

GLOBAL DISPARITIES IN KIDNEY CARE: INEQUITIES IN ACCESS TO DIALYSIS, TRANSPLANTATION, AND EMERGING INNOVATIONS

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ABSTRACT:

End-stage kidney disease and chronic kidney disease are rapidly becoming a health burden to the world and there are notable differences between the accessibility of diagnosis, treatment and long-term care across regions and populations. Despite the fact that much has been done to improve nephrology, accessibility to life-sustaining dialysis and kidney transplantation is not well spread out, particularly in low- and middle-income nations and in such socially deprived groups of high-income areas. It is a summary of the current findings of the inequalities in kidney care worldwide with a specific emphasis on the inequity in the provision of dialysis, kidney transplantation, and the new developments of the care continuum. The review is based on peer-reviewed sources, the global registry data, and the reports on the latest efforts to enhance nephrology in various countries to explore the disparity in the burden of the disease, the ability of healthcare facilities, the funding, and the supply of the workforce that characterizes the access to and outcomes regarding the world. Accessibility to dialysis, modality, quality, and transplantation rates are discussed according to structural and social factors, i.e., socioeconomic status, geographical location, and politics. The evaluation of the possibility of emerging innovations, such as home-based dialysis, transplant technologies, nephroprotective therapies, and diagnostic tools, to improve equity, is also provided, with risks of widening the disparity being the unequal implementation. The findings reveal that to reduce the disparities in kidney care across the globe, the system level interventions that include early disease detection, long-term financing, human resource and fair distribution of innovations must be implemented. Equity should be embedded in the kidney care planning and research as one of the core elements to improve the health of the kidney of the entire world.

KEYWORDS: Chronic Kidney Disease, Health Inequities, Dialysis Access, Kidney Transplantation, Global Nephrology

INTRODUCTION:

The chronic kidney disease (CKD), and the end-stage kidney disease (ESKD) are the rapidly increasing global health problem, and both have serious clinical, social, and economic consequences. Over the last several decades, the prevalence rate of kidney disease in the world has increased considerably due to the advanced age of the population, diabetes and high blood pressure, and the increased survival of other chronic conditions. It has been forecasted that CKD has continued to climb up the world disease rank as one of the leading causes of untimely deaths and disability particularly in the low and middle-income countries where preventive care and early disease diagnosis remains an inconsequential scenario. This rise of the number of individuals with kidney failure imposes unimaginable burdens on the health sectors especially where there are low resources and low accessibility to renal replacement therapy [1].

This dependency of the effective treatment on the capacity of the health system, its funding and its governance in addition with the disease burden have ensured that kidney care is an issue of concern to global health and equity. Dialysis and kidney transplantation are also considered to be essential life-sustaining treatments of ESKD and are still unknown to millions of the population in the entire world. Despite the existence of the countries offering kidney replacement therapy, there are quite considerable discrepancies in the quality of the treatment, mode, which is applied in treating patients and the outcomes of the treatment. Such disparities are indicators of other determinants of health such as socioeconomic status, geography, education, and health literacy, and this aspect warrants why it is important to conceptualize kidney disease as a health inequity issue, and to make it a health inequity indicator [2].

Disparity in the provision of kidney care can be observed at both income groups, geography and among individuals. The increased accessibility to dialysis facilities, skilled workforce and dialysis transplant in nations with high income is high and significantly lacking in most of the low-income areas. Observational evidence of surveys carried out across the world shows that a high disparity exists in the structural arrangement of the CKD detection and monitoring programs

with majority of the countries not well arranged to carry out early diagnosis and longitudinal follow-ups [3]. These lapses contribute to late presentation also, and emergency dialysis which are associated with bad performance and high costs. On the national level, the poor masses, rural regions, and the disadvantaged groups would never access the ideal kidney care even where services theoretically exist.

Differences in the outcomes of dialysis services are quite pronounced since they depend on countries and regions, which also emphasizes unfairness in care delivery. International reviews indicate that there is a wide disparity in the overall patient survival, the sufficiency of treatment, and the rates of complications depending on the health system structure, patterns of financing, and even patterns of practice. Some of the factors that influence disproportionate outcomes in patients under dialysis in the international arena are disparity in the utilization of vascular access, accessibility to peritoneal dialysis, and adherence to clinical guidelines [4]. These funding mechanisms are highly significant since countries with less government funding are likely to hand over dialysis provision to the disparate or privately funded system with more separating disparity between the need to pay and the need to access care.

