Acute Kidney Injury in Latin America

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Summary
Acute kidney injury (AKI) is a major global health issue with significant morbidity and mortality, particularly in low- and middle-income regions like Latin America. AKI prevalence varies across Latin America, with higher rates in rural and underserved areas. Key risk factors include socioeconomic disparities, comorbid conditions such as diabetes and hypertension, and environmental hazards. Infections, especially tropical diseases, and exposure to nephrotoxins, including herbal remedies, are common causes of AKI. Management of AKI faces significant hurdles because of limited access to diagnostic tools, variability in clinical practices, and a shortage of trained health care professionals. The availability of dialysis and renal replacement therapies is often constrained by economic and infrastructural limitations. Public health initiatives focusing on prevention, screening, and early detection are critical to mitigate the impact of AKI. Research in AKI across Latin America is hampered by data gaps and limited funding. Multicenter collaborations and the development of region-specific guidelines are essential to improving outcomes. Addressing these challenges will help reduce the burden of AKI and improve health care systems across the region. This review examines the unique epidemiology, risk factors, and health care challenges surrounding AKI in the region.
Semin Nephrol 45:151609 © 2025 Elsevier Inc. All rights are reserved, including those for text and data mining, AI training, and similar technologies.
Keywords: Acute kidney injury (AKI), Latin America, epidemiology, health care disparities, kidney replacement therapy (KRT)

INTRODUCTION

Acute kidney injury (AKI) represents a sudden decline in renal function, often leading to the accumulation of waste products, electrolyte imbalances, and fluid overload. Globally, AKI is a major public health concern, contributing to increased morbidity, mortality, and health care costs.[1] In Latin America, AKI holds particular significance owing to its diverse epidemiology influenced by unique regional factors, such as infectious diseases, socioeconomic disparities, and access to health care.

Epidemiological studies suggest that the incidence of AKI in Latin America is rising, with considerable variability across countries.[2-4] Factors such as limited health care infrastructure, inadequate access to early diagnosis, and variations in treatment approaches exacerbate the burden of AKI in the region. Additionally, environmental factors, including exposure to nephrotoxic substances and infectious diseases like leptospirosis, dengue, and hantavirus, contribute to the complexity of AKI management.

Studying AKI in Latin America is crucial to understand the region's unique challenges, including health care disparities and the need for tailored prevention and treatment strategies. This review aims to provide a comprehensive overview of AKI in Latin America, focusing on its epidemiology, health care challenges, and the need for targeted interventions to reduce its burden and improve patient outcomes.

EPIDEMIOLOGY OF AKI IN LATIN AMERICA

Prevalence and Incidence

AKI is a severe condition affecting more than 13 million people worldwide each year, with the majority of cases occurring in low-resource regions.[5] AKI is a syndrome that arises from a wide range of conditions, making it a significant yet often overlooked public health issue, especially in low-income countries.

Recent advancements in large-scale data analysis have shifted the paradigm of AKI from a purely clinical approach to a broader perspective that considers the structural and social determinants of health. This new understanding of AKI poses challenges not only for nephrology but also for the entire health care system. It

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requires a more integrated view of a disorder that is deeply intertwined with socioeconomic and cultural factors. Health systems must adapt to this comprehensive perspective, ensuring they can provide timely and appropriate responses and effectively train health care professionals in the prevention and early treatment of AKI. Globally, AKI accounts for approximately 13.3 million cases and 1.7 million deaths annually, with 85% of cases and 82% of deaths occurring in low- and middle-income countries.[5] Despite this significant burden, most epidemiological studies are concentrated in the United States and Western Europe, highlighting the need for more representative studies in regions like Latin America.[6]

In Latin America, the literature on AKI epidemiology is limited and fragmented. Notably, the EPILAT-IRA study, conducted by the Sociedad Latinoamericana de Nefrología e Hipertensión (SLANH) AKI committee, remains the only prospective, longitudinal, multinational cohort study in the region.[3] This study included 905 patients from 15 countries and revealed that 62% of AKI cases were community-acquired, primarily affecting patients with a median age of 64 years and significant comorbidities. AKI was mainly linked to fluid losses and nephrotoxic drugs, requiring kidney replacement therapy (KRT) in 29% of cases. Mortality was high, at 26.5%, with significant associations with older age, chronic liver disease, hypotension, shock, cardiac disturbances, hospital-acquired sepsis, KRT, and mechanical ventilation (Fig. 1).

