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In-hospital Mortality Rate And Its Predictors among Dialysis Requiring Acute Kidney Injury Patients, 6 years Retrospective cross-sectioal study In Addis Ababa, Ethiopia, 2025.

A thesis to be submitted to the Department Of Internal Medicine, College of Health Sciences, Addis Ababa University in Partial fulfillment Of The Requirements of Specialty in Internal Medicine.

Declaration

I, Mihiretu Gebreegziabher, do hereby declare that this research thesis is a result of the works of my own making except where due is made in a review of previous literature in the content and by my knowledge, has never been submitted for any prior academic award or qualification in this Institution.

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Approval of thesis submission

I hereby certify that I have read this thesis prepared under my direction and recommend that it can be accepted as fulfilling the thesis requirement.

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Name of Head of Department	Signature	Date
_____	_____	_____

Acknowledgment

I would like to express my heartfelt gratitude to my esteemed advisors, Dr. Addisu Melkie and Dr. Nebiyou Getachew, for their unwavering support and invaluable guidance throughout the entire journey of this thesis work.My sincere appreciation also goes to Addis Ababa University, College of Health Sciences, and the Department of Internal Medicine for providing me with the opportunity and funding to conduct this research.Lastly, I would like to extend my deepest thanks to my family, friends, and colleagues for their constant encouragement, assistance, and emotional support, which have been indispensable throughout this endeavor.

Research summary information

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Supervisors:	Dr. Addisu Melkie/Dr. Nebiyou Getachew
Full title of the project	In-hospital Mortality Rate And Its Predictors among Dialysis Requiring Acute Kidney Injury Patients In Addis Ababa, Ethiopia, 6 years Retrospective cross-sectioal study
Type of protocol	Acute Kidney Injury Public Health
Duration of the study	6 years, from January 1, 2019, to December 30, 2024
Total cost of the project	ETB 28755.00
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Abstract

Background: Acute kidney injury (AKI) requiring dialysis is a serious and potentially fatal entity that places a significant burden on healthcare systems. Limited data is available on the factors contributing to higher mortality rates among AKI patients requiring dialysis, particularly in low- and middle-income countries including Ethiopia.

Objective: To assess the in-hospital mortality rate and associated factors among acute kidney injury patients requiring dialysis in Addis Ababa, Ethiopia.

Methods: This institution-based retrospective study evaluated patients who underwent hemodialysis for acute kidney injury (AKI) from January 1, 2019, to December 30, 2024, at a major public hospital in Addis Ababa, Ethiopia. A total of 147 patients were screened, and 128 patients fulfilled the inclusion criteria and were included in the study . Data were collected from medical charts and electronic records using a structured tool. Data were analyzed using SPSS version 26. Survival analysis was conducted using the Kaplan-Meier Curve, while Cox regression was used to assess the association between variables (e.g., age, comorbidities) and in-hospital mortality.

Results: The mean age of the study population was 49.5 ± 14.6 years, with a female proportion of 42.2%. The overall in-hospital mortality rate was 16.4% (95% CI: 10.4–24.0%), with a mortality incidence of 7.42 deaths per 1000 person-days. The majority of deaths (66.7%) occurred within the first 15 days of hospitalization. Significant factors associated with increased mortality included low Glasgow Coma Scale (GCS) scores (AHR: 11.93, 95% CI: 2.45–58.03), septic shock (AHR: 26.21, 95% CI: 6.79–117.21), increased the number of dialysis sessions (AHR = 0.86, 95% CI: 0.67–0.89, p = 0.03) and increased serum albumin, (AHR = 0.04, 95% CI: 0.002–0.80, p = 0.04).

Conclusion: The in-hospital mortality rate for patients with AKI requiring hemodialysis in our study was 16.4%, which is significantly lower than both the global average and findings from other studies conducted in Africa. This discrepancy may be attributed to several factors, including the strength of the local healthcare infrastructure, the relatively younger age of our patient population, a lower prevalence of sepsis, and differences in the timing of dialysis initiation.

Keywords: Acute Kidney Injury, Mortality rate, Dialysis

1. Introduction

1.1 Background

Acute kidney injury refers to a sudden decline in kidney function that leads to retention of urea and other nitrogenous waste products as well as electrolyte and extracellular volume imbalance. The Kidney Disease Improving Global Outcomes (KDIGO) guidelines define AKI as follows [1]: Increase in serum creatinine by ≥0.3 mg/dL (≥26.5 micromol/L) within 48 hours, or Increase in serum creatinine to ≥1.5 times baseline, which is known or presumed to have occurred within the prior seven days, or Urine volume <0.5 mL/kg/hour for six hours.

Acute kidney injury (AKI) is a heterogeneous disease that can be classified into three types based on pathophysiologic mechanisms: Pre-renal, Intrinsic, and post-renal. Pre-renal causes are related to diminished renal perfusion as a result of hypovolemia, compromised renal auto-regulation, or decreased cardiac output[2]. Intrinsic AKI occurs following direct kidney damage, usually due to ischemia, sepsis, nephrotoxic drugs, and vasculitis[3]. Post-renal one arises from urinary tract flow obstruction[4]. According to the KDIGO definition, the global incidence of AKI was 21.6% in adults, with pooled AKI-associated mortality of 23.9% from a meta-analysis that comprised 154 studies, the majority of which were done in hospital settings. [5]. In patients who are critically ill, its incidence can even reach up to 50 to 60 percent [6-10]. And 5 to 6 percent of patients in the intensive care unit eventually need renal replacement therapy [11-12]. Despite the paucity of data regarding the prevalence of AKI in Africa, a review of studies published between 2000 and 2015 indicates that the incidence of the disease in hospitalized patients varies between 0.3 % and 1.9 % with mortality ranging from 11.5 to 43.5 % [13]. Different studies indicate that the in-hospital mortality rate among dialysis-requiring AKI is between 40 to 70%, which is still startlingly high. The last few decades have seen little improvement in the outcomes for this patient population, despite advances in critical care management and renal replacement therapies [14].

1.2 Statement of the problem

In hospitalized patients, AKI is a frequent and serious complication that raises morbidity and mortality rates considerably. Dialysis-dependent AKI patients are a particularly vulnerable subgroup with higher rates of adverse outcomes including in-hospital mortality [15]. Frequently, this patient group presents with hemodynamic instability and multiple organ dysfunction that require intensive and critical care. To improve patient outcomes, allocate resources optimally,

and inform clinical decision-making, it is imperative to identify predictors of mortality in this patient group. Hospital mortality rates for AKI patients requiring dialysis vary considerably in the literature, ranging from 30 to 60 percent, depending on the population studied and healthcare settings. Even with a large number of studies on AKI, data specific to a given region or institution is still needed, particularly in developing countries where healthcare resources may be limited [16]. Although the specific factors affecting the mortality among dialysis-requiring AKI are not well understood, the rate remains high in such populations, thus, deeper comprehension of variables influencing this will result from improved management approaches and better patient outcomes.

