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Summary: Little is known regarding the ways in which chronic kidney disease (CKD) prevalence and progression differ between the sexes. Still less is known regarding how social disparities between men and women may affect access to care for CKD. In this review, we briefly describe biological sex differences, noting how these differences currently do not influence CKD management recommendations. We then describe what is known within the published literature regarding differences in CKD epidemiology between sexes; namely prevalence, progression, and access to treatment throughout the major world regions. We highlight that health care expenditure and social gender disparities ultimately may determine whether women have equitable access to care for CKD and end-stage kidney disease. Among many high- and low-income settings, women more often donate and are less likely to receive kidney transplants when compared with men. Research is needed urgently to elucidate the reasons behind these disparities, as well as to develop CKD treatment strategies tailored to women's unique health care needs.

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Culture is defined as the complex whole of interactions that include belief, art, laws, and customs that determine the way an individual or a society lives,¹ thus culture plays a significant role in gender issues. *Culture* includes all the factors (sex, faith, sexual orientation, profession, tastes, age, socioeconomic status, disability, ethnicity, and race) that influence who we are and the way we live. *Gender* denotes “the collection of roles and relationships, personae, attitudes, behaviors, beliefs or tenets, relative authority, and influence that are attributed to either sex on a differential basis by society.”^{2,3} Although *sex* simply refers to the biological differences, *gender* is related to social differences between men and women.³

Over the past 10 to 20 years, research exploring the relationships between sex and health including the gender differences in access to health care, vulnerability to disease, and the impact on disease conditions has increased.⁴

Ideally, gender issues should be considered when biomedical research and health policies are developed and implemented.⁴ Because gender is considered a social construct, gender analysis in health has been conducted mostly by social scientists. Social scientists have noted that biological differences alone do not sufficiently explain health behavior. Social determinants implicated in health outcomes include sex, socioeconomic, sociocultural, and political factors, among others.⁵⁻⁷

The Global Burden of Disease Study estimated that in 2013, chronic kidney disease (CKD) deaths among men of all ages was 14.5 per 100,000, whereas in women it was 12.14 per 100,000.⁸ Interpreting these data at the global level, one could assume a fairly similar or even favorable outcome for women with CKD when compared with men (Fig. 1). In this review of sex patterns within the CKD population, we evaluate what is known regarding CKD patterns of care at more granular levels in relation to both sex and gender. We begin by highlighting selected biological pathways that could explain differences in CKD epidemiology and progression between sexes. Next we review gender differences in CKD outcomes and renal replacement therapy (RRT) provision throughout the world as described in the literature as well as in existing kidney registries. We explore possible reasons for observed differences, and what roles biology versus societal aspects such as gender discrimination, economics, and health care infrastructure may play in manifesting these differences.

BIOLOGICAL DIFFERENCES AFFECTING CKD CARE AND OUTCOMES IN MEN AND WOMEN

Sex differences in the pathophysiology of CKD have divergent clinical implications for male and female

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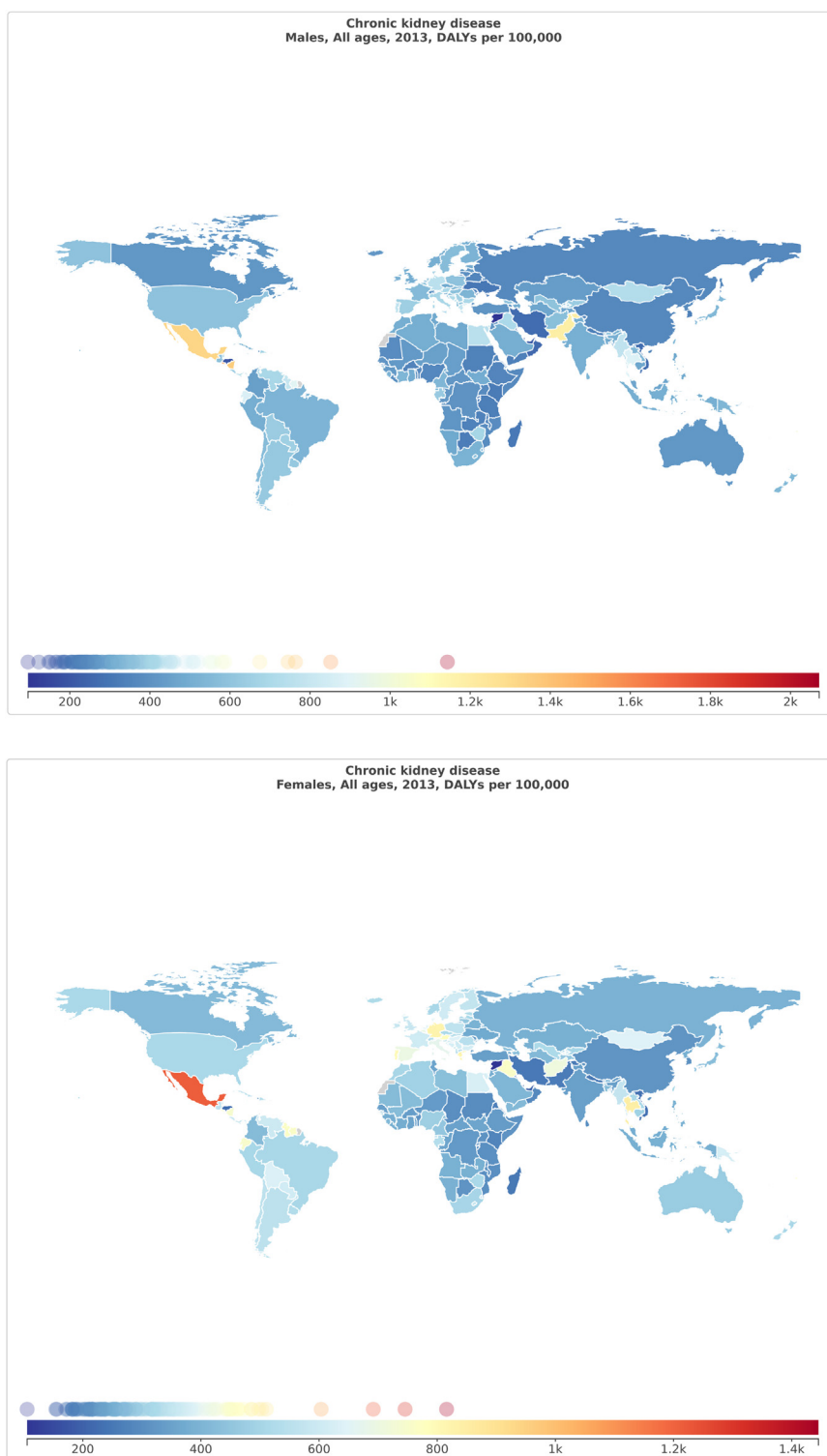


Figure 1. Chronic kidney disease death rates among (A) men and (B) women per 100,000 in 2013 throughout the world.

patients.^{9–11} Some differences are well known, but are not considered in CKD care. The first example is anemia, an inherent complication of CKD and a cornerstone in CKD management. At a community level, it is conventional that women have lower

hemoglobin and hematocrit levels than men. These differences are explained by physiological adaptations to anemia in women, which include shifting of the hemoglobin oxygen dissociation curve to reduce oxygen affinity secondary to higher levels of

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