In case of unequal access, kidney care innovations can contain the potential solutions to these inequities, though they can also introduce a risk of unbalanced access, in that case. The advances in dialysis method, prolongation of home based and peritoneal dialysis modal, innovation in the procedure of organ preservation and advancement of improved CKD detecting system can assist in transforming the results and effectiveness. However, international assessments depict that the disparity in the availability of tools, infrastructure and skilled personnel to implement these innovations without any inequality is quite wide. Further, chronic peritoneal dialysis has been identified to be highly heterogeneous with regard to its offering across the regions despite the fact that it can be applied in decentralized treatment in the resource-constrained areas [5]. Technology development can have a positive influence on the resource endowed centers and population unless there are deliberate policies to support equitable uptake.

It is in this backdrop that there is an urgent need to harmonize all the available evidence on kidney care discrepancies everywhere in the globe particularly on dialysis, transplantation and novel concepts. The capacity to understand the correlation between organization of health system, modes of financing and policy priorities and access and outcomes is very vital in formulating effective and contextual solutions. It is a generalized review that aims at exploring the breadth and etiology of disparities across the kidney care continuum using the context of international information and new international kidney care information, as provided by the International Society of Nephrology Global Kidney Health Atlas. The review targets defining the problems and the opportunities of reforming equitable kidney care in all parts of the world and also to inform clinicians, researchers and policymakers involved in improving kidney health within diverse settings. This review aimed:

1. To critically synthesize global evidence on disparities in access to dialysis and kidney transplantation,
2. To examine the role of emerging innovations in kidney care in shaping equity

2. REVIEW METHODOLOGY

The study was conducted as a comprehensive review aimed at summarizing the available evidence on global inequities in kidney care, with a particular focus on disparities in access to dialysis, kidney transplantation, and innovations in nephrology. A structured literature search was undertaken across major biomedical databases, including PubMed, Scopus, and Web of Science, to identify relevant publications published between January 2017 and December 2024. Articles were restricted to the English language to ensure consistency in interpretation.

Key search terms included combinations of chronic kidney disease, end-stage kidney disease, dialysis, kidney transplantation, health disparities, global health, access to care, and innovation in renal medicine. In addition to peer-reviewed original research and review articles, international registry reports, consensus statements, clinical guidelines, and policy documents from recognized nephrology and global health organizations were included to capture health system-level perspectives.

Evidence synthesis was performed using a thematic approach rather than quantitative analysis, reflecting the heterogeneity of study designs, populations, and outcome measures across regions. The review emphasized clinical relevance, equity-focused interpretation, and applicability across diverse health care settings. As this was a comprehensive review, no formal systematic review protocol or meta-analytic methods were employed.

3. Global Epidemiology And Burden Of Kidney Disease

End-stage kidney disease (ESKD) and chronic kidney disease (CKD) is an emerging health issue worldwide, which is becoming eminent in all aspects of the world are ageing, rising rates of diabetes and hypertension, and better management of other chronic diseases. The rates of kidney disease known are extremely uneven worldwide with the burden of the disease being disproportional to the low- and middle-income countries even though they have limited resources to prevent and cure. Kidney care services have high geographic inequalities in access and structure that disrupt the diagnosis, progression and outcomes of the disease especially in geographical regions with the weakest nephrology systems and financial schemes [6].

The disparities in the incidences of ESKD across the geographical locations and the disparities in the incomes of various populations show the disparities in the availability of the early diagnosis, nephroprotective treatment and replacement modalities of the kidneys. Developed kidney disease, especially in the regions where dialysis is not done in due time or at all, has been adding a lot to premature deaths and high mortality than usual. In addition to mortality, CKD and ESKD typically lead to colossal adverse outcomes on quality of life in the physical expressions, psychosocial distress and economic distress, which in some locations (where out-of-pocket health-spending is significant, and the social support apparatus is inadequate) is amplified.

