



CLINICAL PATTERN AND OUTCOME OF PATIENTS WITH ACUTE KIDNEY INJURY IN ADULT EMERGENCY DEPARTMENT OF SAINT PAUL'S HOSPITAL MILLENNIUM MEDICAL COLLEGE: A ONE YEAR CROSS-SECTIONAL STUDY

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A thesis to be submitted to the department of Emergency Medicine and Critical Care as partial fulfillment of requirements for specialty in Emergency Medicine and Critical Care.

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Pattern and Outcome of Patients with Acute Kidney Injury in the Adult
Emergency Department of Saint Paul's Hospital Millennium Medical College,
Addis Ababa, a one-year cross-sectional study

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Acronyms

AKI	Acute kidney injury
AKIN	Acute kidney injury network
AGN	Acute glomerulonephritis
AOR	Adjusted odd ratio
BPH	Benign prostatic hyperplasia
CKD	Chronic kidney disease
CI	Confidence interval
COR	Crude odd ratio
DM	Diabetic mellitus
ED	Emergency department
EMCC	Emergency Medicine and Critical Care
GC	Gregorian Calendar
GCS	Glasgow coma scale
HIV	Human immunodeficiency virus
HTN	Hypertension
ICU	Intensive care unit
KDIGO	Kidney disease improving global outcome
MD	Medical doctor
MPH	Master of public health
OR	Odd ratio
OUP	Obstructive uropathy
SNNPR	Southern Nations Nationalities and Peoples' Region
SPHMMC	Saint Paul's Hospital Millennium Medical College
SCR	Serum creatinine

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ABSTRACT

Background: Worldwide, 13.3 million people experience AKI each year. 85% of individuals impacted are thought to reside in underdeveloped nations. AKI continues to be one of the most widespread diseases in the world, although little is known about its clinical profile or outcome. The ability to pinpoint particular causes enables the implementation of targeted therapy and the development of preventative measures.

Objective: The main goal of this study is to identify the patterns and outcomes of patients with acute renal injury in the adult emergency department at Saint Paul's Hospital Millennium medical institution.

Method and materials: A cross-sectional study was conducted at the adult emergency department of SPHMMC in Addis Ababa, Ethiopia, from June 1-2021 to May 30-2022. Google Forms was used to collect the data, which was then cleaned up in Microsoft Excel before being sent to SPSS version 25 for analysis. To evaluate demographic, clinical profile, and outcome determinants, descriptive statistics, and binary logistic regression analysis were utilized. A paired samples T-test was used to compare the patient's laboratory findings at admission and discharge.

Results: Among the 222 AKI patients included in the study 110 (49.5%) were males and 112 (50.5%) were females. The mean age of presentation was 48 ± 18 years old. The majority of patients were from Addis Ababa (41.4%) and the Oromia region (40.5%). The most common causes of AKI were infections (26.2%), acute glomerulonephritis (20.4%), volume depletion (18.5%), and obstructive uropathy (16.6%). Uremic encephalopathy, infection, malignancy, and low initial GCS significantly contributed to the death. The presence of nephrotoxic antibiotics, infection, and hyponatremia significantly contributed to the admission rate to the wards and ICU.

Conclusion

In conclusion, infection is the dominant cause and mortality predictor of AKI at SPHMMC. The majority of patients with infections were sepsis (78.1%), pyelonephritis (11.4%), and pneumonia (10.3%). Early initiation of antibiotics in the emergency is better for a good outcome.

Keywords; Acute kidney injury, pattern, outcome

1. INTRODUCTION

1.1 Background

Acute kidney injury is defined as a decline in renal function over hours or days resulting in the accumulation of toxic wastes and the loss of internal homeostasis(1). AKI is defined according to the KDIGO 2012 criteria as an increase in serum creatinine (Scr) by ≥ 0.3 mg/dl within 48 hours, or an increase in Scr to ≥ 1.5 times baseline within the prior 7 days, and urine volume < 0.5 mL/kg/h for 6 hours(1). The baseline serum creatinine used for hospital-acquired AKI is the first documented serum creatinine on admission. For community-acquired AKI, a Prehospital record of creatinine within seven days to three months of hospital admission, whichever is available, or the minimum and/or most recent value of admission serum creatinine is used as baseline(2). The AKIN proposed in 2007, AKI is a decline in kidney function during 48 h as demonstrated by an increase in serum creatinine of more than 0.3 mg/dl, an increase in serum creatinine of more than 50 %, or the development of oliguria(3-7).

