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# Pregnancy-related acute kidney injury requiring dialysis: experience from a tertiary hospital in Tanzania

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## Abstract

**Introduction** Women with pregnancy-related acute kidney injury (PRAKI) often present in a state of critical illness, commonly due to severe hypertensive disorders or other obstetric complications. Those requiring dialysis represent the most severe end of this spectrum, where outcomes are further worsened in low-resource settings by delayed diagnosis, limited access to timely nephrology care, and constrained critical care capacity. Despite this burden, data on pregnancy-related acute kidney injury requiring dialysis (PRAKI-D) in Tanzania are limited. This study describes the clinical characteristics and in-hospital outcomes of these patients at a tertiary hospital.

**Methods** We conducted a retrospective cohort study at Muhimbili National Hospital, including all pregnant and post-partum women, defined as those who were pregnant, in labor, or within six weeks postpartum with PRAKI who received hemodialysis between January 2022 and December 2024. Data were extracted from medical records and included clinical characteristics, dialysis indications, and in-hospital outcomes. Descriptive statistics were used for analysis.

**Results** We analyzed 112 patients with pregnancy-related acute kidney injury requiring dialysis, with a mean age of 31.3 (±6.2) years. Most were referred from lower-level facilities (95.5%) and presented with acute kidney injury (AKI) stage three (51.8%) according to Kidney Disease: Improving Global Outcomes (KDIGO). Hypertensive disorders were the leading obstetric diagnosis (67%). At dialysis initiation, 68.8% were admitted to high-dependency or intensive care units, and 42.8% required ventilator support. In-hospital mortality was 17.9%. Among survivors, (67%) were lost to follow-up at three months.

**Conclusion** Our findings highlight the high burden and adverse outcomes of pregnancy-related acute kidney injury requiring dialysis, emphasizing the need for earlier detection, improved referral systems, and integrated postpartum renal follow-up to reduce morbidity associated with acute kidney injury.

**Keywords** Acute kidney injury (AKI), Pregnancy-related AKI, High risk pregnancy, Hemodialysis, Pregnancy

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## Introduction

Pregnancy-related acute kidney injury (PRAKI) is a significant global health problem, with reported incidence ranging from 1% to 7% of all pregnancies in high-income countries and up to 4–26% in low- and middle-income countries (LMICs), where maternal mortality can exceed 30% in severe cases [1]. In sub-Saharan Africa (SSA), PRAKI accounts for up to 25% of acute kidney injury (AKI) cases among hospitalized pregnant women and remains a major contributor to maternal morbidity and mortality [2]. In Tanzania, limited published data suggest that PRAKI complicates approximately 10% of referrals for pregnancy-related conditions to tertiary hospitals [3].

Despite advances in nephrology care, there is still no definitive management or cure for AKI, including PRAKI [2]. Management continues to rely on early identification and supportive measures to prevent complications [4]. However, outcomes are often poorer in resource-limited settings, where late presentation, lack of prenatal care, and restricted access to kidney replacement therapy (KRT) are common [5]. The shortage of nephrology services across SSA further delays diagnosis and management, contributing to the high burden of adverse outcomes [4, 6].

Dialysis-requiring acute kidney injury (AKI-D) is a devastating complication among hospitalized patients, and this burden is particularly profound among pregnant and post-partum women [7]. These patients are often young, face the dual challenge of recovering from severe pregna1ncy complications, and must resume caregiving roles shortly after childbirth [7, 8]. Among this group, the impact of AKI extends beyond the mother, as failure to recover from dialysis can adversely affect the newborn's care and long-term development [4, 9]. Furthermore, given the risk of recurrent kidney injury in subsequent pregnancies, ensuring optimal recovery and sustained postpartum follow-up is essential for long-term health outcomes [7].

In Tanzania, PRAKI remains a significant obstetric complication. At Muhimbili National Hospital (MNH), approximately one in ten referrals for pregnancy-related complications had PRAKI [10]. Similar to other settings of SSA, most affected women are referred from lower-level health facilities and often present with advanced stages of kidney injury, frequently requiring urgent dialysis [8, 10]. Despite the growing burden, there is limited data on the clinical characteristics, in-hospital outcomes, and recovery trajectories of PRAKI patients requiring dialysis. Additionally, challenges related to long-term care, including access to renal follow-up, remain poorly understood. To address these gaps, aimed to describe the clinical characteristics and in-hospital outcomes of pregnant and postpartum women receiving care at Muhimbili National Hospital in Tanzania.

## Methods

This was a retrospective cohort study conducted at Muhimbili National Hospital (MNH), Tanzania's national referral hospital and the only government facility offering nephrology care in Dar es Salaam. The study included all pregnant and post-partum women up to six week post-delivery, diagnosed with PRAKI who received hemodialysis between January 2022 and December 2024.

