OPINION

Sex-based variations in the risk factors and side effects of chronic kidney disease

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ABSTRACT

For unknown causes, women are approximately 30% more likely than men to have chronic kidney disease (CKD) prior to dialysis. Understanding and trying to eliminate sex-based differences in CKD prevalence are crucial because CKD is linked to several negative health outcomes. The impact of sex and gender on the epidemiology and risk factors for chronic kidney disease (CKD), such as age, diabetes, hypertension and the complications from CKD, such as kidney disease progression, cardiovascular disease, CKD mineral and bone disorders, anemia, quality of life, cancer, and mortality, is mapped in this review along with what is known and what is unknown. Future research can be guided by this mapping.

INTRODUCTION

Predialysis Chronic Kidney Disease (CKD) is widespread, affecting 10% to 15% of the world's population, though not uniformly. A multitude of unfavorable health outcomes, such as cardiovascular disease, the development of renal failure, and death, are independently linked to CKD. This makes it crucial to comprehend differences in the prevalence and course of CKD and to work to eliminate them. It is clear that compared to men, females have a higher chance of developing CKD. In the 700 million or so people with CKD worldwide in 2017, it was estimated that females had an age-standardized prevalence that was 1.29 (95% confidence interval [CI], 1.28-1.30) times greater than males. Females experience disease differently than males do, and this can be attributed to both biological (sex) and social (gender) variables. Although there is evidence that sex affects many elements of treatment and problems in kidney failure (end-stage renal disease), there is surprisingly little information about how sex affects risk factors and complications in early stages of CKD. Despite extensive research on risk factors and consequences, this study has often avoided taking a sex or gender perspective. Since it is obvious that there is still much to learn about how sex affects the onset and progression of CKD, this review maps both what is known and what is unclear about this relationship. This review investigates the potential effects of gender and sex on the epidemiology, risk factors, and complications of CKD.

EPIDEMIOLOGY AND RISK FACTORS OF CKD

The Equation for the Estimated Glomerular Filtration Rate in CKD Diagnosis and the Effect of Sex; Proteinuria and Glomerular Filtration Rate (GFR) measurements of renal function are required for the diagnosis and staging of CKD. In order to avoid intrusive testing and the associated costs, kidney function is typically assessed using an Estimated Glomerular Filtration Rate (eGFR). In order to stage CKD, various proven equations are now in use in clinical practice

Age

Growing older is a significant risk factor for CKD. The prevalence of CKD rises rapidly with age, rising from 4% in those under the age of 40 to 47% in people over the age of 70. This partly reflects a known decline in eGFR of about 1 mL/min per 1.73 m^2 per year beginning at age 40, which is assumed to be mostly caused by nephron loss. Females are more likely than males to live longer and lose enough nephrons to meet CKD diagnostic criteria since they have longer life expectancies. Although it is debatable whether this represents a

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disease or an age-related decline in kidney function, it undoubtedly accounts for some of the higher prevalence of CKD in females.

Diabetes

For both sexes, diabetes is the main contributor of CKD. Diabetic Kidney Disease (DKD) is more common in non-Caucasian persons, with Indigenous Australians, African Americans, Asians, North American First Nations, Hispanics, Maoris, and Pacific Islanders being particularly vulnerable. Females have a lesser probability of acquiring DKD than males do when they have type 1 diabetes. In research examining the link between sex and DKD in type 2 diabetes, different findings have been reported, therefore it does not appear that this association holds true for this condition. There was no difference between the likelihood of developing DKD in girls with diabetes compared to boys with diabetes, according to a 2017 systematic review and meta-analysis that included 10 trials and 5 million participants.

Hypertension

For both males and females, hypertension is a known risk factor for developing CKD. According to a systematic review and meta-analysis of six cohort studies from 2020 that involved more than 2 million people, women with hypertension had a 23% lower relative risk of incident CKD than men did. The US Renal Data System annual report on CKD notes that having hypertension increases the risk of developing CKD in the general population, and that risk roughly doubles if a person also has diabetes. It is unknown what causes this, whether biological, behavioral, or other factors. Nephrology's gender differences have generally received little attention. We looked into a number of risk factors, including age, diabetes, hypertension, obesity, smoking, and cerebrovascular illness, but none of them provided strong support for the idea that gender served as an impact modifier to raise the risk of CKD. The increased life expectancy of women combined with the unreliable female eGFR equations most likely contributes in part, but not entirely. The fact that women are 30% more likely than men to develop CKD globally and that this disparity cannot entirely be explained raises serious concerns and emphasizes how crucial it is to conduct additional study in this area. Despite reporting a lower quality of life than men, women with CKD appear to have a slower disease progression and lower mortality rates. Where sex-based research is available, it is noteworthy that it examines outcomes within the CKD population rather than their counterparts in the wider community, which may understate the effect CKD has on women. Targeted practices and policies can only be devised and the current sex-based disparities can be eliminated with research aimed at elucidating the biological and social factors behind sex-based disparities in the epidemiology of, and consequences from, CKD.