AKI affects approximately 13.3 million individuals globally per year. An estimated 85% of those affected live in the developing world. AKI is thought to contribute to about 1.7 million deaths every year(8, 9). Acute kidney injury (AKI) is a challenging problem in Africa because of the high burden of infectious diseases, the late presentation of patients to healthcare facilities, and the lack of resources to support patients with established AKI(10, 11). The clinical importance of AKI is exemplified by data showing a consistent association with increased long-term risk of poor outcomes, including death, incident chronic kidney disease (CKD), and greater utilization of health resources(12). AKI is a common complication of critical illness, with some research showing that as high as 1 in 5 adults experience AKI per hospital admission. The clinical and public health importance of AKI is well established due to its association with high mortality and its separate independent effect on the risk of death and resource use(12).

The International Society of Nephrology conducted a "Global Snapshot" about AKI in 2014, where most cases (45%) were from low and lower-middle-income countries(13). However, these data may be incomplete, since many of the low-income nations lack the resources to maintain national disease registries, and it is challenging to accurately report cases of AKI outside of major health centers (13). The incidence of AKI in Low-income countries is not completely

understood the proposed reasons being a late presentation of patients to tertiary centers, underreporting, and a reduced capacity to provide intensive care to severely ill patients(13)

1.2 statement of the problem

Despite improvements in the definition of AKI and chances for prevention, renal replacement treatment, and supportive measures, in-hospital death rates are still high. The disease and its long-term effects are still not widely known. AKI is a heavy burden, especially in poor societies with few resources for the care of these patients once the disease progresses to end-stage kidney failure(14). The majority of information on acute kidney injury comes from high-income countries; its effects in low- to moderate-income nations are mostly unclear. Acute renal injury or end-stage renal disease develops when AKI is not detected early. Patients with confirmed AKI are treated inappropriately and the treatment itself is costly in resource-limited settings especially; if progressed to ESRD(15).

AKI typically affects younger, previously healthy persons and is a community-acquired disease in developing countries. Animal venoms (snakes, bees, *Liposcelis* spiders, *Lonomia* caterpillars), septic abortion, diarrheal disorders with dehydration, infectious diseases (malaria, dengue, yellow fever, leptospirosis, tetanus, and human immunodeficiency virus) are some of the particular causes of AKI in this community (8). The majority of these causes of AKI are linked to poverty and have an impact on vulnerable groups due to poor sanitation and water hygiene (diarrheal diseases), a lack of education and access to adequate urban infrastructure, difficulty accessing the healthcare system (septic abortions, snakebite, natural medicines, tetanus)(8).

Ageing, infections, especially sepsis, comorbidities including diabetes and heart failure, higher severity of disease scores and baseline creatinine upon admission, the use of nephrotoxic medications and vasopressors, high-risk operations, and infections like sepsis all enhance the risk of AKI in critically sick patients. Patients are typically younger in low-resource settings, where risk factors include common infections, sepsis, diarrheal diseases, herbal intoxication, and toxins, whereas instances are typically older in high-resource settings, where they entail chronic illnesses and end-organ failures(8). Public health initiatives are necessary to reduce the incidence and complications of AKI, which is frequently brought on in low-resource settings by environmental factors including contaminated water and endemic diseases. (8). To decrease the

prevalence and complications of AKI, which are typically exacerbated in low-resource settings by environmental factors including contaminated water and endemic infections, public health interventions are required(8, 14).

1.3 significance of the study

AKI is one of the most important issues in Africa, particularly in Ethiopia, where there is a large resource limitation at large, and an appreciation of its local pattern can help inform policies on its early prevention and management. Though SPHMMC is the sole kidney transplant center in the country, there is no published objective evidence of the burden and clinical profile of AKI. Therefore, this study is intended to add to the body of knowledge regarding the pattern and outcome of acute kidney injury patients presenting to SPHMMC adult emergency. The ministry of health, the hospital community, healthcare providers, and other stakeholders will gain valuable insight from the study's findings, for refocusing their policies and strategies on reducing the burden of acute kidney injury through better prevention, improved access to care, and promotion of further clinical research to improve treatment standards. Furthermore, it is anticipated that the findings will clarify potential next steps for quality improvement initiatives and the integration of emergency care with conventional management best practices. Additionally, it can highlight the requirement for cutting-edge, fully-stocked emergency care facilities. Finally, it will serve as a baseline source and a place to start for allocating resources and managing risk factors.