Herrera-Añazco et al[7] conducted an ecological study in Peru covering the period from 2005 to 2016, analyzing 26,633 reported AKI cases nationwide. The authors' findings revealed an increase in the age-standardized incidence rate of AKI per 100,000 population, from 10.5 in 2005-2010 to 12.1 in 2011-2016. Conversely, the age-standardized mortality rate of AKI per 100,000 people decreased by 11.1%, from 2.7 in 2005-2010 to 2.4 in 2011-2016. A similar trend in mortality was observed by Ponce et al[4] in Brazil, where a study of 5,428 patients demonstrated a relative risk reduction in mortality of 11% (relative risk, 0.89, 95% confidence interval [CI], 0.81-0.98, P = .02). Chávez-Iñiguez et al[2] conducted a review of the literature on AKI in Latin America, analyzing 61 articles published between 1990 and 2016 in PubMed, MEDLINE, OvidSP, and IMBIOMED. These studies combined data on 10,670 AKI cases across 10 countries. The pooled population consisted predominantly of men (60%), with a mean age of 51.07 years. Most patients were critically ill, with an overall mortality rate of 58%. Other studies in the region have focused on specific populations, such as critically ill patients, those with transmissible diseases, and those exposed to animal venom, as well as studies of historical significance.[8-12] These findings underscore the urgent need for targeted interventions and health care strategies to reduce AKI

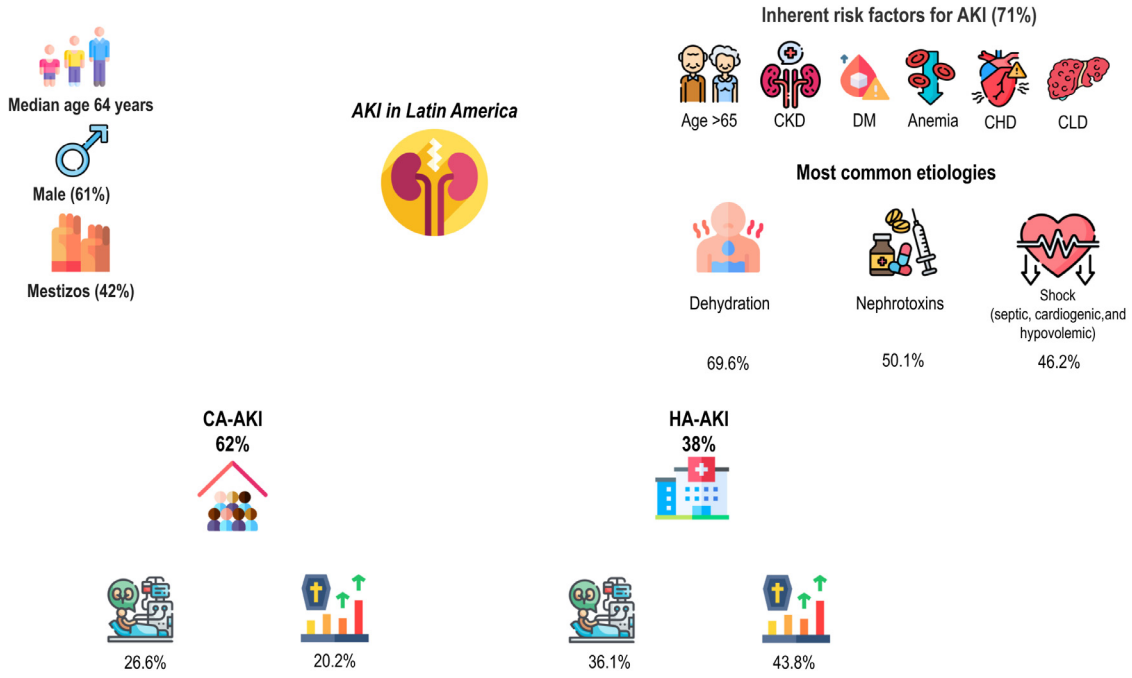


Figure 1. Epidemiology of AKI in Latin America. The majority of AKI cases occur in community settings, predominantly among patients with comorbidities, and are associated with fluid loss, nephrotoxic drugs, and shock. HA-AKI is linked to higher rates of mortality and the need for KRT. Abbreviations: AKI, acute kidney injury; CA-AKI, community-acquired acute kidney injury; CHD, chronic heart disease; CKD, chronic kidney disease; CLD, chronic liver disease; DM, diabetes mellitus; HA-AKI, hospital-acquired acute kidney injury; KRT, kidney replacement therapy.

incidence and improve survival outcomes among high-risk populations in Latin America.

Risk Factors

Latin America and the Caribbean (LAC) is the most unequal region globally, with significant disparities in access to essential services like clean water and electricity.[13] Income inequality, as measured by the Gini index, varies widely across the region, contributing to high poverty levels, with 32.1% of the population living in poverty and 13.8% in extreme poverty. These socioeconomic conditions, along with deficiencies in education, housing, and health care access, are critical risk factors for diseases that can lead to AKI. Poverty is closely linked to a higher incidence of AKI, primarily due to an increased risk of infectious diseases such as cholera and dengue as well as suboptimal access to timely health care. The association between poverty and AKI is driven both by greater exposure to communicable diseases and by barriers to adequate treatment, which raise the likelihood of complications.