The information that is used to find the global burden of kidney disease is very limited due to the incomplete surveillance systems, underreporting, and inequality in the coverage of the registries (Figure 1). In most of the countries, there is no national kidney registry, and even those are of very low quality and completeness, making cross-country comparison challenging. The new regional reviews have also found increased global surveillance tools to be critical in reporting capacity, the human resource figures and access to services and this increased the importance of improved global surveillance and reporting tools in enhancing equitable health planning and policy formulation of kidney health [7].



Figure 1. Global Epidemiology and Burden of Kidney Disease: Pathways and Constraints

4. Disparities In Access To Dialysis

4.1 Global Distribution and Availability of Dialysis Modalities

The allocation of dialysis services in the world map is unequal and the accessibility to the hemodialysis and peritoneal dialysis units in different regions and income groups are also very unequal. A wide scope of modalities is typically developed in the high-income countries, but the concentration of the facilities, the variety of the modalities, and the lack of the service coverage are the common issues in a diversity of the low- and middle-income countries (LMICs). The study conducted on the renal care in Latin America reveals that the people under dialysis are usually concentrated in urban areas and there is the rural and isolated population that lacks or has limited numbers of facilities to receive renal replacement therapy that will keep them alive [8]. The limitation of the supply and the possibility of applicability of the peritoneal dialysis remain to be completely embraced in the majority of the locations as the supply chain is limited and the regulation presents a problem, and the acquaintance with the providers is unfamiliar.

The infrastructural issues, such as the unreliable power supply, ineffective water purification plants and lack of supplies required in the provision of safe dialysis, also contribute to the inequity (Table 1). These limitations are likely to influence the majority of the geographic areas of access and outcome since they are predominant to the peripheral and rural areas. The reviews on the world of the kidney care capacity underline that the dialysis accessibility is deeply interconnected with the health system strength, leadership, and emphasis of noncommunicable diseases in the health agenda of nations [9]. The distributional gaps would be resolved through co-investment in infrastructure and labour force along with the policy which would help in the equitable growth of dialysis modalities in the diverse environments.

Table 1. Key Drivers of Global Disparities in Kidney Care and Potential Levers for Improvement

Domain	Typical gap	LMIC pattern	Practical lever	Ref
CKD burden	Rising load	Late detection	Early screening	[10]
KRT supply	Low capacity	Few centers	Expand units	[11]
Health literacy	Low awareness	Poor uptake	Patient education	[12]
Digital reach	Limited eHealth	Weak systems	Tele-nephrology	[13]
Policy priority	Under-ranked	Low funding	National agenda	[14]

4.2 Economic, Policy, and Health System Barriers

It is discovered that economic barriers are one of the biggest barriers to even access of dialysis all over the planet, especially in LMICs where the share of household income is less than that of treatment costs, in an average scenario. Without a universal health coverage, the usual result of dialysis financing is out of pocket payments that lead to disastrous health spending and dialysis withdrawal among majority of the patients. It is very dependent on the nature of the financing of the health system and the countries in which the public financing of kidney care is poor are likely to be supported by a fragmented or privatized system of provision that results in unfair delivery of health services [15]. In-center therapy could also be advantageous over less expensive home-based therapies due to reimbursement, limited patient choice, and system inefficiency.

Other policy gaps that lead to lack of equity in access are lack of policies of kidney disease in the country and poor integration of dialysis services in both primary and secondary care. The regulatory systems of many of the jurisdictions which regulate the dialysis treatment and quality control are poorly developed debating inconsistencies in benchmarks and monitoring. The issue of the state and non-state dialysis provision is a big concern as the uncontrolled development of the private sector would expand the capacity of the system and imbalance in the cost of dialysis and accessibility by geographic location [16]. Sustainable and equitable dialysis services are significantly subject to consistency in policies, financial and regulatory limits.

4.3 Quality, Outcomes, and Modality Choice

The difference in the dialysis quality and the clinical outcome are directly manifested in the difference in the access, infrastructure, and personnel. The variation in the survival rates and pattern of complication between various regions is also a key issue, which proves the unequal level of the adequacy of treatment, infection control, vascular access practice and continuity of care. Resource constrained environments and late dialysis start and poor follow-ups are prevalent in this case and result in an overwhelming morbidity and mortality among the kidney failure patients [17]. It is frequent that there are no or random quality assurance processes and performance monitoring systems, which limit the possibilities of systematic improvement.