2. LITERATURE REVIEW

2.1 Incidence and pattern of AKI

There is insufficiency of all-inclusive metanalysis of the burden of AKI globally. The incidence of AKI is 21% according to a global meta-analysis conducted from 2002 to 2012. Only one study from sub-Saharan Africa was included out of 154 articles. In contrast to most community-acquired AKI in African nations, the majority of research included patients with hospital-acquired AKI. AKI mortality was lower in nations with high health expenditures, which is indicative of better access to healthcare. A summary of the incidence and outcome of AKI from 62 countries was done in the update of this analysis but was later excluded due to insufficient data. Consequently, this worldwide analysis' generalizability to sub-Saharan countries is still limited(16). Data are required to persuade health policymakers to maintain the availability of dialysis in sub-Saharan nations. Adult research demonstrated the majority of presenting patients had community-acquired AKI. According to a systemic analysis pooling patients with AKI including 1407 adults. The study's adult participants ranged in age from 28 to 44 on average. Significant male dominance, representing 57% of the total proportion, was present. In 56% of individuals, AKI was attributable to intrinsic renal injury. About 30% of AKI was caused by infections, including malaria. (17). The classification of AKI includes pre-renal AKI, acute post-renal obstructive nephropathy, and intrinsic acute kidney injuries. Extra-renal diseases that lower the glomerular filtration rate are the cause of pre-renal and post-renal AKI. Real renal injury is only indicated by "intrinsic" AKI (GFR). These pre-and/or post-renal conditions will eventually lead to renal cellular damage and, as a result, intrinsic renal injury if they persist. In metropolitan areas of developing countries, renal ischemia, sepsis, and nephrotoxic drugs are the main hospital-acquired causes of AKI, while community-acquired infections are usually the cause of it in rural areas (diarrhea, dehydration, infectious diseases, animal venoms, etc (18).

Multiple studies have shown that AKI in the elderly (usually defined as older than 65 years) is increasingly common and that there is an age-dependent relationship between AKI and older age. This has been attributed in part to anatomic and physiologic changes in the aging kidney and in part to various comorbidities - i.e., hypertension, cardiovascular disease, chronic kidney disease (CKD) - that may require procedures and/or medications that act as kidney stressors and alter renal hemodynamics or are nephrotoxic. There is a serious problem with the under-reporting of

the condition, especially in developing countries, which makes it difficult to fully comprehend the impact of AKI in different parts of the world. The occurrence of AKI is rising in wealthy nations. Up to 15% of hospital inpatients and up to 60% of critically ill patients are expected to encounter it. However, although community acquired AKI is often uncommon. A recent study indicated that it accounts for 4.3% of all hospital admissions. Despite this, the true impact of community-acquired AKI is still underreported since patients aren't being admitted to hospitals. (18).

387 patients participated in a cross-sectional study done in Uganda in 2015; of them, 55.6% were men, the mean age was 37 years old, and the prevalence of sepsis-related AKI was 16.3%. 3.1% of patients had been exposed to herbal medicines in the previous 24 hours. The comorbidity that was discovered to be most frequently present (61%) was HIV. AKI was associated with patients' low urine output (0.6-0.2 ml/kg/hour) and high WBC count (>12000)(12).

A prospective cohort study conducted in 2018 over 6 months in a hospital in Tanzania revealed that 5.3% of the 14,487 patients there had AKI. 18.8% of all renal patients required dialysis because they had AKI. 75% of the patients were men, and the mean age was 49. Shortness of breath and decreased urine output were the two main complaints (45.9% and 39.7%, respectively). The most frequent complication were pulmonary edema (37%), uremic encephalopathy (45%), and hyperkalemia (53%). 61 (42% of the patients) had dialysis while they were all hospitalized.(19).

In a prospective study of an ICU setting in South Africa in 2017, the mean age was 42.5 years. Comorbidities included diabetes (13.3%), CKD (7.8%), HIV (32.6%), hypertension (30.5%), and active TB (6.2%). Trauma (26% of admissions) was the most frequent cause. In 497 cases (58.5%), AKI manifested. AKI was independently correlated with male gender, illness severity, length of stay, use of vasopressor medications, and sepsis(20).

In Sudan, a retrospective cohort research looked at 6769 patients' medical files. AKI was discovered in 384 patients (5.7%), and 82.6% of these cases were acquired in the community. In 44%, 38.5%, 8.9%, 5.7%, 4.7%, and 3.1% of patients, respectively, sepsis, volume depletion, obstructive uropathy, heart failure, acute glomerulonephritis, and severe malaria were shown to be the most frequent causes of AKI(21).