Noncommunicable diseases are the leading cause of death and disability in LAC, with the burden of type 2 diabetes and chronic kidney disease (CKD) increasing by 71% and 230%, respectively, between 1990 and 2010.[13,14] Additionally, the region has the highest prevalence of obesity worldwide, further exacerbating the risk of AKI.[15]

Regional Variations

The incidence of AKI in LAC likely varies based on regional socioeconomic and climatic conditions. For example, in tropical regions, AKI may be more closely associated with infectious diseases like leptospirosis, dengue, chikungunya, and malaria as well as diarrhea in areas with poor access to clean water and sanitation.[16]

Burden of AKI on Health Care Systems

The economic burden of AKI is substantial, with costs varying depending on the severity and duration of the condition, the need for KRT, and the requirement for intensive care unit (ICU) admission. Studies from the United Kingdom estimate the cost per AKI patient to range between £3,250 and £3,750, with the total cost accounting for 1% of the National Health Service budget.[17,18] In Canada, hospitalization costs for AKI patients range from 9,444 to 24,260 Canadian dollars depending on the severity of the condition.[19] The long-term economic impact is even greater when considering that AKI is a risk factor for CKD, cardiovascular disease, and premature death. However, there are currently no available data on the economic burden of AKI in LAC, underscoring the need for further research in this area.

ETIOLOGY OF AKI IN LATIN AMERICA

Common Causes of AKI in Latin America

AKI in Latin America is a complex and multifactorial condition, with its etiology deeply influenced by the region's unique socioeconomic disparities, infectious disease burden, environmental factors, and limited access to health care, underscoring the urgent need for targeted interventions (Table 1).

The primary cause of AKI in Latin America is sepsis, particularly from community-acquired infections (community-acquired AKI) such as pulmonary, intestinal, urinary, and skin infections.[20-22] The interplay between infections and AKI places a significant burden on the health care system and public health initiatives across the region. Various infectious diseases prevalent in Latin America can lead to AKI, although this is largely an estimate owing to the lack of comprehensive epidemiological data.[16] It is also important to note that existing data are predominantly from ICUs and referral centers, which may not accurately reflect the true burden of AKI in the region.[2]

Latin America's tropical climate, characterized by high temperatures, fosters the survival of pathogenic microorganisms, parasites, and vermin.[23] Encounters with animals and insects are frequent in these areas owing to widespread agricultural activities and limited access to protective gear.[24] Specific AKI etiologies in Latin America include vector-borne diseases such as dengue and chikungunya as well as venomous bites from

Table 1. Etiologies of AKI in Latin America Related to Tropical Infections, Envenomation (Animals and Insects), and Herbal Medicine

Infections in the Tropics	Envenomation, Animals and Insects	Herbs
Leptospirosis	Spiders (Loxosceles)	Cat's claw (*Uncaria tomentosa*)
Yellow fever	Snakes (colubrids, elapids, and hydrophids)	Oxindole alkaloids
Malaria	*Crotalus* snakes	Yacón (*Smallanthus sonchifolius*)
Dengue	*Bothrops* snakes	Maca (*Lepidium meyenii*)
Hantavirus	*Lonomia* caterpillars	Starfruit (*Averrhoa bilimbi, Averrhoa carambola*)
Chagas		
COVID-19		
Chikungunya		

Abbreviation: AKI, acute kidney injury.

snakes and arthropods.[1,25] Although AKI is an uncommon complication of dengue,[26] the high incidence of the disease and its association with diarrheal symptoms make AKI clinically significant.[2]

Heat exposure has emerged as a significant risk factor for AKI in Latin America, particularly in agricultural and industrial regions, where prolonged heat stress is associated with dehydration and kidney injury. Studies have shown that exposure to temperatures above 30˚C leads to a decline in glomerular filtration rate and elevated serum creatinine levels. These AKI events are often asymptomatic or, in severe and prolonged cases, manifest as heat stroke, with symptoms such as headache, fatigue, drowsiness, hyperthermia, profuse sweating, and dehydration.[27] This environmental hazard contributes to the development and progression of CKD of unknown origin, a condition increasingly documented in labor-intensive, low-resource settings and further exacerbated by limited access to preventive health measures.[28]

The use of herbal and traditional medicine, an ancient practice that remains common in Latin America, also contributes to AKI. These compounds can be particularly hazardous to the kidneys, which are vulnerable because of their high blood flow, extensive endothelial surface area, high metabolic activity, and active reabsorption of electrolytes and amino acids in the tubules.[29] Herbal products may cause AKI through various mechanisms, including direct nephrotoxicity, allergic reactions such as acute tubulointerstitial nephritis, crystal deposition, kidney stones, and glomerulopathies. However, adverse events from herbal products are underreported. For example, in a cohort from 63 US emergency departments, 23,005 annual visits and 2,154 hospitalizations were linked to supplements, with weight loss and energy supplements being the most common causes of adverse effects.[30] In Latin America, such adverse events may be more prevalent because of the widespread and unregulated use of herbal and dietary supplements. This issue is compounded by a lack of systematic reporting mechanisms and limited epidemiological data on the safety and efficacy of these products in the region, leading to potential underestimation of the burden of harm caused by these practices.