The modality choice is frequently curtailed by the unavailable providers, institutional incentive and patient limited education to erode home-based and peritoneal dialysis underutilization despite its possible benefits. Adequacy of staff including trained nephrologists, dialysis nurses and technicians is also a constraint to the safe increment of dialysis services. The nephrology organizations internationally have participated in the capacity-building processes where training, shared tasks and models of integrated care are pertinent in improving access and outcomes [18]. Human resource investments, patient-centered education and standardized care pathways need to be considered together to resolve the quality and modality choice disparity, to ensure that the extended access is linked to meaningful health outcomes (Figure 2).

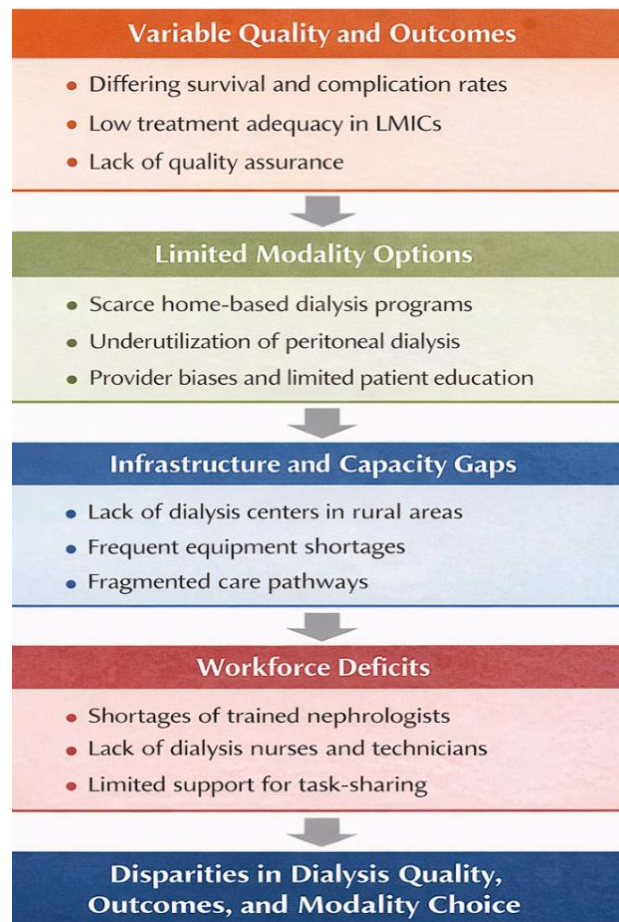


Figure 2. Disparities in Dialysis Quality, Clinical Outcomes, and Modality Choice Across Health Care Settings

5. Disparities In Access To Kidney Transplantation

5.1 Global Transplant Activity and Trends

Kidney transplantation activity is highly varied in relation to the regions as it indicates unequal potential of the health system, financial resources, and availability of the organs donation facilities. The mortality rates among high-income countries are far more advanced by the presence of well-developed deceased donor programs, in most instances, of high throughput post-transplant care networks, whereas the average volumes of transplants in most of the low- and middle-income countries are organized on living organ donation [19]. These disparities result in disparities in access to the preferred type of the kidney replacement therapy that contributes to the chronic dependence on dialysis and greater mortality in the under-resourced setting. Recent transnational research confirms that provision of transplants is significantly correlated to the extent of national income and workforce and government construction, but not disease burden itself [20]. Living donor transplantation in the regions where there are no formal mechanisms to address the deceased donor is the most frequent and in most instances, it thrusts families with disproportionate social and economic needs. The mature organ procurement organization on the other hand encourages increased rates of the deceased donation and equitable allocation within the countries. Those who are at risk in a global context, like those with socioeconomic poor status or merely health literacy, have less access to transplant even in regions with a developed transplant program which reflect the notion that national capacity is inadequate to eliminate inequity [21].