Another study that was carried out in SPHMMC involved a cross-sectional study in a dialysis facility. 151 cases of AKI requiring dialysis were included in the study. Since the patients' mean age was 36.7 years, they were generally younger and had fewer premorbid conditions. Acute glomerulonephritis (AGN), hypovolemia, and pregnancy-related factors were the most typical causes of AKI (22.5%, 21.9%, and 18.5%, respectively). AKI claimed the lives of almost one-third (29.1%) of patients. The most common factors leading to AKI needing dialysis included infections, AGN, obstetric reasons, and nephrotoxins. The majority of these causes can be avoided by implementing straightforward interventions like health education on oral rehydration, high-quality prenatal and emergency obstetric care, appropriate infection management, and taking the necessary precautions when prescribing potentially harmful medications (22).

203 patients from the adult ward of the JIMMA hospital participated in a prospective observational study over five months. Among them, 58 (28.6%) were older than 60 and 121 (59.6%) were men. Glomerulonephritis 51 (25.11%), hypovolemia 99 (48.77%), and sepsis 32 (15.79%) were the most frequent causes of AKI(23).

Socio-demographic data from a prospective cross-sectional study in a tertiary hospital in Ethiopia reveals that from August 2018 to May 2019, 144 patients were diagnosed with AKI, 79 (54.9%) of whom were male, while the remaining patients were female. The patients' mean age was 46.6 ± 16.6 years, and between 30 and 50 years old, around 40% of the patients were detected. Although the patients came from all around Ethiopia, over half of them (49.3%) originated in Addis Ababa, and more than a quarter of them (27.8%) originated in Oromia(24). Clinically, the commonest cause of AKI identified was sepsis (43.8%), 39(27.1%) of the patients were found to have preexisting CKD. The main underlying cause of CKD was extra-renal OUP which included 1/4 of the cases (25.6%) followed by hypertension (23.1%) and diabetes (20.5%)(24).

2.2 outcome of AKI

Various studies have revealed that AKI is linked to both short- and long-term unfavorable effects. These have recently undergone review. Ricci et al. showed that in a comprehensive evaluation of 24 studies with more than 71000 patients where the RIFLE criteria were applied for AKI definition and staging that the mortality rate was 18.9% in the "risk" class, 36.1% in the "injury" class, and 46.5% in the "failure" class. Patients without AKI had a 6.9% death rate. The relative risk for death among AKI patients (compared to non-AKI patients) was 2.4 for the "risk" class, 4.15 for the "injury" class, and 6.15 for the "failure class". In intensive care unit (ICU) populations, observational studies have shown that 4-5% of all critically ill patients develop severe AKI requiring renal replacement therapy (RRT) with the mortality rate often exceeding 60%(18).

AKI mortality was discovered in a global meta-analysis of 17 adults and 21 pediatric studies. The overall mortality rate was 32%, with 346 fatalities occurring out of 1077 individuals. 1842 children had 1827 deaths, a 34% total mortality rate. The overall mortality rate for both adults and children reduced significantly over time, even though the death rates in each trial varied widely. (p 00001)(17).

Recent hospital studies in the developed world estimate that AKI occurs in 3.2–9.6% of admissions, with an in-hospital death rate of about 20% and as high as 50% in patients receiving intensive care. With an adjusted mortality risk of 1.4 and an increase with increasing AKI severity, there is also a higher long-term death rate in patients with AKI who survive hospitalization. 5-6% of ICU patients develop AKI necessitating renal replacement treatment, with a 60% extremely high in-hospital mortality risk. An estimated 2 million people per year pass away from AKI, according to estimates. AKI survivors are more likely to go on to develop CKD in the future. (25).

AKI was linked to a higher in-hospital death rate of 31.8% in retrospective research conducted in South Africa in the ICU setting as opposed to 7.23% in individuals without AKI. There was a higher adjusted odds ratio for death in people who had active tuberculosis, mechanical

ventilation, vasopressor support, sepsis, and any other of these conditions. AKI or inpatient mortality was not independently related to HIV. None of the 14 patients with stage 3 AKI who developed CKD (12.7%) were dependent on dialysis. (20).

