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BURDEN, ACCESS AND DISPARITIES IN KIDNEY DISEASE

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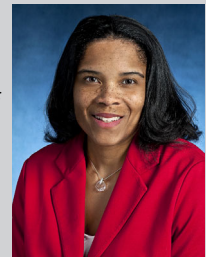
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ABSTRACT

Kidney disease is a global public health problem, affecting over 750 million persons worldwide. The burden of kidney disease varies substantially across the world. In many settings, rates of kidney disease and the provision of its care are defined by socio-economic, cultural and political factors leading to significant disparities. World Kidney Day 2019 offers an opportunity to raise awareness of kidney disease and highlight disparities in its burden and current state of global capacity for prevention and management. Here we highlight the need for strengthening basic infrastructure for kidney care services for early detection and management of acute kidney injury and chronic kidney disease across all countries and advocate for more pragmatic approaches to providing renal replacement therapies. Achieving universal health coverage worldwide by 2030 is a World Health Organization Sustainable Development Goal. While universal health coverage may not include all elements of kidney care in all countries, understanding what is locally feasible and important with a focus on reducing the burden and consequences of kidney disease would be an important step towards achieving kidney health equity.

BIODATA

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INTRODUCTION

Kidney disease is a global public health problem, affecting over 750 million persons worldwide (GBD 2015 DALYs & HALE Collaborators, 2016; Bikbov *et al.* 2018). The burden of kidney disease varies substantially across the world, as does its detection and treatment. In many settings, rates of kidney disease and the provision of its care are defined by socio-economic, cultural and political factors leading to significant disparities (Crews *et al.* 2014). World Kidney Day 2019 offers an opportunity to raise awareness of kidney disease and highlight disparities in its burden and current state of global capacity for prevention and management. Here, we highlight these disparities and emphasize the role of public policies and organizational structures in addressing them.

BURDEN OF KIDNEY DISEASE

Availability of data reflecting the full burden of kidney disease varies substantially worldwide (Table 1) (Bello *et al.* 2017). While several countries have national data collection systems, particularly for end stage renal disease (ESRD), high quality data on non-dialysis chronic kidney disease (CKD) is limited, and often the quality of ESRD data is quite variable across settings. Incorporating kidney disease surveillance parameters in existing chronic disease prevention programs might enhance global efforts towards high quality information on kidney disease burden and attendant consequences (Levin *et al.* 2017).

In addition to a need for functional surveillance systems, the global importance of kidney disease is yet to be widely acknowledged. For instance, the World Health Organization (WHO) Global Action Plan for the Prevention and Control of Non-Communicable Diseases (NCDs) (2013) (World Health Organization 2013) focuses on cardiovascular diseases, cancer, chronic respiratory diseases

and diabetes, but not kidney disease. This is quite concerning as estimates from the Global Burden of Disease study in 2015 showed that around 1.2 million people were known to have died of CKD (GBD 2015 Mortality & Causes of Death Collaborators 2016), and over 2 million people died in 2010 because they had no access to dialysis. It is estimated that another 1.7 million die from acute kidney injury (AKI) on an annual basis (Liyanaage *et al.* 2015; Mehta *et al.* 2015). It is possible, therefore, that kidney disease may contribute to more deaths than the four main NCDs targeted by the current NCD Action Plan.

HEALTH POLICIES AND FINANCING OF KIDNEY DISEASE CARE

Due to the complex and costly nature of kidney disease care, its provision is tightly linked with the public policies and financial status of individual countries. In several high-income countries, universal health care is provided by the government and includes CKD and ESRD care. In others, such as the United States, ESRD care is publically financed for citizens, however, optimal treatment of CKD and its risk factors may not be accessible for persons lacking health insurance, and regular care of undocumented immigrants with kidney disease is not covered. In low- and lower-middle-income countries, neither CKD nor ESRD care may be publically financed and CKD prevention efforts are often limited. In several such countries, collaborations between public and private sectors have emerged to provide funding for RRT (Rizvi *et al.* 2013).