1.3 Significance of the study

This paper on in-hospital mortality and associated factors in patients with AKI requiring dialysis will help to detect patients having high-risk features early to give them priority for prompt interventions that possibly avert preventable death. Dialysis is a costly operation, especially in third-world countries where there is a shortage of skilled professionals, machinery, and beds in the intensive care room. By identifying the predominant factors affecting mortality in such patients, the study enables to allocation of scarce resources right-of-way to those with the highest probability of doing well out of them. Despite having global studies on AKI that require dialysis, regional and local data are lacking, so the results of this paper may offer acumen about the local healthcare environment, which further helps be the foundation on which future research will build.

2. Literature review

In-Hospital Mortality Rates in Dialysis-Requiring AKI

Patients with AKI who require dialysis have considerably high hospital death rates often surpassing 40 to 50% on average. Numerous studies have documented varying rates depending on geographic locations, clinical settings, and patient demographics. AKI requiring dialysis is associated with mortality rates among critically ill patients typically exceeding 50%[17]. Similarly between 5 to 10 percent of AKI patients may require dialysis while they are in the critical care room, with a 30 to 70 percent hospital death rate[18]. According to a study conducted in Rwanda, the in-hospital mortality rate for mainly non-ICU patients who required dialysis was 34 percent, which is significantly lower than the rate for ICU patients [19].

Associated Factors with In-Hospital Mortality

Demographic Factors

For patients with AKI requiring dialysis older age is a significant risk factor for increased mortality since such patients have several comorbidities, poor response to treatment, and compromised physiological reserve. The study conducted in a single center in the Democratic Republic of Congo(DRC), showed that age greater than 60 was associated with higher mortality[20]. Similarly, another paper showed that patients with AKI whose age more than 65 have increased mortality as well [21]

Findings regarding the impact of sex on the prognosis of AKI patients are divergent; most of the research has focused on differences in AKI incidence between the sexes. The female sex has been recognized as a potential risk factor in forecasting models for AKI which occurs following cardiac surgery, use of aminoglycosides or radio-contrast agents, and rhabdomyolysis[22-24]. Likewise, the female sex is one of the susceptibility factors which confers a higher risk of AKI according to the KDIGO Clinical Practice Guideline for Acute Kidney Injury [1].On the

contrary, other studies showed that males are more likely to develop dialysis requiring AKI than females [24-26]

Clinical Factors

The severity of illness: Acute Physiology and Chronic Health Evaluation (APACHE) which is often used to gauge the severity of the underlying illness during initiation of dialysis, has a strong correlation with in-hospital mortality among critically ill patients requiring renal replacement therapy as shown by different studies[27-29]. There are also studies showing the use of vasopressors and mechanical ventilation are independently associated with hospital mortality[30].

Comorbidities: The presence of comorbidities like hypertension and diabetes increases the hospital mortality of any degree of AKI including those requiring dialysis. According to the statutes done by Sezeret et.al. And to Samimasham et al, diabetes and an increased number of comorbid illnesses are found to have increased mortality [31, 32].

Cause of AKI: The etiology of AKI is a significant determinant of mortality. According to previous large series [33-36], sepsis is the most common cause of AKI and is associated with a high hospital death rate when it is discovered during admission or later on.

1.2 Conceptual framework

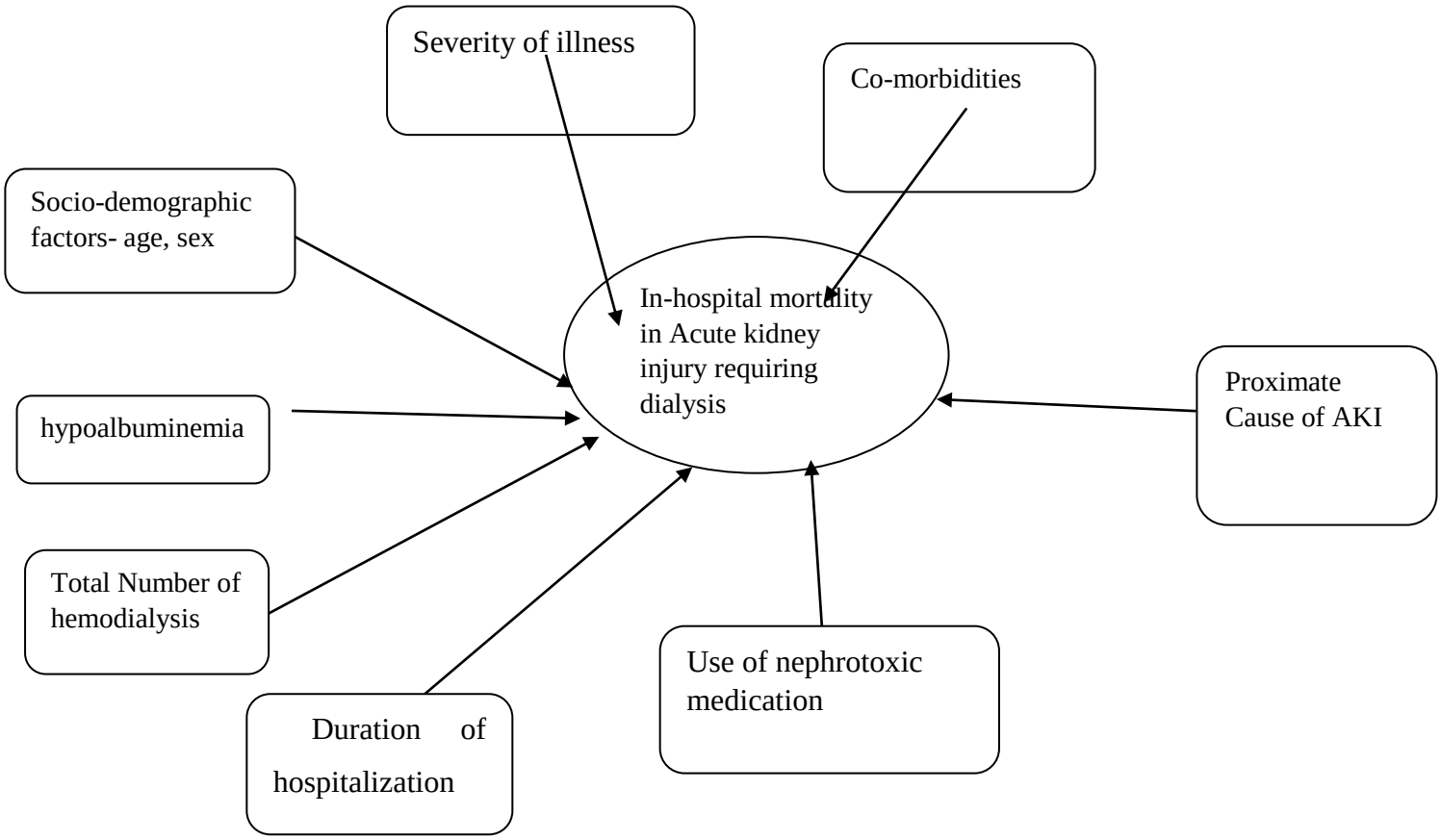

Figure 1–conceptual framework of the study

3. Objectives

3.1 General objectives

- To assess the in-hospital mortality rate and associated factors among acute kidney injury patients requiring dialysis in Addis Ababa, Ethiopia.