In Tan Tanzania Hospital, 6 months of retrospective analysis was performed. 775 (5.3%) of the 14,487 patients who visited the ED throughout the research period had the renal condition. AKI comprised 146/775 (18.8%) people who required urgent dialysis due to symptoms of severe renal injury. 61 patients (42%) had dialysis, whereas 85 patients (58%) received conservative care. 53% of non-dialyzed patients and 20% of dialyzed patients died overall, for a mortality rate of 39% (57). For women, the mortality risk was smaller (OR = 0.13). The independent predictor of dialysis was health insurance. Dialysis rates for those with health insurance were 54% compared to 39% for those who paid out of pocket (OR = 0.3)(26).

In a cross-sectional study conducted in Uganda, 217 (55.6%) of the 387 patients enrolled were men, with a mean age of 37 years (range 18–90 years). Patients with AKI had an in-hospital mortality of 21% (13/63). Of the patients who were alive at discharge or who were hospitalized in the wards after two weeks, 59% (20/49) had ongoing kidney injuries. The persistence of renal injury was substantially correlated with Acute Kidney Injury Network (AKIN) Stage 3 ($p < 0.001$). Due to a lack of access, none of the patients who needed dialysis or ICU care received either (12).

A retrospective cohort study in Sudan examined the medical records of 6769 patients. Complete renal recovery was reported after treatment in 35.7% of patients, whereas 31.2% of patients died. Age [OR 1.03, 95% CI (1.01-1.057); $P=0.003$], the presence of chronic liver disease [OR 2.877, 95% CI (1.5-5.5); $P=0.001$], sepsis [OR 2.51, 95% CI (1.912-4.493); $P=0.002$], and the severity of AKI [OR 3.873, 95% CI (1.498-10.013); $P=0.005$] were all predictors of an increased risk of mortality (21).

A prospective cross-sectional study carried out in a tertiary hospital in Ethiopia found that extrarenal obstructive uropathy, which is primarily caused by cervical cancer (38.5%), accounts for the bulk of mortality in AKI on CKD patients. In individuals with AKI, complications affected 52.8% of the patients. Anemia (40.8%), uremic encephalopathy (42.1%), and hyperkalemia (28.1%) ranked first, second and third, respectively, in terms of frequency of complications (24). 82.6% of the patients were given medications to treat one of the several

causes of AKI, such as cardiac, septic ATN, hypertension, or AGN. However, fluid treatment for AKI was administered to around half of the patients. 18 patients (12.5%) underwent dialysis. The three most common complications were refractory fluid overload (22.2%), hyperkalemia (27.8%), and uremic encephalopathy (72.2%). The majority of the remaining patients underwent surgery, the most common procedure was percutaneous nephrostomy. Cervical cancer is the most common cause of obstructive uropathy(24). The average length of hospital stay was 7.2 days, with minimum and maximum stays of 2 and 36 days, respectively. Sixty-one percent of the patients were discharged home. And roughly a third of the patients (30.6%) passed away. Two patients self-discharged against medical advice, while four patients were sent to other facilities because there weren't enough beds for them(24).

A total of 203 individuals were included over five months in prospective observational research from the adult ward patients at the JIMMA hospital. 12.8% of patients died in hospitals in general. In-hospital mortality was strongly correlated with stage 3 AKI (AHR = 9.61, 95% CI: 1.17-28.52, $p = 0.035$), duration of AKI (AHR = 7.04, 95% CI: 1.37-36.08, $p = 0.019$), length of hospital stays (AHR = 0.19, 95% CI: 0.05-0.73, $p = 0.012$), and hyperkalemia (AHR = 3.61, 95% CI A substantial increase in in-hospital mortality over five months was linked to acute renal injury. Patients would have benefited from early detection and treatment of these reversible causes, as the majority of AKI causes are avoidable. (23, 27)

3. OBJECTIVES

3.1 General objective

To assess the pattern and outcome of acute kidney injury patients in adult emergency of SPHMMC from June 1-2021 to June 1-2022 G.C

3.2 Specific objectives

- To determine clinical characteristics of AKI in the adult emergency department of SPHMMC from June 1-2021 to June -2022.
- To explore management practice for AKI patients in the adult emergency department of SPHMMC, Addis Ababa, Ethiopia from June 1-2021 to June 1-2022.
- To determine the clinical outcome of AKI in SPHMMC adult emergency from June 1-2021 to June 1- 2022.