Drug-induced AKI is another common concern in Latin America, with the indiscriminate use of analgesics and antibiotics being a major contributor. In some regions, antibiotics are available without a prescription or prior medical consultation, increasing the risk of adverse events.[31]

In pediatric populations, community-acquired AKI accounts for 77% of AKI cases,[32] with hemolytic uremic syndrome being a significant cause, representing 64% of glomerular disease-related cases, with a mortality rate of 27%. The incidence of pregnancy-related AKI in Latin America is on the rise, influenced by health care disparities, limited access to specialized care, and the prevalence of infectious diseases, making early detection and intervention critical for improving outcomes in the region.[33] The incidence of AKI during pregnancy in Latin America ranges from 4% to 26%. Among critically ill obstetric patients, AKI is the most common complication, observed in nearly 25% of cases, with a maternal mortality rate of 15%.[33,34] Dialysis is often required, especially in patients with preexisting CKD. The 2014 survey of the SLANH AKI committee on KRT resources highlights the high incidence of septic abortion as a significant and preventable cause of AKI in Latin America, underscoring the critical need for accessible reproductive health care and early intervention strategies to mitigate AKI risk in vulnerable populations.[35]

Influence of Local Health Practices

AKI represents a major public health challenge in Latin America, exerting considerable strain on health care systems.[36] Addressing AKI in the region necessitates coordinated, multifaceted efforts from governments, health care institutions, and the medical community. These initiatives should focus on enhancing the capacity of primary care physicians to recognize at-risk patients, promptly diagnose AKI, and initiate early management, particularly in settings where access to specialized care is limited.

Key strategies include expanding access to medical services, increasing awareness of AKI risk factors and prevention, and bolstering medical education and health care infrastructure. Furthermore, regulatory agencies must closely monitor the safety of commonly used herbal medicines, as many may pose nephrotoxic risks. Public health campaigns should inform populations about the potential dangers of certain herbal products. In cases in which a particular herb is deemed to carry a significant risk, regulatory measures such as market withdrawal and penalties for distributors should be considered. Weak regulatory frameworks exacerbate kidney health risks, allowing the sale of products with undisclosed harmful ingredients or misleading health claims, thereby jeopardizing consumer safety.

RECOGNITION AND MANAGEMENT OF AKI IN LATIN AMERICA

Diagnostic Challenges

AKI poses significant diagnostic challenges in Latin America driven by a complex interplay of limited health care resources, diverse epidemiological profiles, and regional disparities in access to diagnostic tools and specialized care (Fig. 2). Unfortunately, many cases are detected late, often only when the patient is critically ill and requires KRT. The 0by25 feasibility study