3.2 Specific objectives

- To determine the in-hospital mortality rate among acute kidney injury patients requiring dialysis in Addis Ababa, Ethiopia;
- To evaluate factors associated with an in-hospital mortality rate among acute kidney injury patients requiring dialysis in Addis Ababa, Ethiopia.

4. Methods

4.1 Study area

The study is conducted in single health institutions in Addis Ababa, Ethiopia. Tikur Anbessa Specialized Hospital is the largest teaching hospital in Ethiopia with more than 700 beds providing diagnostic and treatment services [37].

4.2 Study design

An institutional-based retrospective cohort study design was used to collect data from patients with AKI who required dialysis from January 1 2019 to December 30,2024.

4.3 Selection criteria

Inclusion criteria

All patients aged 14 and above with AKI and who have been dialyzed at least once during the study period were included.

Exclusion criteria

The following group of patients were excluded from the study:

- Patients with missing or incomplete records
- patients who had dialysis for an overdose of dialyzable drugs
- Patients for whom it was difficult to determine whether they had AKI or CKD based on the available data were excluded from the study.
- Patients with an AKI diagnosis referred from other hospitals who had already started dialysis prior to referral were excluded, as their pre-dialysis laboratory data and the clinical criteria for initiating dialysis were unavailable.

4.4 Source population

All patients who underwent hemodialysis from January1, 2019 to December 302024 who meet the inclusion criteria.

4.5 Sample size calculation

All patients who had dialysis requiring AKI and fulfilled the inclusion criteria were the sample size.

4.6 Sampling procedure

Convenience sampling techniques were applied to include the study participants in the study.

4.7 Data collection instrument

A structured data-collection tool was used to collect data from patients' medical record charts. The checklist contains four parts. The first part is used to assess the socio-demographic

characteristics of the patients. The second part is used to determine the presence of independent variables at baseline. The third part is about dialysis-related information. The final and fourth part of the checklist is about complications during hospitalizations , interventions and outcome.

4.8 Study variables:

- **Dependent variable**–The in-hospital mortality among dialysis-requiring acute kidney injury patients;
- **Independent variables:**
    - Demographics (Age and sex);
    - Comorbidities (Diabetes, Hypertension);
    - Hypotension;
    - Oliguria/Non-oliguria;
    - Duration of AKI;
    - Cause/etiology of AKI;
    - The severity of illness: measured by GCS
    - Laboratory markers: such as creatinine, BUN, potassium, sodium, Albumin, white blood cells, platelets, and hemoglobin;
    - Interventions: other treatments like the use of vasopressors, mechanical ventilation;ICU admission
    - Use of nephrotoxic medications;
    - Duration of hospitalization

4.9 Operational definitions:

- **Acute kidney injury** is defined according to the 2012 KDIGO Guideline [1];
- **In-hospital mortality**: Death of a patient that occurred while they were in the hospital irrespective of their length of stay;
- **Dialysis-Requiring AKI** is a sub-set of AKI where the patient needs renal replacement therapy during their hospital stay.;
- **Predictors of mortality:** variables that are hypothesized to be linked to increased risk of hospital mortality like age, laboratory markers, and comorbid illnesses;

- **Comorbidities** are pre-existing medical illnesses that could affect patient mortality like hypertension and diabetes.
- **Community-Acquired AKI:**Identified at the time of hospital admission or with in the first 48 hrs of hospital admission
- **Hospital acquired AKI:** Defined as acute kidney injury that develops at or after 48 hrs of hospital admission

4.10 Data collection procedure

Six data collectors were employed for data collection. A formal orientation was given to the data collectors by the investigator. All AKI patients who have undergone dialysis in the specified period were included provided that their no missing data from their chart and electronic record system.

4.11 Data quality assurance

To ensure the quality of data, the checklist was pretested on 10 participants to check for inconsistencies and errors. Participants involved in the pretest were excluded from later data collection. Inconsistencies and errors were corrected accordingly.

4.12 Data management

The completeness and consistency of all the data from the checklist were verified first. Following template preparation, SPSS version 26 software is used to code and enter data. The same software is used for data analysis as well.

4.13 Data analysis

Descriptive statistics such as frequencies, means, medians, interquartile, ranges, percentages, and standard deviations were used to summarize baseline characteristics. The overall in-hospital mortality was calculated. The Kaplan-Meier Curve was employed for survival analysis. To determine the association between independent variables and in-hospital mortality, cox regression was used, and hazard ratios (HR) were calculated for each independent variable. Variables with a P-value less than in crude Cox regression were eligible for multivariable Cox regressions and statistical significance is declared at a p-value less than 0.05 at 95%CI

4.14 Ethical considerations

The Institutional Review Board (IRB) of Addis Ababa University's College of Health Sciences has granted ethical approval for this study. Before beginning data collection, permission letters is obtained from the College of Health Sciences at Addis Ababa University, specifically from the

School of Medicine's Department of Internal Medicine. As research utilizes secondary data, consent will not be necessary in written or verbal form. To ensure confidentiality, all data is completely de-identified, and personal identifiers such as names, and sensitive information is not gathered. During all stages of the research process, confidentiality was maintained and data were stored securely on a password-protected system.

4.15 Expected outcomes of the study

Over the course of 5 years, the study will give a precise estimate of the in-hospital mortality rates along with important clinical indicators among patients with AKI who needed dialysis. Considering how serious the illness is, a high death rate is anticipated. By identifying modifiable risk factors that contribute to high mortality, the study will offer a chance to improve patient outcomes through interventions or modifications to clinical practice. Based on the results, the study may propose methods for identifying high-risk patients early on and for improving treatment regimens to lower mortality.

