HAs and NAs than EAs.[22-24] Obesity is now recognized as one of the major risk