At MNH, most obstetric patients requiring nephrology care are referred from lower-level healthcare facilities. The hospital offers hemodialysis services to AKI patients irrespective of their financial ability. Hemodialysis is initiated as clinically indicated and continues until discharge from the obstetrics ward. After discharge, patients are referred to the nephrology outpatient clinic for ongoing follow-up and care.

We included all women admitted with PRAKI who underwent hemodialysis during the study period and had complete medical records up to the point of discharge or death. Patients with incomplete data were excluded. PRAKI was defined as AKI occurring during pregnancy, labor, or within six weeks postpartum, as diagnosed by the attending physician and meeting Kidney Disease: Improving Global Outcomes (KDIGO) criteria; all AKI cases within this timeframe were included, irrespective of etiology. AKI was diagnosed based on an increase in serum creatinine by ≥ 0.3 mg/dL (≥ 26.5 µmol/L) within 48 h. The etiology was recorded from patient records.

Data were collected retrospectively from patient charts and the hospital's electronic medical record system using a standardized data extraction tool. Extracted variables included socio-demographic characteristics, obstetric diagnoses, laboratory parameters on admission, indications for dialysis, total number of dialysis sessions, patient disposition, use of advanced respiratory support in ICU, and in-hospital outcomes. Laboratory values at discharge were also reviewed where available.

Data were entered into the Statistical Package for the Social Sciences (SPSS) version 25 and cleaned for completeness and accuracy. Descriptive statistics were used to summarize patient characteristics. Continuous variables were reported as means with standard deviations (SD) or medians with interquartile ranges (IQR), depending on distribution. Categorical variables were summarized using frequencies and percentages.

## Results

A total of 112 patients with pregnancy-related acute kidney injury (PAKI) who underwent hemodialysis therapy were included in the analysis. The mean age was 31.3 years (SD ± 6.2), with majority being above 30 (52.7%), referred from other facilities (95.5%) to Muhimbili National Hospital. During admission, majority of patients presented with leukocytosis (WBC ≥ $11 \times 10^9$/L) (79.5%),

anemia (hemoglobin < 11 g/dL) (86.6%), thrombocytopenia (platelet count < $150 \times 10^9$/L) (77.7%) with median serum creatinine level of 372.5 µmol/L (IQR 185.0–768.2), and blood urea nitrogen (BUN) of 14 µmol/L (IQR 6.5–21.7). A tenfold increase in AST and ALT were noted in 34.8% and 17% respectively.

Hyponatremia was observed in 62.5% and hyperkalemia in 26.8%. Seropositivity for HIV, hepatitis B virus (HBV), and hepatitis C virus (HCV) was documented in 4.5%, 7.1%, and 3.5% of cases, respectively. Hypertensive disorders were the most prevalent obstetric diagnosis, accounting for 67% of cases, followed by hemorrhagic complications (17%) (Table 1).

At the initiation of dialysis, 68.8% were in high-dependency or intensive care units, with 42.8% required mechanical ventilation. On the acute indications of dialysis, 33.9% of cases had two or more indications, followed by pulmonary edema (26.8%), metabolic acidosis (16.1%), hyperkalemia (12.5%), and uremia (10.7%). The median pre-dialysis creatinine and BUN were 773.5 µmol/L (IQR 627.0–1055.3) and 26.5 µmol/L (IQR 17–36), respectively. At discharge ($N = 73$), the median serum creatinine was 168 µmol/L (IQR 101–385), but 28.8% still had values ≥ 354 µmol/L. In-hospital maternal mortality rate of 17.9%. At three-month follow-up, 8% of patients had complete renal recovery, 7.1% had persistent renal dysfunction, and renal status was unknown in 67%. Among survivors ($N = 91$), 85.7% received fewer than 10 dialysis sessions (Table 2).

## Discussion

Our study offers insights into the clinical presentation and outcomes of pregnancy-related acute kidney injury requiring dialysis (PRAKI-D) at MNH. The majority of patients were referrals from other facilities, with nearly half presenting with stage 3 AKI. Hypertensive disorders emerged as the leading obstetric complication. Notably, seven out of ten patients-initiated dialysis while in high-dependency or intensive care units, and almost half required ventilator support. One-third had two or more acute indications for hemodialysis. The in-hospital mortality rate was two out of ten, and among survivors, more than half did not return for follow-up, leaving their renal recovery status unknown.

