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The silent epidemic and pronounced disparities: A global review of the chronic kidney disease burden

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INTRODUCTION

Chronic kidney disease (CKD), often asymptomatic in its initial phases, represents a growing global health burden characterized by relentless progression and a profound synergy with cardiovascular morbidity and mortality. The 78th World Health Assembly (WHA) formally acknowledged this challenge in May 2025 by designating kidney disease as the fifth major non-communicable disease (NCD) of global priority. This pivotal policy shift was informed by the 2023 Global Burden of Disease Study (GBD 2023) special issue on CKD, which provides the most comprehensive epidemiological landscape of adult CKD to date. Departing from conventional estimates of prevalence and mortality, GBD 2023 employs multidimensional analyses—stratifying by disease stage, attributing risk factors, and assessing treatment access—to delineate the heterogeneity of the CKD burden across regions. This article synthesizes the study's principal findings, examines persistent knowledge gaps, and outlines strategic directions for CKD prevention and management, integrating evidence from clinical nephrology and population health (Figure 1).

CORE CONTRIBUTIONS : FROM MACRO ESTIMATES TO STRUCTURED INSIGHTS

The GBD 2023 CKD study represents a substantial and noteworthy advance in both methodological rigor and analytical scope, with its core contributions concentrated and most impactful within three interconnected key domains.

First, stage-specific burden estimation.The study pioneers the first systematic global estimation of CKD burden stratified by clinically defined stages (Stages 1–5). Aligned with the KDIGO framework using eGFR and ACR, it classifies the global population while distinguishing dialysis and transplant recipients. Notably, while GBD 2023 utilizes cross-sectional data (contrasting with the clinical requirement of persistence ≥3 months), this staging is indispensable for public health planning.[1,2] The data reveal that early-stage disease (Stages 1–3) constitutes the overwhelming majority of the burden. This shifts the intervention "window of opportunity" from end-stage kidney disease (ESKD) to an earlier, more modifiable phase.

Second, quantifying the cardiorenal risk axis.The study establishes reduced kidney function as an independent risk factor for incident cardiovascular disease. In 2023, impaired kidney function accounted for 11.5% of global cardiovascular deaths, ranking as the seventh leading risk factor worldwide. This population-attributable fraction surpasses that of high fasting plasma glucose and obesity. These findings provide robust epidemiological evidence for cardiorenal interactions, supporting a paradigm shift from fragmented care to integrated cardiorenal management. More importantly, they clarify a critical pathway within the cardiorenal syndrome and strengthen the rationale for clinical models that address shared pathophysiological mechanisms rather than treating kidney and cardiovascular disease as separate entities.

Third, expanding the risk attribution framework.Acknowledging the complex aetiology of kidney disease, the study incorporates environmental and climatic exposures. It identifies non-optimal temperatures, particularly sustained heat, as a significant contributor to CKD-related DALYs. This provides critical etiological insights for chronic kidney disease of unknown etiology (CKDu) in regions like Central America and South Asia. This expansion necessitates a move beyond single-risk models toward sophisticated analyses of dynamic environmental interactions. It also highlights the need for future epidemiological frameworks capable of capturing temporal shifts in dominant disease drivers and the complex interplay between environmental, occupational, and metabolic exposures across diverse populations.

PERSISTENT CHALLENGES AND STRATEGIC PRIORITIES

The extensive data from GBD 2023 not only illuminate the burden but also reveal profound, persistent challenges in global CKD response, alongside clarifying strategic priorities for intervention.

The gap between therapeutic progress and population-level control

Despite pharmacological advances, the global CKD burden is escalating, indicating failures in translating clinical efficacy into population health gains.[1] For instance, guideline-recommended albuminuria testing remains underutilized among high-risk patients (<30% in some regions), contributing to underdetection. Furthermore, barriers related to cost, infrastructure, and awareness hinder the dissemination of foundational therapies like SGLT2 inhibitors, as recommended by KDIGO 2024. This divergence between therapeutic innovation and population-level outcomes underscores a broader implementation failure. While the evidence base supporting contemporary CKD management continues to expand, many of the patients most likely to benefit from these advances remain undiagnosed, untreated, or excluded from effective long-term care pathways.