5.2 Barriers to Transplant Access

A number of institutional and individual barriers to equitable access to kidney transplantation in most countries throughout the world exist. It has been observed that the differences between the referral pathway, transplant assessment procedure, and wait listing practices have unequally affected socially and economically disadvantaged groups in the community to delay the process of transplantation or access to transplantation [22]. Another major limiting factor is the supply of organs particularly in regions where the law of deceased donation or other traditional forms of donation do not exist. The laws and regulatory guidelines of organ donation are varied which influences registration of donor, consent modalities and transparency of distribution [23]. Certain groups of people have their perceptions about their cultures, religious beliefs, mistrust in health systems that affects their willingness to give and accept transplantation. Poor health system coordination and fragmentation between dialysis centers and transplant programs also ensures that referral and assessment are not timely made. The overall tendencies in the world demonstrate that the issue of low transplant rates in countries is not always a single logistical issue but rather it is the problems of inadequate funding, staff shortage, and ineffective leadership [24]. The best way to overcome these hindrances is to have holistic policy solutions and strategies, which include legal changes, involvement of the people and standardized methods of referral to avail equitable and timely access to transplantation.

5.3 Post-Transplant Care and Outcome Inequities

The inequality in kidney transplantation is not limited to the access to surgery but also in the post-surgery care and long outcomes (Table 2). Regions do not have equivalent access to essential immunosuppressive medications, and a large number of the low-resource individuals with limited finances undergo a lapse in treatment in some jurisdictions due to the cost, supply chain variability, or weak insurance cover. Such problems contribute to more instances of acute rejection, graft loss and preventable death also. The follow up care is not short-term, but rather long-term and not constant particularly in the rural or underserved areas, and the need to monitor the complications and adherence provision through the follow-up care. Financial toxicity is also a major problem and out-of-pocket expenses of medications, laboratory tests, and travel are overwhelming transplant patients and their family members [25]. Other barriers to coordination of post-transplant care and adherence support can be a problem with vulnerable populations, e.g., cognitively or developmentally disabled, which increases the gap in outcomes even further. In order to address post-transplant inequities, the long-term provision of medications, arranging follow-up and patient-focused models of support relying on social and economic determinants of health should be supported [26].

Table 2. Evidence Base Informing Global Disparities Across the Kidney Care Continuum (CKD Burden, Dialysis Access, and Digital Innovations)

Focus area	Key indicator	Common disparity signal	Practice / policy lever	Reference
CKD burden (1990–2021)	Burden change	Uneven regional rise	Target prevention	[27]
CKD trends (GBD 2021)	Long-term trend	Widening inequality	Risk stratifies	[28]
Hemodialysis delivery	Practice patterns	Variable standards	Standardize care	[29]
Telenephrology	Service reach	Rural access gap	Remote follow-up	[30]
Dialysis initiation & choice	Modality access	Late start, limited choice	Shared decisions	[31]

6. Emerging Innovations In Kidney Care And The Global Equity Gap

6.1 Innovations in Dialysis Technologies and Care Models

The recent dialysis technologies and models of care delivery hold immense opportunities of managing the global inequities in managing kidney failures in the world. Home-based treatments, and in particular peritoneal dialysis (PD), has been proposed as a practical and scalable treatment in low-resource settings, in which the inability to deliver in-center dialysis is dictated by infrastructure and staffing limitations. PD is also less technologically complex and can be decentralized to assist with models of treatments. The idea of modality diversification and patient-centered approaches to dialysis burden is being emphasized as an international reaction to the problem to utilize resources up to the level of the local health system. There is also the severe predictor of access in terms of the density of dialysis facilities in geographic areas since the areas with low densities in terms of facilities distribution have low initiation and poor outcomes [32]. The necessity to integrate new dialysis models and health system planning is notable to ensure that the progress in the sphere of technology can be decreased to provide equal access, rather than to divide further.