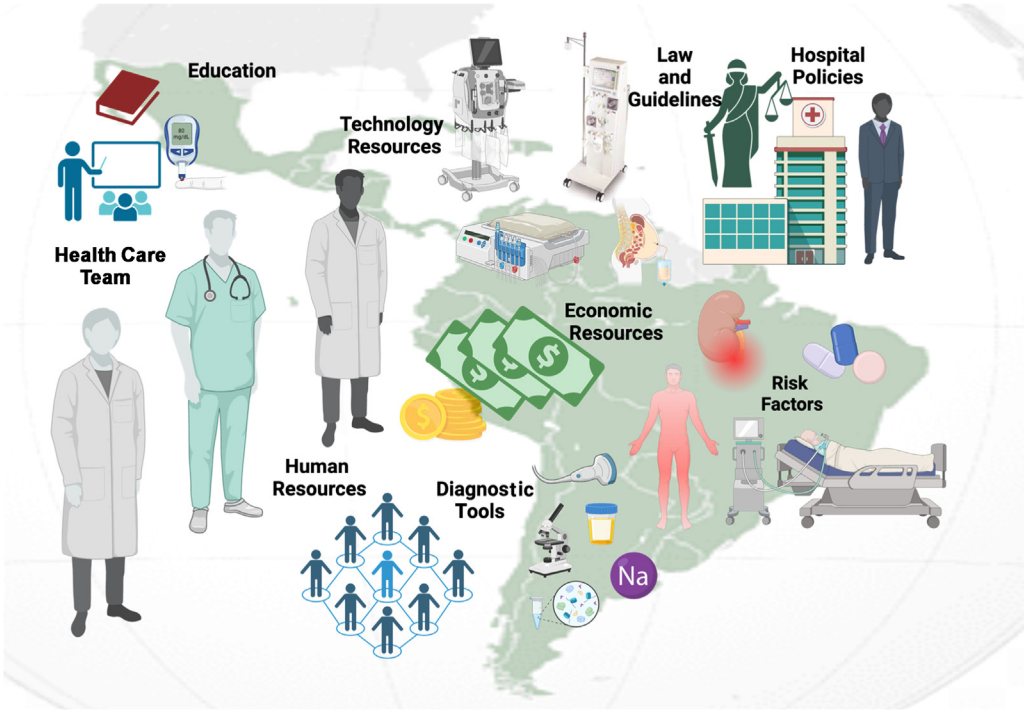


Figure 2. The complexity of AKI, from diagnosis to treatment, considering the available resources and adapted health care policies in Latin America. Abbreviation: AKI, acute kidney injury.

underscores the potential impact of implementing point-of-care (POC) serum creatinine and urine dipstick testing alongside education and training protocols to enhance the recognition and management of AKI in Latin America and other low-resource settings. Conducted across Cochabamba, Bolivia; Dharan, Nepal; and Blantyre, Malawi, the study demonstrated that integrating POC testing in primary care centers with standardized, protocol-based management improved patient outcomes by facilitating timely interventions such as fluid resuscitation and reducing hospitalizations. This approach not only strengthens early AKI detection but also helps mitigate progression to CKD and associated mortality, proving valuable for resource-limited regions.[37] Another approach focused on hospital settings with greater resources is the model proposed by Rizo-Topete et al,[38] which involves the implementation of a nephrology rapid response team. This team emphasizes the prompt identification of AKI risk factors using a checklist and the initiation of targeted interventions based on Kidney Disease: Improving Global Outcomes bundles. The primary goal is to prevent or delay the onset of AKI, with dynamic reassessment to monitor risk and allow for swift action if KRT becomes necessary.

The implementation of newer diagnostic tools, such as structural biomarkers like cystatin C, neutrophil gelatinase-associated lipocalin, interleukin 6, interleukin 1, tissue inhibitor of metalloproteinase 2 × insulin-like growth factor-binding protein 7 (NephroCheck; bioMérieux), has been limited in Latin America as a result of several factors, including high cost, lack of widespread infrastructure to support their use, and limited access to specialized laboratories capable of processing these biomarkers. Additionally, the health care systems in many regions face resource constraints, prioritizing more affordable and widely available diagnostic methods like serum creatinine and urinary output despite their delayed sensitivity in detecting AKI.[39]

Two underutilized yet valuable diagnostic tools are urinary sediment analysis and urinary sodium measurement, which have shown utility in specific scenarios. These simple, cost-effective investigations can help determine AKI etiology and guide treatment decisions. For example, they have demonstrated particular value in managing cirrhosis and hepatorenal syndrome.[40]

Additionally, the use of POC ultrasonography (POCUS) is an exciting advancement in nephrology that can improve diagnostic timing and refine treatment strategies. POCUS, along with VExUS scoring, helps assess fluid status, guiding decisions about diuretics, vasopressors, sodium, bicarbonate, albumin, and other intravenous solutions, particularly in critically ill ICU patients. The implementation of newer diagnostic tools and POCUS in Latin America is feasible but would require significant investments in health care infrastructure, training of health care professionals, and allocation of resources to ensure widespread access and integration into clinical practice.[41,42]

Treatment approaches for AKI in Latin America must address both immediate renal support and the broader

context of health care disparities. KRT such as intermittent hemodialysis, continuous KRT, and peritoneal dialysis is widely utilized, although access is often limited by regional infrastructure and availability of trained personnel.[35] Fluid overload and uremic complications are the most common indications for KRT in the region, with CRRT increasingly favored in critical care settings. Preventive measures and early intervention play a vital role in reducing the need for KRT. Strategies like early detection of sepsis, timely correction of volume imbalances, and minimization of nephrotoxic drug use can prevent the progression of AKI to severe stages requiring dialysis.[43] The integration of POC diagnostics and the promotion of educational programs for health care workers are crucial in ensuring that AKI is identified and managed early, particularly in community and resource-limited settings.[37] A combination of improved KRT access and robust preventive measures is key to enhancing AKI outcomes in Latin America.

The integration of various diagnostic and therapeutic tools is essential for the early identification, treatment, and prevention of AKI as well as for promoting renal recovery. Efforts like the International Society of Nephrology's 0by25 initiative[5] emphasize the need to raise awareness and improve early intervention strategies, whereas new guidelines continue to refine KRT evaluation, management, and renal recovery follow-up.[43,44]

Health Care System Barriers

Latin America faces health care challenges similar to those observed globally, with a striking disparity in the availability of nephrologists. In low-income countries, the density of nephrologists is approximately 0.32 per million population compared with 28.52 per million in high-income countries.[45] Most Latin American nations fall into the low- to middle-income category, with the shortage of nephrologists particularly pronounced in rural areas, smaller cities, and economically disadvantaged regions.[20,46] This scarcity in specialists underscores the need for primary care physicians and other health care providers to play a pivotal role in early AKI recognition.