5. Result

5.1.1 Sociodemographic Characteristics and patients setting

A total of 147 patients were screened, and 128 patients fulfilled the inclusion criteria and were included in the study. The majority were female (63.3%), from urban areas (60.9%), and had a mean age of 35.9 years, with most falling in the 25-35 age group (35.2%). The largest regional representation was from Oromia (43.0%), and 63.3% were enrolled in Community-Based Health Insurance (CBHI). Regarding patient settings, the majority were admitted to medical wards (67.2%)(table 1).

Table 1: Socio-demographic and Clinical Characteristics of AKI Patients Requiring Dialysis in a Referral Hospital, Addis Ababa, Ethiopia (N = 128)

Variables	Count	Percentage
Sex		
Female	81	63.3
Male	47	36.7
Age		
14-24	28	21.9
25-35	45	35.2
36-45	24	18.8
45-55	14	10.9
≥56	17	13.3
Residency		
Rural	50	39.1
Urban	78	60.9
Regions		
OROMIA	55	43.0
Addis Ababa	36	28.1
Amhara	18	14.1
SNNPR	16	12.5
Others	2	1.6
Health insurance		
Use CBHI	81	63.3
Not use insurance	47	36.7
Patients setting		
Medical ward	86	67.2
Surgical ward	13	10.2
ICU/emergency	19	14.9
Obstetric ward	10	7.8

5.2 Cause, presenting symptoms, and comorbidities

The study found that 91.4% of AKI cases were community-acquired**,** with the most common cause being ischemic ATN, infections, and pulmonary-renal syndrome (28.1%)**.** Oliguria/anuria (65.6%) was the most frequent symptom, followed by mental status changes (35.9%) and pulmonary edema (25.0%)**.** Hypertension (27.3%) and CKD (18.8%) were common comorbidities. Nephrotoxic drug use (11.7%) was a notable risk factor. More than half of cases (56.3%) lasted over 14 days, suggesting delayed diagnosis or severe disease (table 2).

Table 2: Distribution of source, Causes, Clinical Presentation, Comorbidities, and Duration of AKI

Variables	Count	Parentage
Source AKI		
Community-acquired	117	91.4
Hospital-acquired	11	8.6
Cause AKI		
Preeclampsia and Hypertensive Nephropathy	15	11.7
Severe Malaria	21	16.4
Rapidly Progressive Glomerulonephritis (RPGN) (, PSGN, HUS ,Lupus Nephritis, Pauci-immune crescentic, Grade I-IFTA),	30	23.4
Obstructive Uropathy and Renal Stones	14	8.6
Septic ATN	16	12.5
Tumor lysis syndrome(TLS)	12	9.3
Hypovolemia	11	8.6
Others	9	7 .0
Presenting systems		
Pulmonary edema	32	25.0
Oliguria/anuria	84	65.6
Mental status change	46	35.9
Seizure	10	7.8
Edematous	43	33.6
Febrile	8	6.3
Others	4	3.1
Comorbidities		
HTN	35	27.3
DM	10	7.8
CKD	24	18.8
CVS	14	10.9
Others*	30	
Duration of AKI		
<7 days	23	18.0
8-14 days	33	25.8

>14 days	72	56.3
GCS		
≤8	15	11.7
9-12	9	7.0
13-15	104	81.3

5.3 Laboratory findings

A majority had elevated creatinine levels, with 53.9% between 5-10 mg/dl and 39.1% exceeding 10 mg/dl, indicating severe kidney dysfunction. BUN levels were also elevated, with 60.9% between 100-200 mg/dl and 34.4% exceeding 200 mg/dl, reflecting uremic toxicity. Potassium levels were abnormal, with 48.4% between 4.5-6.5 mEq/L and 32.8% below 4.5 mEq/L, while hyponatremia was present in 72.7%, who had sodium levels below 135 mEq/L. White blood cell counts were low at 78.1%, and thrombocytopenia was observed in 40.6% of patients with platelet counts below 150,000 cells/µL. Hemoglobin levels were low in 75.3% of females and 86.4% of males, indicating a high prevalence of anemia (Table 2). The serum albumin level, measured in 70 patients, had a mean of 2.61 ± 0.53 g/dL, while the serum protein level, assessed in 71 patients, had a mean of 2.16 ± 3.51 g/dL(table 3).

Table 3: Laboratory profile of AKI Patients Requiring Dialysis in a Referral Hospital, Addis Ababa, Ethiopia (N = 128)

Variables	Count	Frequency
Creatinine before dialysis		
≤5mg/dl	9	7.0
5-10mg/dl	69	53.9
>10mg/dl	50	39.1
BUN before dialysis		
<100	6	4.7
100-200	78	60.9
>200	44	34.4
Potassium level (mEq/L)		
<4.5	42	32.8
4.5-6.5	62	48.4
<6.5	24	18.8
Sodium level (mEq/L)		
<135	93	72.7
135-145	26	20.3
>145	9	7.0
White blood cells (cells/µL)		
≤3999	100	78.1
400-10,000	23	18.0
>10000	5	3.9
Platelet (cells/µL)		

	<150	52	40.6
	150-450	72	56.3
	>450	4	3.1
Hemoglobin			
Female (n=81)			
	Low(<12g/dl)	61	75.3
	Normal(12-15g/dl)	19	23.5
	High(>15g/dl)	1	1.2
Male (n=81)			
	Low(<13g/dl)	45	95.7
	Normal (13-17/dl	2	4.3
	High (>17)	0	0

5.4 Indication for dialysis and related variables

Uremic symptoms (77.3%) were the primary indication for dialysis, followed by refractory fluid overload (40.6%). Most patients (54.7%) received fewer than five dialysis sessions. A majority had urine output between 50-400 ml (61.7%) before dialysis. In terms of complications, septic shock and mechanical ventilation were each observed in 18% of patients. Dialysis-related complications included intradialytic hypotension in 3.9% and dialysis catheter infection in 2.3%. The mean length of stay (LOS) was 22.1 days. The majority of patients (70.3%) had hospital stays longer than 14 days (table 4).