6.2 Advances in Kidney Transplantation

Although the innovation of the dialysis services has been more rapid in resource limited environment, the events surrounding the kidney transplants have also enhanced due to the new established global frameworks that have created a connection between the health of kidneys and the overall development agendas. The improved transplantation systems are in accordance with the international goals to reduce inappropriate deaths due to noncommunicable diseases and improving access to essential health services [33]. However, transplantation is very resource-intensive, and it requires integrated infrastructure, regulatory regulation and the ability to provide long-term care that is not evenly available globally. The renal dialysis burden in the world is continuing to increase at a greater rate compared to the transplant in most sites further justifying the use of renal replacement therapies rather than end-stage treatment. The long-term intervention that will be implemented to seal the equity gaps needs to be an investment in health systems integration, workforce training, and ethical governance structures that will lead to the benefit of the innovation to the populations of the different countries and not a few countries (Table 3).

Table 3. Social and System Drivers of Inequity in Access to Kidney Transplantation and Related Care

Factor	Equity signal	Where it shows up	Action lever	Reference
Neighbourhood disadvantage	Lower access	Referral → transplant	Outreach + navigation	[34]
Geography / distance	Unequal pathways	Evaluation logistics	Regional hubs	[35]
Social risk in dialysis care	Performance gaps	Facility metrics	Risk adjustment	[36]
Population health management	Care gaps	Continuum tracking	Registry + panels	[37]
Waitlisting disparity	Lower listing	“Healthy” youth	Standardize	[38]

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6.3 Nephroprotective and Pharmacologic Innovations

The clinical nephrology has been redefined by pharmacologic innovations to slow disease progression and lessen complications in chronic kidney disease, though their availability is still largely uneven. The increasing world-wide incidences of kidney disease underscore the important of implementing nephroprotective interventions earlier in the disease process, especially in those environments where the available kidney replacement therapy is scarce. Nevertheless, the accessibility of medicines, regulatory acceptance and the supply chain limits the practical potential of new treatment in low and middle-income nations. Kidney failure is a global issue and evaluations of the dialysis load emphasize that prevention and delay of kidney failure are critical elements in the sustainability of kidney care systems [39]. Pharmacologic improvements do not ensure the reduction of the necessity of dialysis and transplantation without simultaneous attempts to enhance access to essential and innovative drugs, which will only contribute to the increase in disparities (Figure 3).

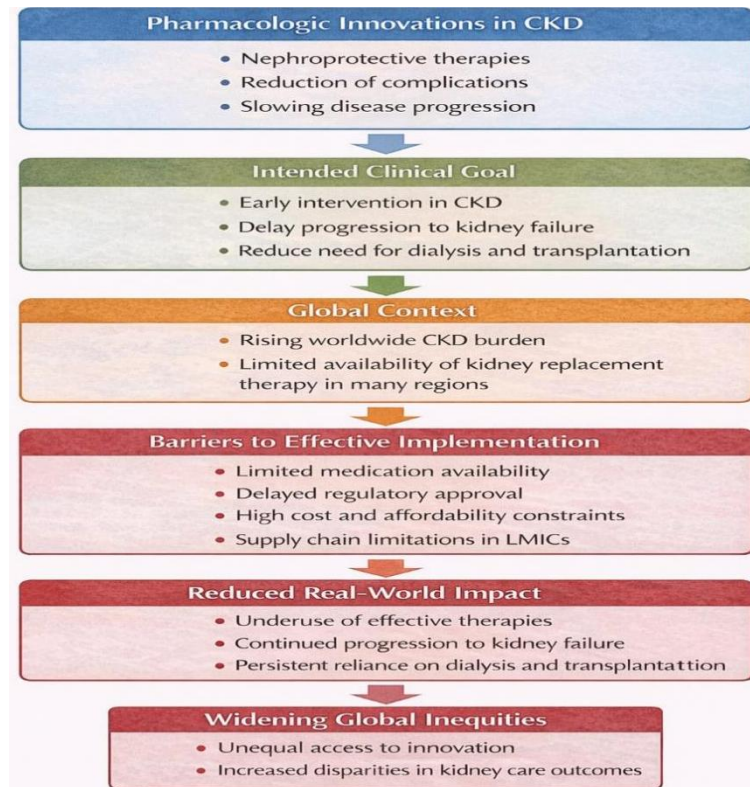


Figure 3. Nephroprotective and Pharmacologic Innovations: Therapeutic Advances and Barriers to Equitable Global Access

6.4 Diagnostic and Predictive Innovations

The development of diagnostics and risk stratification can change the situation in the kidney care sector by providing the opportunity to detect the problem earlier and intervene. Knowing the disease of kidneys at early stages is especially important in those areas, where the infrastructure of dialysis is underdeveloped, as late diagnosis increases emergency introduction of dialysis and poor prognosis. In spite of this possibility, the availability of diagnostic instruments is highly unequal with numerous health systems not having routine laboratory tests and the ability to monitor over time. The worldwide level of kidney diseases complicates the need to incorporate the diagnostics into the primary care and community health to facilitate the management of the diseases sustainably. Innovations in diagnostics should therefore be followed with investments at the system level in order to facilitate fair implementation, continuity of data and connection to effective care pathways.