Challenges in AKI diagnosis also vary by region, often stemming from the use of outdated local clinical guidelines that rely on obsolete nomenclature and treatment strategies not supported by current evidence. Furthermore, many countries lack up-to-date legal frameworks to regulate and implement new medical concepts, technologies, and treatment options. The diversity of health care systems across Latin America complicates efforts to standardize AKI management. Access to care is often constrained by material and human resource shortages, with many regions lacking nephrology services within hundreds of kilometers. In some areas, care depends on whether patients have access to social security or health care providers, with countries like Mexico reporting that up to 50% of the population lacks both.[20]

In some locations, even when nephrologists or intensivists are available to administer KRT, there is often a shortage of dialysis machines for intermittent hemodialysis and CRRT.[20,46] During catastrophic events such as the COVID-19 pandemic, peritoneal dialysis emerged as a viable alternative in resource-limited situations.[47] However, ongoing environmental challenges, including earthquakes, heatwaves, hurricanes, and even armed conflicts, further strain health care systems, highlighting the need for adaptable solutions such as manual hemodialysis for patients requiring emergency KRT.[48]

Prevention Strategies

In Latin America, the prevention of AKI presents unique challenges due to health care disparities, limited resources, and diverse socioeconomic conditions. Effective prevention strategies must prioritize early identification of risk factors, especially in vulnerable populations, such as those with limited access to health care.[37] Public health initiatives, such as educational campaigns targeting both health care professionals and the general population, play a critical role in improving awareness of AKI risks, including dehydration, infections, and pregnancy-related complications like preeclampsia.[49] Programs developed by organizations like SLANH emphasize the importance of training primary care providers to recognize early signs of AKI and implement preventive measures. Additionally, enhancing access to POC diagnostics, promoting the judicious use of nephrotoxic medications, and expanding the availability of KRT in resource-limited settings are essential for reducing the incidence and severity of AKI across the region.[37] Early identification and management of conditions such as sepsis, one of the leading causes of AKI, can significantly reduce the progression to multiorgan failure and the need for KRT. Biomarkers and POC testing are valuable tools in detecting community-acquired AKI early, allowing for timely interventions that improve patient outcomes and delay the progression to CKD.[42]

OUTCOMES AND PROGNOSIS OF AKI IN LATIN AMERICA

Short-Term Outcomes

AKI is a significant global health care issue associated with increased short-term mortality, prolonged length of stay, and greater hospitalization costs.[50-52] When acute KRT is required, mortality rates can be as high as 80%.[51,53]

Despite the fact that the majority of the global population resides in resource-limited countries, most

epidemiological data on AKI originate from high-income regions. There is a notable paucity of data regarding AKI outcomes in Latin America. The EPI-LAT-IRA study showed that among 905 patients with AKI in the region, acute KRT was performed in 29% of cases.[3] In-hospital mortality was 26.5% and was independently associated with older age, chronic liver disease, hypotension, shock, cardiac disturbances, hospital-acquired sepsis, use of acute KRT, and mechanical ventilation. The leading causes of death were infection (43%), shock (25%), cardiovascular disease (13%), and malignant disease (4%).

Comparative data on short-term outcomes of AKI between low-income and high-income countries are scarce. A multicenter prospective study of patients with AKI admitted to an ICU found that compared with patients from high-income nations, those from emerging countries had more CKD, greater use of KRT but not mechanical ventilation or vasopressor support, and higher mortality rates.[54] These differences may relate to resource limitations within the ICUs of these countries, increased baseline morbidity, or a perception that escalating treatment in these patients is futile.

A systematic review of published studies on AKI in ICUs between 2005 and 2015 compared high-income and low-income countries by evaluating AKI incidence and mortality.[55] Ninety-two studies were included, with 60 studies from high-income countries (1,057,332 patients) and 33 from low-income countries (34,539 patients), including 17 studies from Latin America (Brazil, Colombia, and Mexico; 6,104 patients). For the meta-analysis, 38 studies from high-income countries and 18 from low-income countries were selected, with comparable AKI incidence rates (39.3% and 35.1%, respectively). In Latin American countries, the need for dialysis was 41.5%; ICU and hospital lengths of stay were 12.2 and 23.4 days, respectively; and in-hospital mortality was 59.5%. Furthermore, this systematic review showed that, overall, patients in low-income regions tended to be younger and had fewer instances of cardiovascular disease but experienced higher dialysis rates, longer lengths of stay, and increased mortality.