Table 4: Indication for dialysis and related variables of AKI Patients Requiring Dialysis in a Referral Hospital, Addis Ababa, Ethiopia (N = 128)

Variable's		Count	Frequency
Indication for dialysis			
	Refractory fluid overload	52	40.6
	Uremic symptoms	99	77.3
	Refractory hyperkalemic	11	8.6
	Metabolic acidosis	20	15.6
Number of dialysis during hospitalization			
	<5	70	54.7
	≥5	58	45.3
Urine output before dialysis			
	<50 ml	19	14.8
	50 to 400ml	79	61.7
	≥400 ml	30	23.4
Complications during hospitalization			
	Septic shock	23	18.0
	Mechanical ventilator	23	18.0
	Use of vasopressor	20	15.6

	ICU admission	28	21.9
Dialysis related complications			
	Intradialytic hypotension	5	3.9
	Intradialytic arrhythmia	2	1.6
	Intradialytic bleeding	2	1.6
	Thrombosis	2	1.6
	Intradialytic hemodynamic instability	4	3.1
	Dialysis catheter infection	3	2.3
Length of hospital stay (in days)			
	<7	7	5.5
	7-14	31	24.2
	>14	90	70.3

5.5 In Hospital Mortality and Outcomes

The overall Inhospital mortality rate of dialysis requiring AKI patients was 16.4% (16.4% (95% CI: 10.4-24.0). The total person-time observation was 2828 person-days in this study. The incidence of death among dialysis AKI-requiring patients, in general, was found to be 7.42 cases (95% CI, 4.84 to 11.38) per 1000-person day observation. Refractory septic shock was the leading cause of death, accounting for 42.9% of cases, followed by multiorgan failure (33.3%) and respiratory failure (23.8%). Notably, all deaths occurred within 30 days of hospital admission, with a significant proportion (66.7%) occurring within the first 15 days. Figure 1 illustrates the distribution of mortality over time. In addition, 79.7% (102/128) were discharged with improvement, either having fully resolved or continuing dialysis as part of their ongoing treatment. Only,3.9%(5/128) patients were discharged against medical advice (AMA).

The incidence of mortality among patients with septic shock is depicted in Figure 2. The results show a statistically significant difference in survival (or mortality) outcomes between patients with septic shock and those without septic shock, as indicated by the log-rank test ($p = 0.001$). Mortality rises sharply with increasing hospital stay, reaching its peak around 30 days (figure 2).

Based on the GCS statsus, the kaplair miler curve (log-rank test ($p=0.001p=0.001$) confirms a statistically significant difference in survival outcomes between patients with GCS <8 (severe neurological impairment) and GCS 9–12 (moderate impairment). Even moderate impairment (GCS 9–12) carries substantially higher mortality risk compared to mild cases (GCS 13–15), though less severe than GCS <8(figure 3)

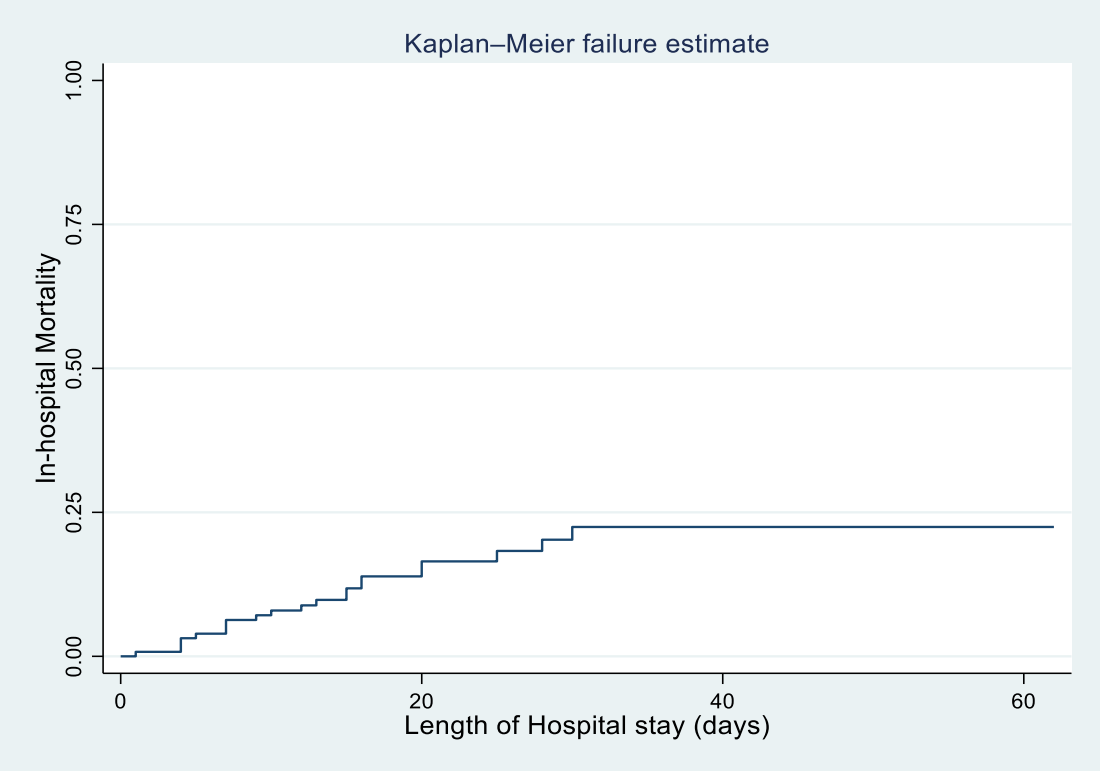

Figure 1: Kaplan Meier incidence of mortality rate among AKI Patients Requiring Dialysis in a Referral Hospital, Addis Ababa, Ethiopia (N = 128)

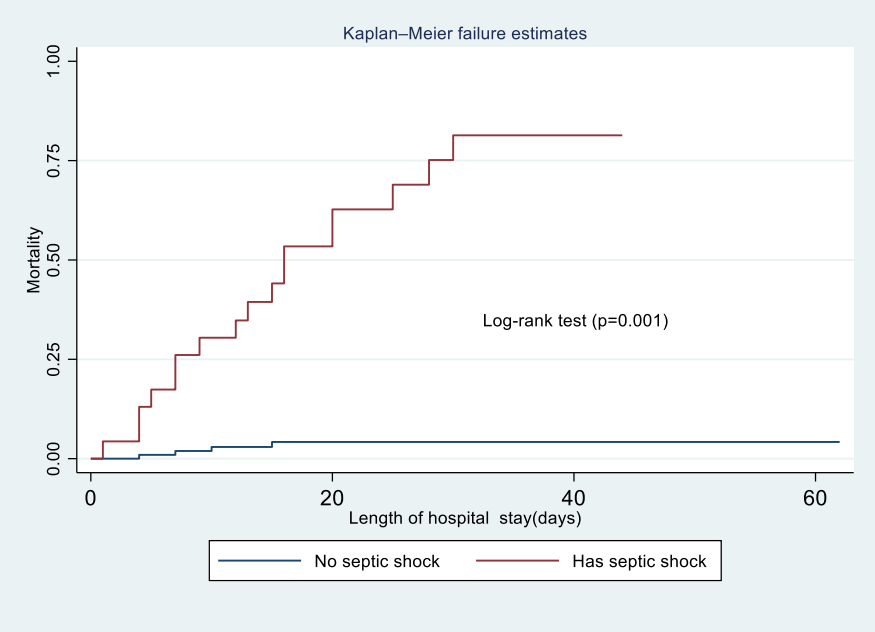

Figure 1: Kaplan Meier incidence of mortality rate in patients with and with out sepetic shock among AKI Patients Requiring Dialysis in a Referral Hospital, Addis Ababa, Ethiopia (N = 128)

