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EDITORIAL

Chronic kidney disease in disadvantaged populations



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“Of all of the forms of inequality, injustice in health is the most shocking and inhumane.”

Dr. Martin Luther King, Jr.

March 12, 2015 marked the 10th anniversary of World Kidney Day (WKD), an initiative of the International Society of Nephrology and the International Federation of Kidney Foundations. Since its inception in 2006, WKD has become the most successful effort ever mounted to raise awareness among decision-makers and the general public about the importance of kidney disease. Each year WKD reminds us that kidney disease is common, harmful, and treatable. The focus of WKD 2015 is on chronic kidney disease (CKD) in disadvantaged populations. This article reviews the key links between poverty and CKD and the consequent implications for the prevention of kidney disease and the care of kidney patients in these populations.

Chronic kidney disease is increasingly a global public health problem and is a key determinant of poor health outcomes. There is compelling evidence that disadvantaged communities (e.g., communities with low resources, racial and minority ethnic communities, and/or indigenous

and socially disadvantaged backgrounds) experience marked increases in the burden of unrecognized and untreated CKD. The entire population of some low- and middle-income countries could be considered disadvantaged, although further discrimination on the basis of local factors creates a position of extreme disadvantage for certain population groups (e.g., peasants, people living in certain rural areas, women, the elderly, religious minorities). The fact that, even in developed countries, racial and ethnic minorities bear a disproportionate burden of CKD and have worse outcomes suggest there is much to learn beyond the traditional risk factors that contribute to CKD-associated complications.¹

Approximately 1.2 billion people live in extreme poverty worldwide. Poverty negatively influences healthy behaviors, health care access, and environmental exposure—all of these factors contribute to health care disparities² (Table 1). The poor are more susceptible to disease because of lack of access to goods and services (in particular clean water and sanitation), lack of information about preventive behaviors, adequate nutrition, and reduced access to health care.³

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Table 1 Possible mechanisms by which poverty increases the burden of disease.

Health behavior	Access to health care	Biological factors	Environmental factors
<ul style="list-style-type: none"> • Lack of information on preventive behaviors • Lack of knowledge on how best to respond to an episode of illness • Health beliefs and unhealthy behaviors 	<ul style="list-style-type: none"> • Lack of access to health care • Greater distance from health care providers • Lack of out-of-pocket resources 	<ul style="list-style-type: none"> • Low birth weight • Genetic predisposition • Cumulative biological risk profiles • Inadequate nutrition 	<ul style="list-style-type: none"> • Increased exposure to pollutants • Increased exposure to communicable diseases • Lack of clean water and sanitation

CKD in developed countries

In the United States, ethnic minorities have a higher incidence of end-stage renal disease (ESRD), despite similar prevalence rates for early stages of CKD.⁴ Poor outcomes such as ESRD are 1.5–4 times higher among minorities (e.g., African-Americans, Latinos and Native Americans).^{2,5–7} Poverty further increases the disparity in ESRD rates with African-Americans being at greater risk.⁸ In the United Kingdom, the rates of treated ESRD are higher in ethnic minority groups and are higher with increasing social deprivation.⁹ In Singapore, the CKD prevalence is similarly higher among the Malays and Indians than among the Chinese, and socioeconomic and behavioral factors account for 70–80% of the excess risk.¹⁰

The ESRD incidence is also higher among the less advantaged indigenous populations in developed countries. Canadian First Nations people experience ESRD at rates 2.5–4 times higher than in the general population.¹¹ In Australia, the increase in the number of indigenous people starting renal replacement therapy (RRT) during the past 25 years exceeded that of the nonindigenous population by 3.5-fold; this is largely because of a disproportionate (> 10-fold) difference in ESRD due to type II diabetic nephropathy, a disease largely attributable to lifestyle issues such as poor nutrition and lack of exercise.¹² Indigenous populations also have a higher incidence of ESRD due to glomerulonephritis and hypertension.¹³ Compared to the general population in the United States, the ESRD incidence rate is higher in Guam and Hawaii, where the proportion of indigenous people is high; this rate is also driven primarily by diabetic ESRD.¹⁴ Native Americans have a greater prevalence of albuminuria and higher ESRD incidence rate.^{15–18} Nearly three-quarters of all incident ESRD cases among this population are attributable to type II diabetes.