4. METHODS and MATERIALS

4.1 Study area

This study was conducted at the adult emergency of SPHMMC, which is located in Addis Ababa the capital city of Ethiopia. The hospital was established in 1968 by the late Emperor Haile Selassie as Saint Paul's Hospital. It is a specialized teaching hospital located in the northwestern part of Addis Ababa, the capital of the country. Its catchment population is well over 7 million, making it one of the largest referral centers in the country. As a tertiary center, it receives patients from every corner of the country, most of whom come from the central areas of the country.

In 2010, the hospital was advanced to a medical school, through the decree of the national council of the ministries, and with this, it attained its current name: then got the name, Saint Paul's Hospital Millennium Medical College (SPHMMC). Being one of the leading tertiary and teaching hospitals in the country, SPHMMC has around 250 faculty members and more than 2800 clinical, academic, administrative & supportive staff. While its inpatient capacity is more than 700 beds, the hospital gives service to an average of 1200 emergency and outpatient clients daily. The hospital serves as a teaching institution for undergraduate and postgraduate medical students and is a research center(28).

The department of emergency and critical care is in charge of its adult emergency. Eight nephrologists work for the nephrology unit, which also offers fellowships. The first and only living-related kidney transplant program was established in September 2015 in collaboration with the University of Michigan(29). The ICU, the kidney transplant department, and the first floor of the maternity block all have areas for dialysis at the hospital.

4.2 Study design:

Hospital-based cross-sectional study over one year was conducted by reviewing the charts of patients admitted and diagnosed to have AKI in the adult emergency department of SPHMMC from June 1-2021 to May 30- 2022 G.C.

4.3 Study period & duration: data collection was carried out from August 1-2022 to September 1-2022 for patients who had been admitted to the adult emergency from June 1-2021 to May 30 - 2022.

4.4 Population

4.4.1 Source population: Records of all patients admitted to the adult emergency department of SPHMMC from Jun 1-2021 to May 30- 2022

4.4.2 Study population

After systemic random sampling was done for all patients with acute kidney injury admitted to the adult emergency department of SPHMMC **from June 1-2021 to May 30-2022. 222 patients** were included in this study. $504/222=2$, therefore $k=2$

4.5 sampling technique;

A systemic random sampling technique was employed to select 222 patients from the total of 504 AKI patients who were seen over a year. For this study, the medical records of sampled patients that fulfill the inclusion criteria and were admitted to the adult emergency department of SPHMMC from June 1-2021 to May 30 - 2022 were reviewed.

4.6 Eligibility criteria

4.6.1 Inclusion criteria: patients who were admitted to the adult emergency department of SPHMMC and diagnosed to have acute kidney injury from Jun 1-2021 to May 30-2022 were eligible and included in this study. Those who had baseline creatinine from referral or in the hospital are included.

4.6.2 Exclusion criteria:

 those patients with

- Incomplete records

- AKI on CKD

- multiple admissions during the study period and previously enrolled in the study were identified by chart review to avoid duplication of data.

4.7 Sample size determination and sampling procedure

4.7.1 Sample size determination

The following assumptions were considered in calculating the sample size. P value is taken as 0.3 (a mortality rate of AKI patients in a study done in the same city and the same setting) (24).

And 95% confidence interval was used, with a 5% margin of error tolerated; the sample size was determined by using single population proportion formula.

$$n = \frac{(Z_{\alpha/2})^2 p (1-p)}{d^2}$$

Where;

n- Required Sample

z- Standard normal value at 95% CI which is 1.96

p- Estimated population proportion which is 0.3 which is taken from a similar study in a similar setting and city.

d- Possible margin of error tolerated which is 0.05

$$n = \frac{(1.96)^2 0.3(1-0.3)}{(0.05)^2} = 322$$

Then, as the source population is less than 10,000 correction formula is used to compute the final sample size using the finite population correction formula;

$$nf = \frac{n}{1+(n-1)/N}$$

$$nf = \frac{322}{1+(322-1)/504} = 202$$

Hence, adding 10% of the calculated sample size for the contingency that might happen due to lost charts or incomplete reports, the final sample size became 222.

4.8 Study variable

4.8.1 Dependent variables

Outcome

- ✓ Death
- ✓ Admitted to wards, ICU, or
- ✓ Discharged improved

4.8.2 Independent variables

- ✓ Age
- ✓ Sex
- ✓ Etiology
- ✓ Precipitating factors

- ✓ Comorbidities (HTN, DM, BPH, pelvic tumors, cardiac disease)
- ✓ medications

4.9 Operational definition

Outcome: conditions of patients written on patients' chart at discharge time from emergency (admitted to ward or ICU, death, transferred to another hospital, discharged home).