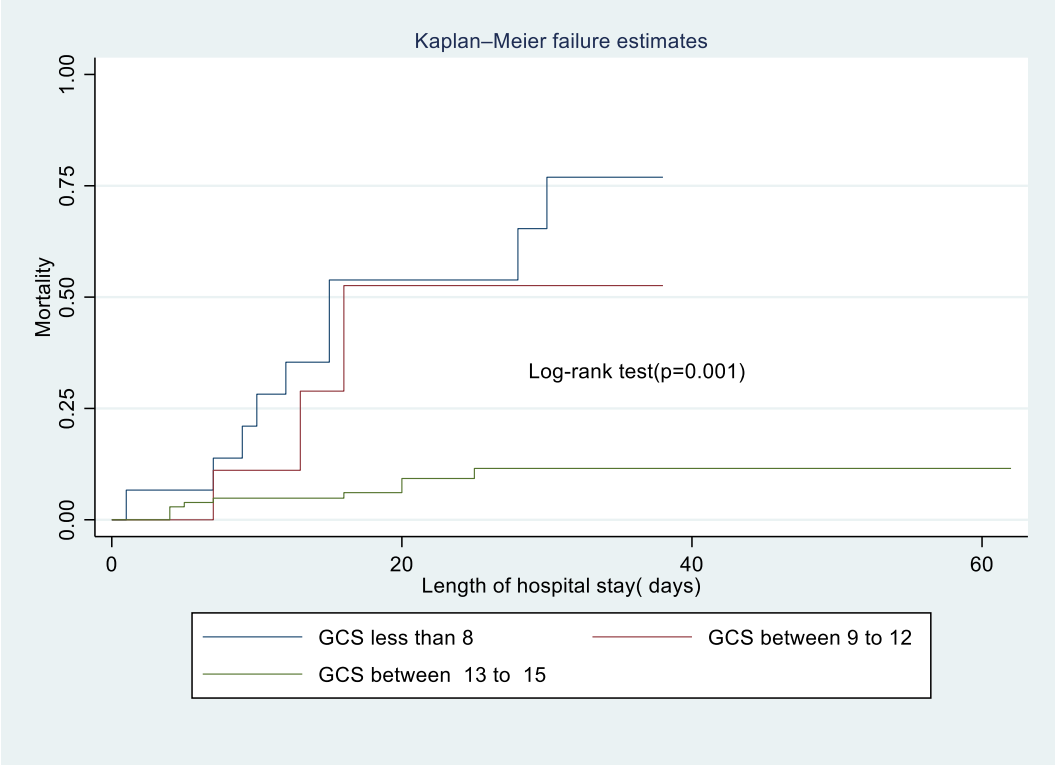

Figure 2: Kaplan Meier incidence of mortality rate based on the GCS status among AKI Patients Requiring Dialysis in a Referral Hospital, Addis Ababa, Ethiopia (N = 128)

5.5 Predictors of mortality among dialysis requiring AKI patents

In the crude Cox regression analysis, several variables with P-values less than 0.25 were considered for inclusion in the adjusted Cox regression model. These variables included female sex (P = 0.22), living area (Addis Ababa vs. out of Addis Ababa, P = 0.06), and insurance level (No-CBHI vs. CBHI, P = 0.13). Additionally, malaria infection (P = 0.14), GCS <8 (P = 0.001), GCS 9-19 (P = 0.012), serum potassium (P = 0.06), septic shock (P = 0.001), mechanical

ventilation requirement (P = 0.006), ICU admission (P = 0.045), dialysis numbers (P = 0.03) and serum9 albumin(p=0.01) were also found eligible for the adjusted Cox regression model(table 5).

In the adjusted Cox regression analysis, three variables were significantly associated with mortality. Patients with a Glasgow Coma Scale (GCS) score of less than 8 had an 11.93-fold increased risk of mortality (AHR: 11.93, 95% CI: 2.45-58.03, P = 0.002) compared to those with a GCS score of 13-15. Septic shock was also a strong predictor of mortality, with affected patients having a 26.21-fold increased risk (AHR: 26.21, 95% CI: 6.79-117.21, P = 0.001) compared to those without septic shock. Each additional dialysis session was associated with a 14% reduction in the risk of in-hospital mortality (AHR = 0.86, 95% CI: 0.67–0.89, p = 0.03), suggesting that more frequent dialysis may improve survival. Similarly, for every 1 g/dL increase in serum albumin, the risk of in-hospital mortality decreased by 96% (AHR = 0.04, 95% CI: 0.002–0.80, p = 0.04) (table 5).

Table 5: Cox regression analysis for Factors Associated with Mortality in Patients Requiring Dialysis in a Referral Hospital, Addis Ababa, Ethiopia (N = 128

Variables	CHR (95%CI)	P-Value	AHR (95%CI)	P-Value
Female sex	1.72(0.73,4.04)	0.22	0.94(0.25,3.48)	0.72
Living area				
Out of Addis Ababa	1		1	
Addis Ababa	2.25(0 .96,5.308	0.06	0.69(0.17,2.91)	0.62
Insurance status				
CBHI	1		1	
No-CBHI	1.92(0.81,4.52)	0.13	0.73(0.19,2.66)	0.73
Malaria infection	3.44(0.77,15.29)	0.14	2.21(0.35,13.89	0.39
Glasgow Coma Scale (GCS)				
<8	9.36(3.69,23.71)	0.001	11.93(2.45,58.03)	**0.002**
9-19	5.38(1.44,20.06)	0.012		
13-15	1		2.65(0.48,14.32)	0.25
Serum potassium	1.23(0.99,1.52)	0.06	0.90(0.67,1.21)	0.48
Number of dialysis	0.83(0.725,0.95)	0.01	0.86(0.67,0.89	**0.03**
Serum Albumin	0.07(0.006,0.79)	0.03	0.04(0.002,0.80)	**0.04**
Septic shock	24.26(8.15,72.22)	0.001	26.21(6.79,117.21)	**0.001**
Require MV	3.39(1.42,8.09)	0.006	2.86(0.44,18.67)	0.27
Require ICU admission	2.42(1.02,5.77)	0.045	0.19(0.03,1.18)	0.07

6. Discussions

This study aimed to assess the in-hospital mortality rate and identify factors associated with mortality among acute kidney injury (AKI) patients requiring dialysis in Addis Ababa, Ethiopia. The findings revealed an overall in-hospital mortality rate of 16.4%**,** with an incidence of 7.42 deaths per 1000 person-days**.** The majority of deaths occurred within the first 15 days of hospitalization. Using Cox regression analysis, identified factors significantly associated with in-hospital mortality included a low Glasgow Coma Scale (GCS) score**,** the presence of septic shock**,** the number of dialysis and serum albumin.