CKD in developing countries

Poverty-related factors such as infectious diseases secondary to poor sanitation, inadequate supply of safe water, environmental pollutants, and high concentrations of disease-transmitting vectors continue to have an important role in the development of CKD in low-income countries. The rates of diabetic nephropathy are rising, although chronic glomerulonephritis and interstitial nephritis are among the principal causes of CKD in many countries. Of note is the emergence of HIV-associated nephropathy as the major cause of CKD in sub-Saharan Africa.¹⁹

A high prevalence of CKD of unknown etiology has been reported in rural agricultural communities in Central America, Egypt, India, and Sri Lanka. Male farm workers are disproportionately affected. The clinical presentation suggests interstitial nephritis, which is confirmed by renal biopsy. The strong association with farm work has led to suggestions that exposure to agrochemicals, dehydration, and the consumption of contaminated water may be responsible.²⁰ In addition, the use of traditional herbal medications is common and frequently associated with CKD among the poor.^{21,22} In Mexico, CKD prevalence among the poor is two- to three-fold higher than among the general population, and the etiology of CKD is unknown in 30% of ESRD patients.^{23–26}

Low birth weight and risk of CKD in disadvantaged populations

An association between low birth weight (LBW) primarily due to nutritional factors and kidney disease has been described in disadvantaged populations. The frequency of LBW is more than double in the aboriginal population than in the nonaboriginal population in Australia. The high prevalence of albuminuria in the nonaboriginal population has been linked to a low number of nephrons associated with LBW.^{27,28} Morphometry studies of kidney biopsies in aboriginals show glomerulomegaly that is perhaps secondary to nephron deficiency, which may predispose them to glomerulosclerosis.^{29,30} A correlation between LBW and CKD has also been described in poor African-Americans and Caucasians living in the southeastern United States.³¹ In an Indian cohort, LBW and early malnutrition were similarly associated with the later development of metabolic syndrome, diabetes, and diabetic nephropathy.³² The finding of a high prevalence of proteinuria, elevated blood pressure, and CKD of unknown etiology in South Asian children may also be explained by this mechanism.^{33,34}

Disparities in access to RRT

A recent analysis showed that 2.6 million people globally were on dialysis in 2010; among these, 93% were in high or upper middle-income countries. By contrast, the number of people requiring RRT was an estimated 4.9–9 million, which suggests that at least 2.3 million people died prematurely because of lack of access to RRT. Even though diabetes and hypertension increase the burden of CKD, the current provision of RRT is linked largely to two factors: the per capita gross national product and a patient's age, which suggest

that poverty is a major disadvantage for receiving RRT. By 2030, the number of people receiving RRT around the world is projected to increase to 5.4 million. Most of this increase will be in the developing countries of Asia and Africa.³⁵

Access to RRT in the emerging world depends mostly on health care expenditures and the economic strength of individual countries with the relationship between income and access to RRT nearly linear in low- and middle-income countries.^{19,36} In Latin America, the RRT prevalence and kidney transplantation rates are significantly correlated with gross national income and health expenditure.³⁷ However, in India and Pakistan, < 10% of all ESRD patients have access to RRT.³⁸ In addition, developing countries have low transplant rates because of a combination of low levels of infrastructure; geographical remoteness; lack of legislation governing brain death; religious, cultural, and social constraints; and commercial incentives that favor dialysis.³⁹