7. Structural And Social Determinants Of Inequity In Kidney Care

Social determinants and structural processes are deemed to be of paramount concern throughout the imbalance in the whole kidney care continuum, particularly with regards to transplant access, and advanced treatment. Absence of socioeconomic factors, insufficiency of education, and health literacy will always reduce patients to the complicated referral, evaluation and waitlisting, notwithstanding the highly-income health systems. These impediments are the reasons behind the delayed accessibility of the services related to transplant and low opportunities of receiving clear treatment.

Socioeconomic issues also interact with race, ethnicity, and marginalization to augment inequalities in accessing kidney care. Evidence of the case of transplantation systems shows that minority groups are being subjected to a long-term form

of disadvantage during the decision process including referral, listing, and decisional allocation of organs irrespective of clinical qualification. These disparities represent the presence of more social inequalities, implicit bias, supportive resources access instead of medical need disparities.

Political environment and governance of the health system have significant roles in influencing implementation and allocation of new innovative methods in kidney care. The following phase of technologies such as normothermic machine perfusion can utilize more effectively the donor organs and better grafts but their application is typically focused on resources available centres limiting equitable benefit beneficence across populations and regions. The technological shifts might have the unintended separation of the access without having deliberate policies on the issue.

The burden of kidney disease is also inequitable in regard to environment and work exposures; they require greater transplantations and advanced treatment in the disadvantaged groups. These exposures or combined with a lack of access to innovative transplant activity and facilities contribute to the inequalities of disadvantage and poor outcomes (Table 4). The remedy to the structural inequity in kidney care is therefore the joint solutions to the structural inequity using joint policies which integrates social policy, equitable distribution of technologies and reforming the health systems to generate innovations to make them an inclusive benefit.

Table 4. Transplant Innovations and Equity Considerations in Global Kidney Care

Innovation	Core aim	Typical benefit	Equity concern	Reference
Ex-vivo perfusion	Organ repair	Better use	Cost/skills	[40]
Normothermic perfusion	Preserve organs	More viability	Center-limited	[41]
Hypothermic perfusion	Improve storage	Less DGF	Device access	[42]
Xenotransplantation	Expand supply	New organs	Ethics/regulation	[43]
LMIC capacity model	Build programs	More transplants	Sustainability	[44]

8.Strategies To Achieve Equitable Kidney Care Globally

8.1 Policy and Health System Reforms

The policy and health system reforms are also significant in reducing the inequalities in kidney care particularly access to transplantation or long-term care. As the experience of the low- and middle-income countries revealed, the socioeconomic disadvantage has become one of the key obstacles to the access to the transplant implementation due to the gaps in insurance coverage, referral to transplantation, and follow-up. The kidney care taken into the universal models of health cover would serve in reducing the financial dimension of the burden and reliance on out-of-pocket payments. The national chronic kidney disease (CKD) and end-stage kidney disease (ESKD) programs play a role in harmonising the care pathways, improving the early detection, and persistence through the care pathway. To prevent graft loss and inequity, there is a need to have sustainable financing models to both deal with transplants and lifelong immunosuppression, which also points to the need to combine kidney care with other health system strengthening programs [45].