In many settings, individuals with advanced CKD shoulder substantial financial burden. A systematic review of 260 studies including patients from 30 countries identified significant challenges including: fragmented care of indeterminate duration, reliance on emergency care, and fear of catastrophic life

CKD care	Low-income countries (%)	Lower-middle-income countries (%)	Upper middle-income countries (%)	High-income countries (%)
Governmental recognition of CKD as a health priority	59	50	17	29
Government funds all aspects of CKD care	13	21	40	53
Availability of CKD management and referral guidelines (international, national, or regional)	46	73	83	97
Existence of current CKD detection programs	6	24	24	32
Availability of dialysis registries	24	48	72	89
Availability of academic centers for renal clinical trial management	12	34	62	63

Table 1: World bank country group chronic kidney disease gaps.

CKD: chronic kidney disease.
Data source: Bello *et al.* (2017).

events because of diminished financial capacity to withstand them (Roberti et al. 2018). Challenges may be even greater for families of children with ESRD, as many regions lack qualified pediatric care centers (Harambat & Ekulu 2016).

ORGANIZATION AND STRUCTURES FOR KIDNEY DISEASE CARE

The lack of recognition and therefore absence of a global action plan for kidney disease partly explains the substantial variation in structures and capacity for kidney care around the globe. In 2017, the International Society of Nephrology collected data on country-level capacity for kidney care delivery using a survey, the Global Kidney Health Atlas (GKHA) (Bello et al. 2017), which aligned with the WHO's building blocks of a health system (World Health Organization 2010). The GKHA highlights limited awareness of kidney disease and its consequences and persistent inequities in resources required to tackle the burden of kidney disease across the globe. For example, CKD was recognized as a health care priority by government in only 36% of countries that participated in this survey, and priorities were inversely related to income level: CKD was a healthcare priority in more than half of low- and lower-middle-income countries, but in less than 30% of upper-middle- and high-income countries.

On capacity and resources for kidney care, many countries still lack access to basic diagnostics, a trained nephrology workforce, universal access to primary health care, and RRT. Low- and lower-middle-income countries, especially in Africa, had limited services for the diagnosis, management, and monitoring of CKD at the primary care level, with only 12% having serum creatinine measurement including estimated glomerular filtration rate. Across all world countries, availability of services at the secondary/tertiary care level was considerably higher than at the primary care level.

RENAL REPLACEMENT THERAPIES

The distribution of RRT technologies varied widely. On the surface, all countries reported having chronic hemodialysis services, and more than 90% of countries reported having acute hemodialysis. However, access to and distribution of RRT across countries and regions was highly inequitable, often requiring prohibitive out-of-pocket expenditure, particularly in low-income regions. For instance, more than 90% of upper-middle- and high-income countries reported having chronic peritoneal dialysis services, whereas these services were available in 64% and 35% of low- and lower-middle-income countries, respectively. As expected, low-income countries had the lowest availability of kidney transplant services, with only 12% reporting availability, and live donors as the only source.