Barriers to health care access[5,35] and lack of infrastructure, such as ICU beds and health care personnel skilled in managing critically ill patients,[56,57] likely contributed to the comparably worse outcomes observed in low-resource settings. It is possible that patients in low-income countries are transferred to the ICU at a more advanced stage of disease progression, resulting in lower chances of recovery.[58] The higher frequency of acute KRT use in low-income countries supports this hypothesis.

Long-Term Consequences

Several studies have reported an association between AKI and adverse long-term outcomes in the resource-limited world, including recurrent AKI episodes in 25-30% of cases, hospital readmissions in up to 40% of patients, increased risk of cardiovascular events and progression to CKD, and significantly increased long-term mortality.[58] Despite these long-term consequences, only a minority of patients in the resource-limited world receive follow-up care after an episode of AKI, and optimal strategies to promote rehabilitation remain poorly defined.

We identified only five published reports of AKI follow-up programs in Latin America.[3,22,59-61] In a multinational cohort study that included 905 patients from 15 Latin American countries, Lombardi et al[3] reported 90-day follow-up data for 413 patients, although the information was incomplete in some cases. Of the 366 patients with available data, 88 (24%) had died. Kidney function was assessed in 253 patients, with 127 (50%) achieving complete recovery, 77 (30%) showing partial recovery, and 49 (19%) experiencing no recovery; 11 of 325 patients (3.4%) were on dialysis. Serum creatinine at the end of follow-up was available for 235 patients, with a median (interquartile range) value of 1.20 mg/dL (0.90-1.75). Higher baseline serum creatinine levels at diagnosis of AKI, at peak during the episode, and at discharge were correlated with higher serum creatinine levels at 90-day follow-up, suggesting a relationship between initial AKI severity and long-term kidney function outcomes.

Data from two large institutions in Ecuador showed that 67% of patients with Kidney Disease: Improving Global Outcomes 3 AKI fully recovered kidney function, whereas 9% progressed to kidney failure at 90-day follow-up.[22] Given the lack of longer-term follow-up data, it is likely that the percentage of patients progressing to CKD is higher than currently reported.

Ponce et al[4] conducted a prospective study evaluating the long-term outcomes of 509 stage 3 AKI patients followed by nephrologists at a Brazilian university hospital from 2004 to 2013. At hospital discharge, 52% of patients had achieved complete recovery of renal function, 39.7% had achieved partial recovery, and 8.3% had not recovered renal function. After 36 months, 43.5% of patients had progressed to CKD and 5.3% required chronic dialysis. Factors associated with CKD progression included age (hazard ratio [HR], 1.02, 95% CI, 1.008-1.035, P = .009), preexisting CKD (HR, 1.05, 95% CI, 1.007-1.09, P = .04), diabetes (HR, 1.12, 95% CI, 1.008-1.035, P = .009), and number of AKI episodes (HR, 1.65, 95% CI, 1.19-2.2, P = .0023).[61]

In Latin America, only a small percentage of patients are referred for nephrology care after discharge despite evidence suggesting improved outcomes with nephrology referral, particularly in addressing cardiovascular risk and preventing CKD progression. Moreover, the high rate of patients lost to follow-up underscores the lack of an organized health care system to ensure continuity of care.