The in-hospital mortality rate for patients with AKI requiring hemodialysis in our study was 16.4%, which is, significantly lower than the global average. Typically, hospital mortality rates for dialysis-requiring AKI patients surpasses 40-50%, with critically ill individuals often having mortality rates above 50% [17,18]. Comparatively, studies in Africa have reported higher mortality rates, such as a 34 percent in Rwanda [19], 25.2% in the Democratic Republic of Congo [20], 43.5 % in Nigeria[39] and 29.1% in Ethiopia [38],all of which show a higher burden of mortality compared our study.on the contrary the mortality rate in our study is comparable to study done in peru [40].These differences could be influenced by local healthcare infrastructure, the severity of underlying conditions, and variations in the timing of dialysis initiation and different prevalence of sepsis and patient age group. Regarding the timing of deaths, most deaths in our study occurred within the first 15 days of hospitalization, which aligns with findings from other studies, where 60-70% of deaths occur within the first 7-10 days [17,18,33-36]. Additionally, a study from Rwanda highlighted an even more acute mortality trend, with 50% of deaths occurring within the first 3 days of hospitalization [19]. This rapid mortality pattern underscores the critical nature of the underlying illnesses in these patients, such as sepsis, multi-organ failure, and hemodynamic instability, which are commonly observed in those requiring

dialysis. Such early mortality emphasizes the urgent need for timely interventions and comprehensive management strategies to address the severity of these conditions.

Our study identified several critical prognostic factors for AKI patients requiring hemodialysis, with important similarities and differences compared to other African studies. The association between low Glasgow Coma Scale (GCS) scores and increased mortality was particularly strong, mirroring findings from the DRC study [20] where coma increased mortality risk by 11.4-fold [20]. Similarly, the Rwandan study [19] identified uremic encephalopathy as one of the leading indications for dialysis initiation. These consistent findings across African studies suggest that neurological monitoring should be prioritized in AKI management protocols throughout the region.

The impact of septic shock on mortality in our cohort aligns with findings from the Ethiopian study [41], where sepsis accounted for 15.9% of deaths. However, our lower sepsis prevalence (12.5% vs 32-45% in the Rwandan and DRC studies [19,20]) may explain our better overall outcomes. This pattern reinforces that sepsis prevention and management remain critical challenges for AKI care across Africa, as also highlighted in global studies showing 30-60% mortality for sepsis-associated AKI [33-36].

Our finding that more frequent dialysis sessions improved survival provides important context to the Rwandan study's observation that patients receiving <5 sessions had 4-fold higher mortality [19]. Both studies suggest current dialysis practices in resource-limited settings may be inadequate, particularly during the critical early illness phase when most deaths occur. This has important implications for clinical protocols across the region.

Higher serum albumin levels were strongly protective against mortality in our AKI cohort, an important finding not previously examined in the Rwandan [19], DRC [20], or Ethiopian [38] studies. This likely reflects multiple beneficial effects: reduced systemic inflammation, better fluid balance maintenance, and improved nutritional status - particularly relevant in our malnutrition-prevalent setting. While global studies support albumin's protective role [31,32], our data uniquely demonstrate its importance in African AKI patients, suggesting nutritional support could be a cost-effective adjunct to dialysis in resource-limited hospitals. This finding warrants prospective evaluation of nutritional interventions in future African AKI research.

7. Strength and limitations

This study offers valuable insights into AKI outcomes in Addis Ababa, Ethiopia. Its strengths include comprehensive data collection, the use of Cox regression to identify mortality predictors, and a focus on high-risk dialysis-requiring patients, which is critical in resource-limited settings. The findings highlight modifiable risk factors like delayed dialysis and septic shock, providing actionable steps for improving care. Emphasizing early intervention, as most deaths occurred within 15 days, aligns with global evidence. The study's rigorous methodology and context-specific findings make it a significant contribution to reducing AKI-related mortality and enhancing healthcare delivery.

While this study provides valuable insights, it has several limitations. First, its cross-sectional design limits the ability to establish causal relationships between the identified factors and mortality, as it only captures data at a single point in time. Second, the study was conducted in a single referral hospital in Addis Ababa, which may limit the generalizability of the findings to other settings, particularly rural areas or regions with different healthcare resources. Third, the retrospective nature of data collection may introduce biases related to incomplete or inaccurate documentation in medical records. Finally, the sample size was relatively small, which may limit the statistical power to detect significant associations for some variables.

8. Conclusion and recommendations

This study found that more than one in ten (16.4%) AKI patients requiring dialysis died during hospitalization, with most deaths occurring within the first 15 days. The findings underscore the role of modifiable risk factors in driving mortality, highlighting the importance of early diagnosis, timely intervention, and enhanced clinical care to improve outcomes in this vulnerable population.

To improve outcomes for AKI patients requiring dialysis, early diagnosis and timely initiation of dialysis should be prioritized, as most deaths occur within the first 15 days of hospitalization. Implementing protocols for early AKI recognition and intervention can help prevent disease progression. Effective management of septic shock is crucial, given its strong association with mortality, and should include prompt administration of antibiotics and aggressive hemodynamic support. Ensuring adequate dialysis sessions, particularly in the early stages, is essential, as receiving fewer than five sessions was linked to higher mortality. Strengthening critical care services, including access to mechanical ventilation and vasopressors, can improve survival for

critically ill patients with low GCS scores. Additionally, training healthcare providers on AKI management, early warning signs, and clinical assessment tools can enhance decision-making and patient care, ultimately reducing mortality in this high-risk population.