As in other African settings, hypertensive disorders are the leading cause of pregnancy-related acute kidney injury (PRAKI) in our cohort [11]. Nearly half of the patients presented with KDIGO Stage 3 AKI, reflecting delayed obstetric care. Most were referred from lower-level facilities, indicating missed opportunities for early intervention. This pattern aligns with findings from other sub-Saharan African studies, where PRAKI patients often arrive in advanced stages, typically due to absent prenatal care, late referrals, and delayed diagnosis [1, 7, 12]. Dialysis in PRAKI signals critical illness and highlights gaps in early risk detection, timely management, and access to nephrology care. In our cohort, more than half of the patients were admitted to high-dependency or intensive care units, and a substantial proportion required advanced respiratory support. This clinical severity highlights the extent of systemic compromise in PRAKI-D cases and further emphasizes the need for timely obstetric and critical care interventions to prevent progression to such severe states.

PRAKI patients represent some of the most critically ill pregnant women, typically presenting with severe hypertensive or other obstetric complications [13]. Among these, those requiring dialysis fall at the most severe end of the spectrum [14]. In our study, two out of ten patients with PRAKI requiring dialysis died during the course of treatment. Although this mortality rate is significant, it is notably lower than what has been reported in other sub-Saharan African settings, where mortality rates among PRAKI patients requiring dialysis have reached six out of ten, and even higher when dialysis is indicated but unavailable [13, 15, 16]. The relatively lower mortality observed in our cohort may reflect the availability of dialysis services provided irrespective of a patient's financial means. Nevertheless, dialysis access alone is not sufficient. Mortality in this group is also driven by other critical factors, including the lack of vasoactive medications use, late presentation with markedly elevated creatinine levels, and underlying multi-organ dysfunction [4, 7, 14, 16]. These findings underscore the importance of both timely access to renal replacement therapy and integrated critical care services to improve outcomes for this high-risk population [8].

Acute kidney injury, including pregnancy-related AKI (PRAKI), is independently associated with the development of chronic kidney disease (CKD), particularly in patients who experienced dialysis-requiring AKI [17]. In our cohort, nearly 10% of PRAKI patients had not recovered to their baseline renal function by the time of discharge, placing them at increased risk for future AKI episodes and progression to CKD. Alarmingly, although all patients were advised to return for follow-up care, more than half were lost to follow-up by three months, leaving their renal recovery status unknown. This reflects a broader challenge in resource-limited settings, where only a minority of patients receive post-AKI follow-up care [18]. It is now well established that survivors of AKI are at increased risk of adverse long-term outcomes, including progression to CKD, hypertension, and other cardiovascular diseases [2, 17, 18].

Our study highlights the critical burden of pregnancy-related acute kidney injury requiring dialysis at a tertiary facility in Tanzania, where most patients presented with stage 3 AKI. Despite access to dialysis therapy, nearly two

**Table 1** Clinical and laboratory characteristics on admission (N = 112)

| Variable | N(%) |
|---|---|
| **Age (Years)** | |
| ≤30 | 53 (47.3) |
| >30 | 59 (52.7) |
| Mean (SD) | 31.3 (6.2) |
| **Referral status** | |
| Referral from other facility | 107 (95.5) |
| Direct admission | 5 (4.5) |
| **WBC count ($\times 10^9$/L)** | |
| <11 | 23 (20.5) |
| ≥11 | 89 (79.5) |
| **Hemoglobin level (g/dl)** | |
| <11 | 97 (86.6) |
| ≥11 | 15 (13.4) |
| Mean (SD) | 8.09 (2.6) |
| **Platelets count ($\times 10^9$/L)** | |
| <150 | 87 (77.7) |
| ≥150 | 25 (22.3) |
| **Creatinine (µmol/L) at admission** | |
| <97 | 43 (38.4) |
| 97-353 | 11 (9.8) |
| ≥ 354 | 58 (51.8) |
| Median (IQR) | 372.5 (185.0–768.2) |
| **Blood urea nitrogen (µmol/L) at admission** | |
| <8.5 | 33(29.5) |
| ≥8.5 | 79 (70.5) |
| Median (IQR) | 14 (6.5–21.7) |
| **AST(IU/L)** | |
| <35 | 26 (23.2) |
| 35 – 350 | 47 (42) |
| >350 | 39 (34.8) |
| **ALT (IU/L)** | |
| <56 | 43 (38.4) |
| 56 – 560 | 50 (44.6) |
| >560 | 19 (17) |
| **Sodium (mEq/L)** | |
| <135 | 70 (62.5) |
| ≥135 | 42 (37.5) |
| Mean (SD) | 132.8 (8.2) |
| **Potassium (mmol/L)** | |
| <5.5 | 82 (73.2) |
| ≥5.5 | 30 (26.8) |
| Mean (SD) | 4.8 (0.9) |
| **HIV status** | |
| Positive | 5 (4.5) |
| Negative | 107 (95.5) |
| **Hepatitis B status** | |
| Positive | 8 (7.1) |
| Negative | 104 (92.9) |
| **Hepatitis C status** | |
| Positive | 4 (3.5) |
| Negative | 108 (96.5) |
| **Obstetrics diagnosis** | |
| Hypertensive disorders | 75 (67) |

