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## Global Perspectives in Acute Kidney Injury: Bolivia

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### Key Points:

### Abstract:

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## **Global Perspectives in Acute Kidney Injury: Bolivia**

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## **Introduction**

Acute kidney injury (AKI) is global healthcare issue with high morbidity and mortality, and caused by multiple and varied etiologies. In Bolivia like in many low and low-middle income countries (LLMICs), a considerable number of patients who develop AKI die (1). Since AKI commonly occurs in the community (CA-AKI) as a complication of a single reversible disease that is potentially preventable and treatable (2); it is extremely important to improve AKI awareness, education programs among health-care workers, detection tools and treatment protocols in order to avoid short and long term adverse outcomes.

## **Epidemiology of AKI in Bolivia**

The epidemiology of AKI in Latin America and the Caribbean is highly dependent on patient characteristics, context and geography, with limited information in the region. A recent observational, prospective, longitudinal, multinational cohort study (EPILAT-IRA) provided data from 15 countries on 905 patients with AKI. Median age was 64 years; most of them were male (61%). CA-AKI was more frequent (62%) with dehydration, shock and nephrotoxic drugs as the commonest causes. Kidney replacement therapy (KRT) was performed in 29% of cases. In-hospital mortality was 26.5%; and long term follow-up showed that at 90-days complete or partial renal recovery was 81% with 24% of mortality(3).

Unfortunately, there is not much published data about the incidence, risk factors, etiology, and outcomes of AKI in Bolivia. Ramirez Torrejon JN and Arze RS published one of the first studies in 1993; this single center study described 41 cases of hospital acquired AKI (HA-AKI) defined as an increase of serum creatinine  $\geq 2$  times baseline. Most patients were male (51%) and mean age was  $54 \pm 17$  years(4). Common risk factors were hypotensive episodes, exposure to nephrotoxins, use of contrast media, and rhabdomyolysis. Pre-renal AKI was the most common presentation (59%), and mortality rate was 49%. KRT was required in 24.3% of patients, peritoneal dialysis (PD) was used in 50% of cases, intermittent hemodialysis (IHD) in 30% and continuous arterio-venous hemofiltration in 20%. In a more recent single center study, authors using Acute Dialysis Quality Initiative (ADQI) RIFLE criteria and Acute Kidney Injury Network (AKIN) diagnostic criteria found 65

patients with HA-AKI during 2010; most patients were male (58.3%). The 3 most frequent causes and/or risk factors for HA-AKI were hypovolemia (41.6%), hypertension (30.5%), and congestive cardiac failure (11.1%)(5). Unfortunately, authors fail to describe what type of medical treatment patients received, KRT requirements, or short term and long term outcomes.

We have better understanding of COVID-19 related AKI in Bolivia, since some centers from the 3 main cities in the country (La Paz, Santa Cruz and Cochabamba) have participated in the recent published Latin American Society of Nephrology and Hypertension (SLANH) AKI committee epidemiology study(6). Data from this study shows that the incidence of COVID-19 related AKI is 31.6%, 64.7% was HA-AKI and 46.2% required KRT. Non-recovery of kidney function was observed in 65.3% of cases with a mortality rate of 57.4%.

### **AKI Diagnosis, Prevention and Treatment**

Diagnosis of AKI in Bolivia follows the KDIGO definition and classification criteria and has replaced the RIFLE and AKIN criteria used in the past (7). Unfortunately, no novel kidney injury biomarkers is being use in a clinical or research context as they are not available. Since there is a lack of national guidelines for the evaluation and general management of AKI patients, most centers across the country have adopted the KDIGO bundle of care(8). However, implementation of KDIGO guideline-based care can be very difficult in countries like Bolivia due to several existing barriers (Table 1). Publishing simplified guidelines in local languages, customized educational tools, flow charts, algorithms, and medical applications for cellphones can facilitate their implementation. We have shown that this is achievable with the 0by25 initiative and its 5Rs approach (evaluation of **R**isk, early **R**ecognition, protocol based **R**esponse, providing **R**enal support, and patients follow-up **R**ehabilitation) coupled with an education and training program; the use of a point of care test, use of mHealth and tele-consultation(9, 10).

The 0by25 feasibility study have shown an incidence of CA-AKI within 7 days of enrollment of 30%; most cases were severe (KDIGO stage 2/3 in 59.9%), with an overall mortality of 14%. The 3 most common etiology risk factors for AKI were dehydration, infections, and nephrotoxins (including herbal medicines). Dialysis requirement was 6.2% with 1/3 of the cases not dialyzed even though having an indication due to lack of resources or

patient/family wishes. Overall renal recovery was 80.4% with *De Novo* CKD presenting in 16.3% of the cases during the 6 month follow-up period(9).

### **Organizational Structure and KRT Management**

Knowledge of the available human and KRT resources is important since both are fundamental in AKI treatment. The number of nephrologists in Bolivia have improved in the past 10 years; currently, there are 124 board certified nephrologists (11 pediatric nephrologists) with 10.6 nephrologist pmp. Most of the nephrologists (78.5%) are located in the 3 main cities of Bolivia (La Paz, Santa Cruz, and Cochabamba). However, the current number of nephrologists is below of what PAHO's Strategic Plan has recommended (20 nephrologist pmp); fortunately the number of available training programs in the country has increased too (8 fellowship programs) with 10 graduates from these programs in 2021.