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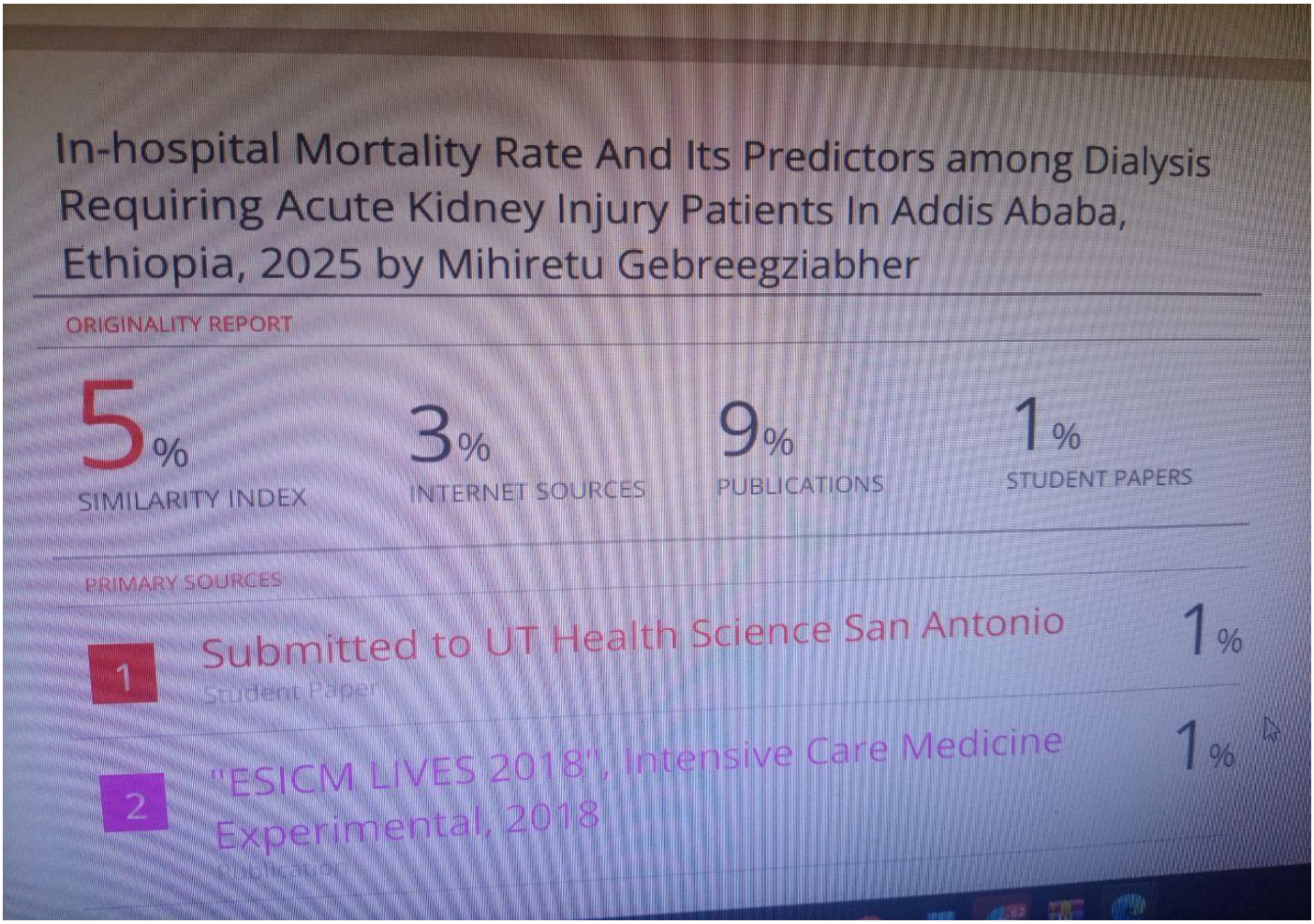

Checklist

Date: (DD/MM/YYYY) _____/_____/_____.

Section 1: Sociodemographic factors. Put a ✓ on the choice that applies.

1.1 Sex: Male ☐ Female ☐

1.2 Age (In years): _____

1.3 Region Addis Ababa ☐

SNNPR ☐
Oromia ☐
Amhara ☐
Afar ☐
Gambella ☐
Tigray ☐
Somali ☐
Harari ☐

1.4 Place of residence: Urban ☐ Rural ☐

1.5 Insurance status : CBHI ☐ Uninsured ☐

Section 2: Assessing independent variables. Put a ✓ on the choice that applies and fill the boxes with appropriate data (more *than one choice is possible*)

2.1 Settings of AKI diagnosis Community-acquired -----

Hospital-acquired-----

2.2 Clinical Settings: Medical-- ☐ Obstetric ☐

Surgical --- ☐ ICU ☐

Emergency ☐

2.2.1.Cause of AKI-------

2.2.1.2 Proximate cause of AKI 1. Hypovolemia 2.Sepsis 3.AGN 4.Malaria

5. Obstructive uropathy 6.Nephrotoxic drugs 7.TLS

8. Trauma 9. Pregnancy-related causes 10. Surgery

11. other please specify

Presenting symptoms/signs: 1)Pulmonary edema 2).oliguria/anuria 3. change in mentation

4. seizure 5. edematous 6. febrile 7. other specify--

2.3.Laboratory Parameters Before initiation of dialysis

1. Creatinine ----- 2.BUN---

3).Sodium------ 4)potassium----- 5)Albumin----- 6)WBC----- 7) Hgb-----

8)platelet----- 9)Proteinuria as measured by 24 hr urine protein or qualitative-----

2.4 severity of illness as measured by GCS _____.

2.5: Comorbid illness: 1. Hypertension ☐ 2.Diabetes ☐

3. Cardiac illness 4. CKD ☐

Other specify–----------

2.6 use of nephrotoxic medications 1. yes 2. No

2.7.Urine output Before initiation of hemodialysis in ml -----

3. Dialysis information

3.1. Indication for dialysis 1. refractory fluid overload 2. uremic symptoms/signs

3.refractory hyperkalemia 4.clinical metabolic acidosis

5.ABG metabolic acidosis 6.other specify ----

3.1 .2 Number of dialysis sessions during hospital stay ☐

3.2 .Intradialytic hypotension 1. yes 2. No

3.3 . Intradialytic arrhythmia 1. yes 2.No

3.4 . Intradialytic Bleeding 1. yes 2.No

3.5 . Dialysis vascular access thrombosis 1. Yes, 2. No

3.6 . Dialysis discontinuation for hemodynamic instability 1. Yes, 2. No

3.7 . Dialysis catheter-related infection 1. Yes 2.No

Section 4: complications during Hospitalizations and Interventions and Outcome Put a ✓ on the choice that applies.

4.1 septic shock: 1. yes 2.No

4.2 Need for mechanical ventilation: 1. Yes 2. No

4.3 Need for vasopressor therapy: 1. yes 2.No

4.4 ICU admission 1. yes 2. NO: if yes length of ICU stay-----

4.5 total length of hospital stay –---------

4.6. Renal outcome a) resolving or resolved AKI b) indeterminate course

c) dialysis dependent

4.7.Patient outcome 1. Discahrged

2. Went against medical advice

3. Inhospital mortality a) yes b) No

if yes cause of death a).refractory septic shock b) respiratory failure c) cardiogenic shock d) multi-organ failure d) PE

e) other specify