Admission: is transferring of a patient from ED to the ward or ICU

Disease Pattern: a factor determining and influencing the frequency and distribution of disease, injury, and other health-related events and their cause in a defined human population at admission.

Acute kidney injury: is defined by KIDGO criteria 2012 as increase Cr by 0.3 mg/dl over 48 hours or increase by 1.5 time from baseline creatinine or urine output less than 0.5ml/kg/hour (30).

Adult- refers to individuals above the age group of 14, which is the cut of age for patients to be seen by an adult ED physician at SPHMMC.

4.10 Data Collection Procedures

Data was collected from all eligible acute kidney injury patients' charts using a structured checklist by google form. All sampled acute kidney injury patients' data were collected from the SPHMMC registration logbook, patients' charts, Health Management Information System (HMIS), referral papers, and death reports. Patient charts and referral papers were reviewed for the age of patients, sex, comorbid illness, medications history, clinical presentation, interventions provided in the hospital, the outcome of patients after the treatment, complications, length of stay, and for other necessary data using a structured checklist in the google form. The checklist was prepared from the articles in the literature review, and guidelines on AKI. The data collection tool was prepared in the English language by google form and was filled by well-oriented SPHMMC emergency residents and the principal investigator.

4.11 Data quality management

One week before data collection, a 10% pretested English version of a checklist was utilized to gather data; however, the checklist needed to be modified to incorporate a few factors. Before

starting the data-collecting procedure, the data collectors (emergency residents) received quick training on how to collect data. Close monitoring was kept throughout the data collection process, and the primary investigator and data collectors double-checked full checklists each day to ensure consistency and completeness before analysis.

4.12 Data processing and analysis

After being exported from Google Forms, the data were cleaned up and edited in Microsoft Excel. The IBM SPSS (Statistical Package for Social science) version 25 was then used for data entry, code clearance, and analysis. To look for missing values and variables, frequency and cross-tabulation were utilized. Using descriptive statistics like mean, percentage, frequency, and standard deviation, the demographic and clinical features of the patients were calculated. paired binary and t-test to identify relationships between independent and dependent variables, logistic regression was performed. Diagrams, tables, and figures are used to present the study's findings, as seen in the outcome section.

4.13 Ethical consideration

The St. Paul's Hospital Millennium Medical College Institutional Research Review Board in Addis Ababa provided ethical clearance and permission for this study. The Department of EMCC & Research Directorate sent a letter of authorization to the medical record unit requesting access to and examination of the patient charts. No names or other personal information was utilized in the data collection to ensure confidentiality.

4.14 Dissemination of results

The result of the study will be submitted to the Emergency and Critical Care Medicine department. it will be also reported to St. Paul's hospital millennium medical college, the result will also be presented to the medical/scientific community at different national and international meetings.

5. RESULTS

5.1 Demographic characteristics of patients

Of 222 AKI patients identified 110 (49.5%) were males and 112(50.5%) were female patients.

The mean age was of 48 ± 18 years old. Most of the patients 173 (77.9%) were in the age less than 65 years and old greater than 64 years consist of 49 patients (22.1%) followed by 35-44 years 44 (19.8%) and the least age category was less than 24 years. Most of patients were from Addis Ababa (n=92,41.4%) followed by Oromia region (n=90,40.5%). More than two third of (77.5%) patients were referred from government health facilities, whereas, 12.6% of patients were referred from private health facilities. The rest 9.9% of patents were self-referral (home). All the self-referred patients were from Addis Ababa and Oromia region.

Table. 1 demographic characteristic of AKI Patients in adult ED of SPHMMC June 2021-2022

Demographic characteristics	Sub-variables	frequency	percent
age groups	14-24	24	10.8
	25-34	29	13.1
	35-44	44	19.8
	45-54	39	17.6
	55-64	37	16.7
	>64	49	22.1
Address	Addis Ababa	92	41.4
	Amhara	16	7.2
	Oromia	90	40.5
	SNNPR	18	8.1
	Others	6	2.7
patient referred from	Self-referral (home)	22	9.9
	government health facility	172	77.5
	private health facility	28	12.6
SEX	Male	110	49.5
	Female	112	50.5

From the total 222 AKI patients presented to the adult emergency, the majority 141 (63.5%) were triaged to yellow-green, 60 (27.3%) were triaged to orange and 21 (9.46%) were triaged to red area of the emergency.