Initial management of AKI is done usually by other specialist like general practitioners, internists, family physicians, or intensivists. We consider that there is a need to work in collaboration with other specialist to improve outcomes in AKI. Our patients have complex medical problems, and their care spans many disciplines; establishing AKI care teams can improve outcomes and ensure appropriate follow-up of patients after an episode of AKI. (11)

Patients who developed moderate or severe AKI in remote areas are usually transfer to centers located in larger cities so appropriate treatment including KRT could be started. Dialysis is usually provided in nephrology units located in third level health care centers with limited availability reflecting a frequent lack of qualified nurses or physicians, as well as a lack of available machines or supplies (12, 13); for example, in the capital city of La Paz there are 32 certified ICUs of these only 2 ICUs have the capacity to offer KRT to their patients (one is located in a public hospital and the other correspond to a Social Security (SS) system). In the rest of the ICUs KRT is provided by 4 different nephrology private practice groups. Intermittent hemodialysis is usually available in 100% of the units while other techniques like SLED, continuous kidney replacement therapies (CKRT) and PD are less frequently use. Fortunately, ongoing CKRT and PD programs for AKI in selected centers are developing.

Bolivia has a mixed healthcare system. On the public side, there is the “Sistema Unico de Salud” (SUS) program that provides health coverage to approximately 60% of the population that does not have access to a health-care insurance, 30% of the population are active dependent or independent workers who benefit from the SS health-care system, and 10% of the population have private insurances or have the capacity to seek medical care in the private health care system. In the SUS, some medications and treatments including KRT (usually limited to IHD) are covered by the government. For patients who benefit from the SS, every aspect of their AKI treatment including different types of KRT are available and the cost is completely covered. Since the supreme decree No 2360 was enacted in May 13<sup>th</sup> 2015 the SUS through local governments will cover persistent severe AKI on KRT and chronic KRT in the case of patients who progress to ESKD after an episode of AKI. In the case of SS healthcare system, patient insurance covers both persistent AKI on KRT and chronic KRT in patients who develop ESKD.

### **AKI Outcomes and Follow Up**

Post-AKI care in the country has been shown to be variable and without following any specific protocol; with most of the patients not receiving any care or planned follow-up after an episode of AKI. In Bolivia (one of the pilot centers of the ISN 0by25 initiative) the 0by25 feasibility study has allowed to establish the first post AKI clinic at Hospital Obrero No 2 – CNS in Cochabamba, where patients are follow-up at 1 and 3 months after an AKI episode at nephrology outpatient clinic(9). The model is trying to be implemented across other centers in the country with the support of the Minister of Health National Kidney Health Program to make it sustainable in the different health-care systems available in the country.

### **Challenges & Future of AKI in Bolivia**

The 0by25 initiative and other multicenter epidemiological studies like the EPILAT-IRA study(3, 9) that have been conducted in recent years have allow us to know better about the epidemiology of AKI in Bolivia and the region (Figure 1) and in the particular case of the 0by25 initiative it has shown that improving the recognition and management of AKI is possible. As a result of this experience and after meeting with those in charge of the

Bolivian National Kidney Health Program, AKI is soon to be included as part of this program, with the development of national guidelines, expanding the model of care to other centers in the country, promoting advocacy and action to implement early AKI recognition and response for better patient outcomes (Table 1).

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Rolando Claire-Del Granado: Conceptualization; Data curation; Formal analysis; Investigation; Supervision; Validation; Writing - original draft; Writing - review and editing.  
Raúl Plata-Cornejo: Investigation; Writing - original draft; Writing - review and editing.

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**Table 1 | Barriers and recommendations to implement a sustainable and effective AKI care program.**

<b>BARRIES</b>	<b>RECOMENDATIONS</b>
Lack of access to health insurance	Universal health access for NCD like AKI
Need of a better understanding of AKI epidemiology in LICs and LMICs	Establishing a national AKI registry
Marked variation on AKI prevention, recognition, and management.	Raising awareness and knowledge of AKI
Focus on curative rather than preventive medicine	Include screening and management for AKI in the existing National Kidney Health Program
Inadequate health-care systems	Increase government funding for AKI detection and prevention
Delayed diagnosis and late presentation	Use of low cost POC tests and sustainable mobile health technology
Lack of standardized care tools for physicians and educational tools for patients	Developing education and training programs for healthcare providers
Resource constraints	Building sustainable capacity for the implementation of national protocols into everyday clinical practice
Perceived complexity of guidelines and lack of training	Publishing simplified guidelines in local languages, customized educational tools, flow charts, algorithms, and the use of mHealth (Medical applications)
Limited ability to provide dialysis	Increase access to KRT in remote areas by implementing PD programs
Lack of follow-up after an AKI episode	Establish post AKI follow-up clinics using telemedicine

**NCD, non-communicable diseases; AKI, acute kidney injury; LICs, low income countries; LMICs, low-middle income countries; POC, point of care; mHealth, mobile health; KRT, kidney replacement therapy; PD, peritoneal dialysis.**

## **Figure Legend**

### **AKI epidemiology in Bolivia**

Unfortunately the incidence of AKI is unknown; however, information from recent epidemiological studies and trials has improved our understanding of risk factors, etiology and outcomes of AKI in the country.

AKI, acute kidney injury; CA-AKI, community acquired acute kidney injury; HA-AKI, hospital acquired acute kidney injury; KRT, kidney replacement therapy; CKD, chronic kidney disease.

Figure 1