**Table 1** (continued)

| Variable | N(%) |
|---|---|
| Obstetrics hemorrhage | 19 (17) |
| Obstructed labor or uterine trauma | 5 (4.5) |
| Others | 13 (11.5) |

**Table 2** Process of care and outcomes of the pregnancy-related AKI patients on hemodialysis therapy

| Variable | N (%) |
|---|---|
| **Patient disposition at the start of hemodialysis** | |
| HDU/ICU | 77 (68.8) |
| General ward | 35 (31.2) |
| **Use of ventilator (N=77)** | |
| Yes | 33 (42.8) |
| No | 44 (57.2) |
| **Indication for dialysis** | |
| ≥2 indications | 38 (33.9) |
| Pulmonary edema | 30 (26.8) |
| Metabolic acidosis | 18 (16.1) |
| Hyperkalemia | 14 (12.5) |
| Uremia | 12 (10.7) |
| Median pre-hemodialysis creatinine (IQR) (µmol/L) | 773.5 (627.0–1055.3) |
| Median pre-hemodialysis BUN (IQR) (µmol/L) | 26.5 (17–36) |
| **Creatinine at discharge (N=73) (µmol/L)** | |
| <97 | 34 (46.6) |
| 97-353 | 18 (24.7) |
| ≥ 354 | 21 (28.8) |
| Median (IQR) | 168 (101–385) |
| **Blood urea nitrogen at discharge (N=73) (µmol/L)** | |
| <8.5 | 50 (68.5) |
| ≥8.5 | 23 (31.5) |
| Median (IQR) | 6 (4.1 – 10.4) |
| **Maternal outcome** | |
| Alive | 92 (82.1) |
| In-hospital mortality | 20 (17.9) |
| **Renal outcome at three months** | |
| Known complete renal recovery | 9 (8) |
| Persistent renal dysfunction | 8 (7.1) |
| Unknown renal function status | 75 (67) |
| **Number of dialysis sessions among the survivors (N=91)** | |
| <10 | 78 (85.7) |
| ≥10 | 13 (14.3) |

out of ten patients died, likely due to late referrals and the resulting severity of illness. Post-discharge follow-up was inadequate, with the majority of patients lost to care within three months, limiting our understanding of long-term renal recovery. Low-cost training for obstetric providers, simplified referral checklists, and outreach visits can improve early detection and outcome. These resource-sensitive strategies align with LMIC priorities for early intervention, task-sharing, and sustained care at minimal cost, and have been successfully implemented in other African countries.

## Limitation

Our study provides important baseline insights into this high-risk group; however, the sample size was insufficient to support robust analyses of predictors of mortality and renal recovery. Additionally, the retrospective design limited the range of variables collected, restricting a more detailed characterization of patient risk profiles. In particular, urine output an important, low-cost early marker of kidney injury severity was not consistently documented in patient records and therefore could not be analyzed. Furthermore, patients with incomplete records were excluded, which may have introduced selection bias and affected the representativeness of our findings. Loss to follow-up of more than half of survivors within three months further limited our ability to comment on long-term renal recovery. Prospective studies with larger cohorts, standardized data collection, and complete follow-up are needed to better understand the determinants of outcomes in PRAKI patients and to inform targeted interventions.

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**Author contributions**
DM: Conceived the study, developed the study design, coordinated data collection, led data analysis and interpretation, drafted the manuscript. JM: Contributed to study design and data analysis.EM: Participated in data collection and initial drafting.GV: Supported clinical interpretation and manuscript revision.UN: Assisted in data organization and literature review. JS: Contributed to data entry and quality control.JB: Participated in field coordination and data verification.HR: Supported data synthesis and results presentation.JD: Assisted with clinical data extraction and patient follow-up. MN: Contributed to manuscript editing and referencing.MS: Provided input on clinical methodology and context.GK: Reviewed manuscript for intellectual content and clarity.PP: Offered statistical guidance and methodological review.FF: Contributed to data interpretation and manuscript structuring.PR: Provided senior oversight, mentorship, and final review.

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**Data availability**
The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

## Declarations

### Ethical approval

Ethical clearance was obtained from the Muhimbili National Hospital, Clinical Research, Training and Consultancy Unit (Ref: MNH/IRB/I/2023/071). The study was conducted in accordance with the ethical standards of the institutional research committee and the 1964 Declaration of Helsinki. A waiver of informed consent was granted due to the retrospective nature of the study and the use of anonymized data from hospital records.

### Consent for publication

Not applicable.

### Competing interests

The authors declare no competing interests.

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