8.2 Capacity Building and Workforce Development

The ability of the workforce must be reinforced in an attempt to treat kidneys fairly in different environments. Various geographical locations are deficient in trained nephrologists, transplant surgeons, nurses and other health personnel and service is only available to the growing disease burden. Application of tasks sharing strategies and post-transplant follow up training models that depend on the circumstances of a situation could create a wider coverage of care by empowering the non-specialized providers to respond to CKD management and post-transplant follow- up. One of the sufficient options is professional exchange program and international cooperation to acquire local expertise primarily in transplantation and advanced renal care. It has been indicated that positive policy environments and viable finances should facilitate investment in the workforce development to ensure long term impacts are experienced. The retention, mentorship and career development-based capacity-building initiatives are crucial regarding empowering health systems and rendering them less reliant on the external resources.

8.3 Equitable Implementation of Innovations

To warrant a reasonable implementation of the innovations in kidney care, there is the need to put into consideration intentional plans that can assist in addressing such factors as affordability, accessibility, and health system preparedness. Innovative pharmacologic therapeutic interventions such as sodium to glucose cotransporter-2 inhibitors have already shown to be of great practical value in the process of slowing down the CKD progression, their distribution is still to be distributed equally across geographic regions and populations. The cost-effectiveness research contributes to the concept that the long-term health and economic impact of their combination with vital post-transplant therapies and nephroprotective drugs could be evident in their creating the public insurance plans. The situational adjustment of innovations, which can be supported with the frameworks of the implementation science, will ensure that the new therapies and technologies will be aligned both with the local capacity and needs of patients. Alliances and business

relations with other countries play a central role in the technology transfer, regulations harmonization and equitable sharing of the innovations with the less fortunate.

9. Research Gaps And Future Directions

However, the studies on the perception and solutions to the inequities in the global kidney care, particularly in the populations and regions which are underrepresented, still have some significant gaps. Many of the low- and middle-income countries lack robust information on prevalence, progression and outcomes of chronic kidney diseases which hampers their ability to come up with interventions unique to them. Rural communities, socioeconomically disadvantaged populations, women, and individuals with disabilities are still the most vulnerable groups that are underrepresented in kidney research, and the evidence is not necessarily reflective of the needs and barriers to care of the vulnerable groups.

The future research should focus on equity-oriented clinical trials that are specifically designed to address different populations and to compare the interventions across different health system settings. Such trials are required to confirm that new therapies, care models and technologies are effective, safe and viable in the real world and not confined to high income countries. Also, it is crucial to empower and extend international kidney registries since the disease burden, treatment access, and long-term outcomes should be tracked using the quality and standardized data. Finally, to track improvements and guide policy, funding and accountability efforts in the area of global kidney health, certain and measurable equity indicators, such as access to diagnosis, modality choice and long-term outcomes, will also have to be created.

10. CONCLUSION

The global inequality in kidney care has been severe and is still being reflected through robust inequities in health system capacity, financial provisions, and access to required services by areas and groups of individuals. Despite its attempts to learn and treat chronic kidney disease and kidney failure, millions of the population across the globe continue to lack or have limited access to early diagnosis, dialysis and kidney transplantation. The synthesized evidence in this review reveals that the differences in kidney care cannot be occasioned by burden of illness alone but are strongly affected by socioeconomic status, geographical location, availability of workforce, and priorities of the policy. These implications mean that they will be presented too late, treated less-than-optimal, and with poorer outcomes, particularly in low- and middle-income countries, and other vulnerable populations in any environment. Dialysis and transplantation are life-sustaining, even potentially curative, but have uneven distribution and are highly variable in terms of their availability, quality and affordability. The use of new technologies in kidney care, including the creation of dialysis system, transplantation system, pharmacologic therapy and the use of diagnostic equipment, has a huge potential of improving the efficacy and effectiveness of kidney care. However, unless special steps are taken to ensure that these innovations are so fair in their implementation, they can serve to solidify the existing inequalities as they have an upper hand in favor of well-endowed health systems and populations. A fair provision of kidney care along all levels in the globe requires an effort that involves the system that requires policy change, long-term financing systems, expansion of the human resource, and patient-driven care models. The essential aspects of this initiative are the improvement of the early detection, the augmentation of the access to the affordable kidney replacement therapy, and the post-transplant care. It is worth noting that the incorporation of equity can be the central idea in the design, evaluation, and distribution of kidney care innovations. The global nephrology community can transform into a situation of reducing the unnecessary disparity and realize improved kidney outcome amongst all through the clinical advancement and fortification of the health system coupled with the social policy.

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