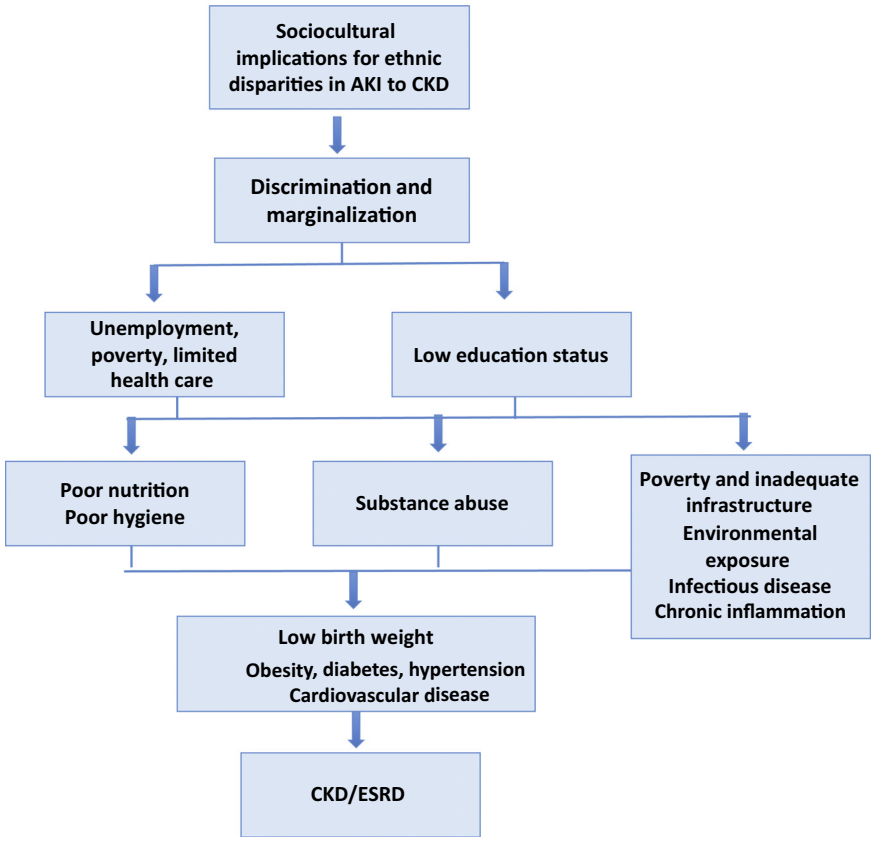


Figure 3. Sociocultural influences on the health of ethnic minorities and their implications for the progression of AKI to CKD. Abbreviations: AKI, acute kidney injury; CKD, chronic kidney disease; ESRD, end-stage renal disease.

Disparities in Outcomes

Racial disparities, socioeconomic status, and health care access significantly impact AKI outcomes. Because of factors such as low income, poor access to health care, and lack of health insurance, Black and low-income patients with kidney disease are often referred late to nephrologists, preventing them from receiving optimal care. Figure 3 illustrates how sociocultural factors influence the health of racial and ethnic minorities, with implications for the progression of AKI to CKD and kidney failure.[62]

To improve health care for disenfranchised ethnic minorities worldwide, it is crucial to address persistent racial and ethnic health disparities across the spectrum of kidney disease. These disparities continue to worsen limited educational opportunities, deepen socioeconomic inequalities, and restrict access to health care, all of which contribute to poorer health outcomes among disadvantaged racial minorities affected by AKI.[63]

RESEARCH GAPS AND FUTURE DIRECTIONS

Current Limitations in AKI Research in Latin America

AKI research in Latin America faces significant limitations, including a lack of robust multicenter studies and incomplete data reporting. Most available studies are small, single-center, and often retrospective, limiting the generalizability of findings across the region. Comprehensive national and regional registries are scarce, contributing to the data gaps in AKI epidemiology, risk factors, and outcomes.[64]

Funding limitations and insufficient research infrastructure further hinder AKI research in Latin America. Many health care facilities lack the resources to conduct high-quality prospective studies or to follow up patients long term after AKI. The absence of dedicated research teams and minimal government and institutional support also limit the scope of investigations. Without adequate financial and technical support, the region struggles to develop and implement large-scale studies that could address the unique challenges faced by Latin American populations.[65]

Opportunities for Collaborative Research

To overcome these challenges, regional and international collaborations offer promising opportunities for advancing AKI research in Latin America. Multicenter studies involving countries with similar socioeconomic contexts could enhance data collection and allow for more comprehensive analyses of AKI incidence, outcomes, and

treatment responses. International partnerships, such as those with established research consortia in North America and Europe, can help bridge the gap by providing expertise, resources, and infrastructure support.[66,67]

The implementation of evidence-based guidelines adapted to the Latin American context would also improve AKI management. Collaborative efforts among health care providers, researchers, and policymakers could lead to the development of region-specific protocols that address the diverse patient populations, health care system limitations, and socioeconomic factors prevalent in the region.[68]

Potential Areas for Further Investigation

Several areas of AKI research in Latin America warrant further investigation. Innovations in diagnosis and treatment, particularly those that are cost-effective and adaptable to resource-limited settings, could greatly improve patient outcomes.[37] POC diagnostics, telemedicine, and mobile health technologies hold potential for earlier detection and management of AKI, especially in rural areas.[37,43,69]

Additionally, there is a need to investigate the role of genetic and environmental factors unique to Latin American populations. Research exploring genetic predispositions and how environmental influences such as infections, pollution, and malnutrition affect AKI incidence and progression would provide valuable insights into tailoring interventions to the region.[16,70-73]

CONCLUSIONS

AKI is a growing public health concern in Latin America driven by regional factors such as infections, malnutrition, and socioeconomic disparities. Although AKI incidence in the region mirrors that of high-income countries, outcomes such as mortality and progression to CKD are significantly worse. These disparities stem from delayed diagnosis, limited health care access, and a lack of standardized protocols. Additionally, the scarcity of multicenter studies and long-term follow-up data hinders a comprehensive understanding of AKI's full burden.

To address this, health care policies must focus on early recognition and management of AKI, particularly in resource-limited settings. Creating national and regional AKI registries could fill data gaps and enhance research on genetic, environmental, and socioeconomic factors.

Collaboration, both regionally and internationally, is essential for progress. Partnerships could support the development of evidence-based, region-specific guidelines, helping to reduce the AKI burden and improve patient outcomes across Latin America.

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