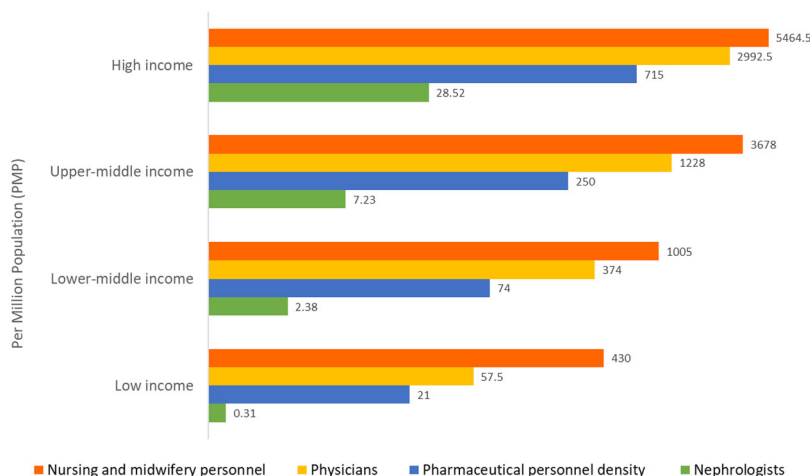


Figure 1: Nephrologists Availability (density per million population) compared to General Practice Physicians, Nursing and Pharmaceutical Personnel Availability by Country Income Level. Logarithmic scale used for x-axis [log(x+1)] due to the large range in provider's density. Pharmaceutical personnel include: pharmacists, pharmaceutical assistants, pharmaceutical technicians. Nursing and midwifery personnel include: professional nurses, professional midwives, auxiliary nurses, auxiliary midwives, enrolled nurses, enrolled midwives and related occupations such as dental nurses. Data source: (1) Nephrologists: Global Kidney Health Atlas (2016). (A) Bello et al. (2017) (B) Osman et al. (2018). (2) Physician, nursing and pharmaceutical personnel: World Health Organization (2018).

WORKFORCE FOR KIDNEY CARE

Considerable international variation was also noted in the distribution of the kidney care workforce, particularly nephrologists. The lowest density (<5 nephrologists per million population) was very common in low-income countries, whereas the highest density (>15 nephrologists per million population) was reported mainly in high-income countries (Figure 1) (Bello *et al.* 2017; Osman *et al.* 2018; World Health Organization 2018). Quite encouragingly, the number of nephrologists and nephropathologists is rising in low- and lower-middle-income countries, in part thanks to fellowship programs supported by international nephrology organizations (Harris *et al.* 2012; Feehally 2016).

Most countries reported nephrologists as primarily responsible for both CKD and AKI care. Primary care physicians (PCPs) had more responsibility for CKD care than AKI care. Intensive care specialists were primarily responsible for AKI in 75% of countries, likely because AKI is typically treated in hospitals. However, only 45% of low-income countries reported that intensive care specialists were primarily responsible for AKI, compared to 90% of high-income countries. For other care providers essential for kidney care, provider shortages were highest for renal pathologists (86% of countries reported a shortage), vascular access coordinators (81%), and dietitians (78%), and the shortages were more common in low-income countries.

How could this information be used to mitigate existing barriers to kidney care? First, basic infrastructure for services must be strengthened at the primary care level for early detection and management of AKI and CKD across all countries (Couser *et al.* 2011). Second, whilst optimal kidney care should obviously emphasize prevention to reduce adverse consequences of kidney disease at the population level, countries (particularly low- and lower-middle-income countries) should be supported at the same

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time to adopt more pragmatic approaches in providing RRT. For example, acute peritoneal dialysis could be an attractive modality for AKI, as this is as effective as hemodialysis, requires far less infrastructure, and can be performed with solutions and catheters adapted to local resources (Chionh *et al.* 2013; Cullis *et al.* 2014). Third, kidney transplantation should be encouraged through increased awareness among the public and political leaders across countries, as this is the clinically optimal modality of RRT and it is also cost-effective, provided that costs of the surgery and long-term medication and follow-up are made sustainable through public (and/or private) funding (Muralidharan & White 2015).

CONCLUSION

Socially disadvantaged individuals experience a disproportionate burden of kidney disease worldwide. The provision of and delivery of kidney care varies widely across the world. Achieving universal health coverage worldwide by 2030 is one of the WHO Sustainable Development Goals (World Health Organization 2017). While universal health coverage may not include all elements of kidney care in all countries, understanding what is feasible and important for a country or region with a focus on reducing the burden and consequences of kidney disease would be an important step towards achieving kidney health equity.

DISCLOSURE

All the authors declared no competing interests.

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AUTHOR CONTRIBUTIONS

All authors contributed equally to the conception, preparation and editing of the manuscript.

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