There are also differences in utilization of renal replacement modalities between indigenous and nonindigenous groups in developed countries. In Australia and New Zealand, the proportion of people receiving home dialysis is considerably lower among indigenous people. At the end of 2007 in Australia, 33% of nonindigenous people requiring RRT were receiving home-based dialysis therapies, compared to 18% of aboriginal people. In New Zealand, 62% of nonindigenous RRT population utilized home-based dialysis, but only 42% of Maori/Pacific Islanders did so.¹² The rate of kidney transplantation is also lower in disadvantaged communities. Maori and Pacific people are only 25% as likely to get a transplant as European New Zealanders, and the proportion of indigenous people who undergo transplantation and had a functioning kidney transplant is lower among aboriginal Australians (12%) than among nonindigenous Australians (45%). In the United Kingdom, white individuals from socially deprived areas, South Asians, and blacks were all less likely to receive a pre-emptive renal transplant or living donor transplant, compared to their more affluent white counterparts.⁹ A multinational study found that, compared with white patients, an aboriginal patient's likelihood of receiving a transplant for was 77% lower in Australia and New Zealand, and 66% lower in Canadian First Nations individuals.⁴⁰

Disparities in renal care are more evident in developing nations. Data from India shows that there are fewer nephrologists and nephrology services in the poorer states. As a result, people living in these states are likely to receive less care.⁴¹ In Mexico, the fragmentation of the health care system has resulted in unequal access to RRT. In the state of Jalisco, the acceptance and prevalence rates [327 per million population (pmp) and 939 pmp, respectively] were higher in the more economically advantaged insured population than for patients without medical insurance (99 pmp and 166 pmp, respectively). The transplant rate also was dramatically different at 72 pmp for people with health insurance and 7.5 pmp for people without it.⁴²

The bidirectional relationship between poverty and CKD

In addition to having a higher disease burden, the poor have limited access to resources for meeting treatment costs. A

large proportion of patients who are forced to meet the expensive ESRD treatment costs by incurring out-of-pocket expenditure are forced into extreme poverty. In one Indian study, > 70% of patients undergoing kidney transplantation experienced catastrophic health care expenditures.⁴³ Entire families experience the impact of this through job loss and interruptions in the education of children, etc.

Outcomes

The overall mortality rates among people who do receive RRT are higher in the indigenous, minority, and uninsured populations, even after adjusting for comorbidities. The hazard ratios for death on dialysis relative to nonindigenous people are 1.4 for aboriginal Australians and New Zealand Maori.⁴⁴ The Canadian First Nations patients achieve target levels for Blood Pressure and mineral metabolism less frequently.⁴⁵ In the United States, living in predominantly black neighborhoods is associated with higher than expected mortality rates on dialysis and an increased time to transplantation.⁴⁶ Black patients on peritoneal dialysis similarly have a higher risk of death or technique failure, compared to whites.⁴⁷

In Mexico, the mortality on peritoneal dialysis is three-fold higher among the uninsured population, compared to Mexican patients receiving treatment in the United States, and the survival rate is significantly lower in this population than in the insured Mexican population.⁴⁸ By contrast, in India nearly two-thirds of patients are unable to continue dialysis beyond the first 3 months because of financial reasons.⁴⁹

Summary

The increased burden of CKD in disadvantaged populations is because of global factors and population-specific issues. Low socioeconomic status and poor access to care contribute to health care disparities and exacerbate the negative effects of genetic or biologic predisposition. Providing appropriate renal care to these populations requires a two-pronged approach: (1) expanding the reach of dialysis through the development of low-cost alternatives that can be practiced in remote locations, and (2) implementing and evaluating cost-effective prevention strategies. Kidney transplantation should be promoted by expanding deceased donor transplant programs and using inexpensive generic immunosuppressive drugs. The message of WKD 2015 is that a concerted attack against diseases that lead to ESRD could end the unacceptable relationship between CKD and disadvantage in these communities by increasing community outreach, providing better education, and improving economic opportunity and access to preventive medicine for people at highest risk.

Conflicts of interest

All authors declare no conflicts of interest.

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