The profound mismatch between disease burden and treatment capacity

The study reveals a pronounced geographical mismatch: regions with the highest CKD prevalence, including North Africa, the Middle East, and sub-Saharan Africa, often have the most limited availability of life-sustaining kidney replacement therapy (KRT).[1] This disparity, an example of the "inverse care law," results in vast amounts of preventable death. The inequity extends beyond mere treatment access and permeates disease characterization itself; in sub-Saharan Africa, for instance, the CKD etiological spectrum remains poorly defined, with estimates suggesting a significant proportion of cases cannot be attributed to traditional risk factors like diabetes or hypertension and are thus classified as CKDu.[3] This suggests that high-burden regions suffer from a dual and compounding deficit: a crippling lack of therapeutic resources coupled with insufficient epidemiological data to inform targeted, primary prevention strategies tailored to local etiologies, a situation further exacerbated by severe shortages in specialized human resources and diagnostic infrastructure as documented by reports such as the International Society of Nephrology Global Kidney Health Atlas.[4]

The etiological "black box" in high-burden regions

While GBD excels at modeling population-level data, it often lacks the granularity to specify etiology, particularly in hotspots for CKD of unknown cause (CKDu).[1] The study acknowledges that the true burden of CKDu and specific genetic factors are likely underestimated.[1] This limits the development of targeted primary prevention in regions like parts of Africa, where CKDu is linked to environmental and occupational factors such as agricultural labor and agrochemical exposure.[3] The striking contrast between the rapid advances occurring in molecular and precision nephrology and the persistent coarseness of population-level etiological data creates a significant knowledge translation gap, leaving millions worldwide exposed to poorly understood kidney disease determinants.

STRATEGIC PRIORITIES FOR ACTION

To address these challenges, three priority areas offer high-impact pathways.First, focus on demographic giants.Countries with the highest absolute burden—such as China and India (each >100 million)—and other populous nations (e.g., USA, Indonesia, Japan) must be prioritized. Tailored, large-scale strategies in these regions are paramount to reducing global CKD prevalence.Second, target modifiable risks.Hypertension, high BMI, and metabolic factors are the primary drivers of CKD. Public health efforts focusing on blood pressure control, metabolic health, and obesity prevention promise the highest return on investment.Third, capitalize on early-stage disease.As most patients are in asymptomatic early stages (Stages 1–2),

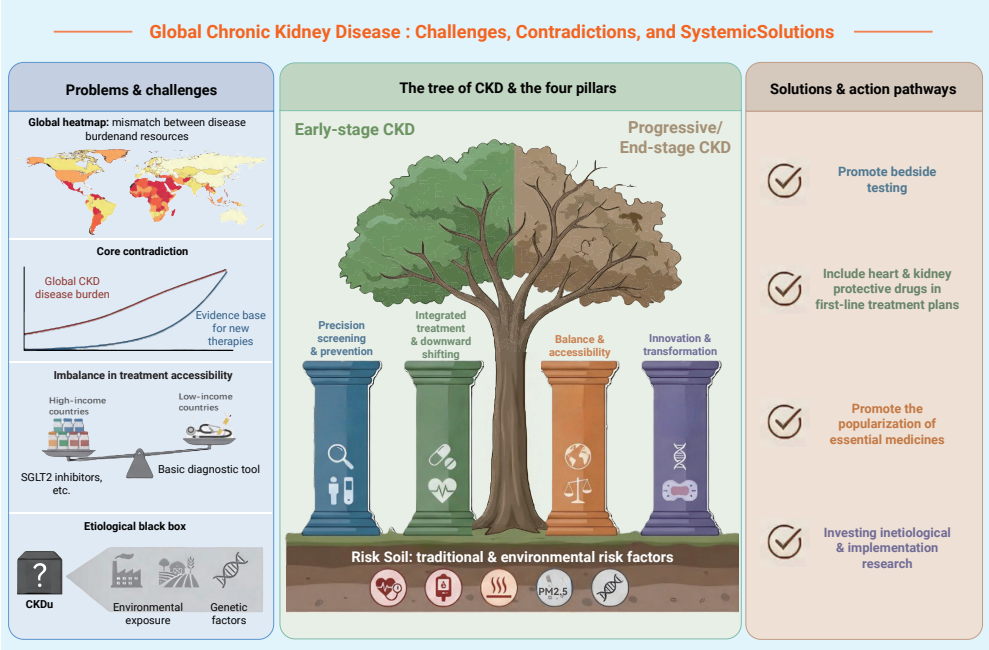

Figure 1. The global CKD burden: a silent epidemic, a pronounced disparity, a call for integrated action.

shifting the paradigm to early detection via targeted screening and timely intervention will yield greater benefits than managing late-stage complications.

BUILDING A FOUR DIMENSIONAL RESPONSE STRATEGY

Informed by the pivotal insights from GBD 2023 and the strategic priorities above, the global response must achieve a decisive transformation across four interconnected dimensions.

Public health: Precision screening and upstream prevention

Health systems should transition from opportunistic testing to structured, risk-based screening embedded within primary care, institutionalizing regular eGFR and albuminuria assessments among high-risk populations. Expanding access to point-of-care testing (POCT) may help overcome laboratory dependence in resource-constrained settings and facilitate earlier diagnosis. However, screening alone will not be sufficient. The growing recognition of environmental and climatic contributors to CKD highlights the importance of upstream prevention. Kidney health should therefore be incorporated into cross-sectoral policies addressing environmental regulation, occupational health, agricultural practices, heat exposure, and climate adaptation. Such an approach would move CKD prevention beyond the clinic and embed kidney health within broader sustainability, environmental justice, and planetary health agendas.

Clinical practice: Integrated and decentralized care

The clinical management of CKD must pivot decisively toward earlier, integrated, and decentralized care models. Pharmacological cornerstone therapies, most notably SGLT2 inhibitors, have demonstrated robust renal and cardiovascular benefits across a wide spectrum of CKD populations, irrespective of diabetes status, and now constitute an evidence-based foundation for treatment.[5] Critically, the delivery of these and other evidence-based protocols must be shifted from specialist-dominated tertiary settings to strengthened primary healthcare systems through mechanisms such as structured training, task-sharing, and telemedicine support, enabling a model of "front-loaded intervention and downward-shifted care delivery" that is both efficient and equitable.

Global health: Equity and access

The international community must act collectively to advocate for the inclusion of essential nephrology drugs and diagnostic tools on the World Health Organization's Model Lists of Essential Medicines and Diagnostics and to reduce treatment costs in low- and middle-income countries through innovative mechanisms like patent pools and technology transfer.

Research and innovation: Etiology and implementation science

Future research must prioritize several key avenues: deep investigation into gene-environment interactions driving regional epidemics like CKDu; the development and validation of low-cost, point-of-care diagnostic and monitoring technologies suitable for resource-constrained settings; and the rigorous evaluation of climate-adaptive public health interventions on kidney health outcomes. Simultaneously, translating the tools of precision medicine into accessible, population-level public health solutions should be actively encouraged. Furthermore, comparative effectiveness research and implementation science studies aimed at understanding and overcoming barriers to treatment accessibility are now as urgent as the pursuit of novel biological mechanisms.

CONCLUSION

The GBD 2023 special issue on CKD represents far more than a mere quantification of disease burden; it serves as a global diagnosis of profound health inequity and an evidence-based call to action. The synthesized evidence makes clear that addressing the escalating challenge of CKD demands a comprehensive, coordinated, and persistent response that strategically integrates early detection, optimized and integrated care delivery, a relentless pursuit of global equity in access, and etiologically informed, context-specific research.[1,2,5] Embedding kidney health firmly within the core agenda of universal health coverage and the Sustainable Development Goals, while concurrently correcting the profound mismatch between disease burden and healthcare resources, constitutes an inescapable responsibility for the global health community in this era. As underscored by the recent World Health Assembly resolution, achieving this vital objective requires sustained political commitment and genuine cross-sectoral, interdisciplinary collaboration that boldly extends beyond the traditional boundaries of clinical medicine. Ultimately, the paramount goal of such research and analysis should not be the generation of ever more precise estimations alone, but the effective and equitable translation of robust evidence into decisive, scalable, and life-saving action.

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AUTHOR CONTRIBUTIONS

All authors contributed to and approved the manuscript.

DECLARATION OF INTERESTS

The authors declare no competing interests.