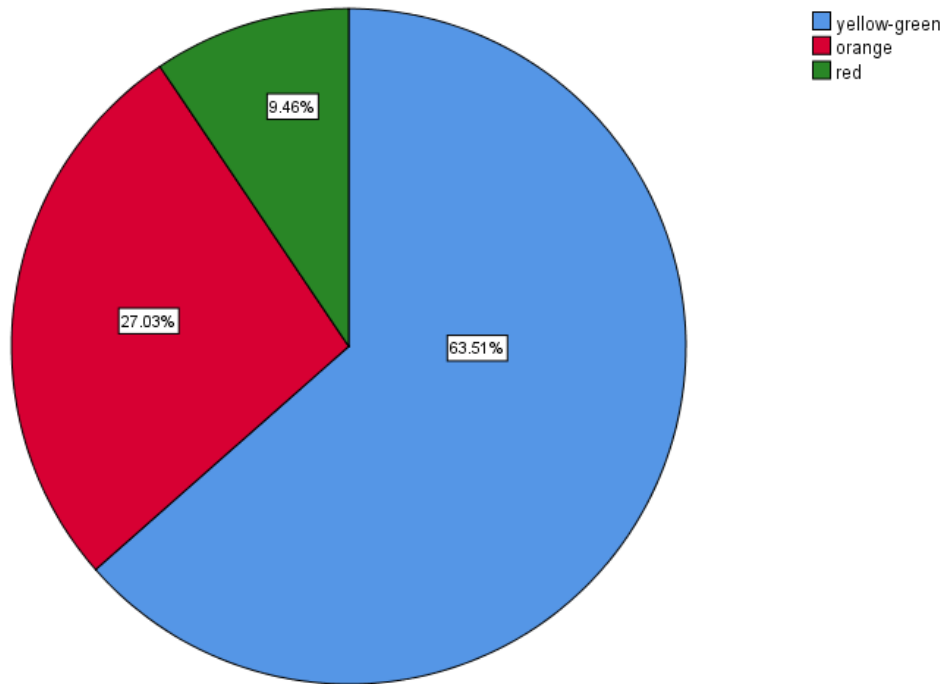


Figure 1: triage category of AKI Pts in adult ED of SPHMMC, June 1-2021-May-2022

Of all the patients presented with normal range blood pressure was 112(50.3%). And 26 patients (11.6%) and 72 patients (32.4%) were in the hypotensive and hypertensive range of blood

pressure respectively. Only 12 (5.3%) were presented with hypertensive crises. But it is hard to say whether hypertension is a manifestation of AKI or cause of AKI.

Out of all patients, more than three-fourths of patients presented with normal temperature, whereas 13.4% had a fever on presentation. Around 58.9% had RBS range of 140-180. And 24.7% of patients with AKI presented with RBS of greater than 180 mg/dl. Only 1.3% of patients had hypoglycemia on presentation to the emergency.

Table. 2 Distribution of vital signs of AKI Patients in adult ED of SPHMMC, June1-2021-2022

Vital Sign	Male N (%)	Female N (%)	Total %
BP			
<90/60	13 (5.8)	13 (5.8)	11.6
90/60-130/80	54 (24.3)	58 (26)	50.3
131/81-180/120	38 (17.1)	34 (15.3)	32.4
>180/120	5(2.2)	7 (3.1)	5.3
SPO2			
>90%	70 (31.5)	62 (27.9)	59.4
86-90%	3 (1.3)	10 (4.5)	5.8
<85%	37 (16)	40 (18)	34
PR			
<60bpm	4 (1.8)	0	1.8
60-100bpm	60 (27)	60 (27)	54
>100bpm	46 (20.7)	52 (23.4)	44
RR			
<12	1 (0.4)	1 (0.4)	0.8
12-22	72 (32.4)	60(27)	59.4
23-35	37 (16.6)	51 (22.9)	39.5
>35	0	1(0.4)	0.4
Temperature			
36.5-38	94 (42.3)	97 (43.6)	85.9
>38	15(6.7)	15(6.7)	13.4
RBS			
<70	3 (1.3)	0	1.3
70-140	18(8.1)	14(6.3)	14.4
141-180	64(28.8)	67(30.1)	58.9
>180	24(10.8)	31(13.9)	24.7

5.2 Comorbid conditions

The most common premorbid condition identified was hypertension (27.2 %), followed by malignancy (24.7 %) and DM (19 %). Heart failure and HIV account for 14% and 8.2% respectively.

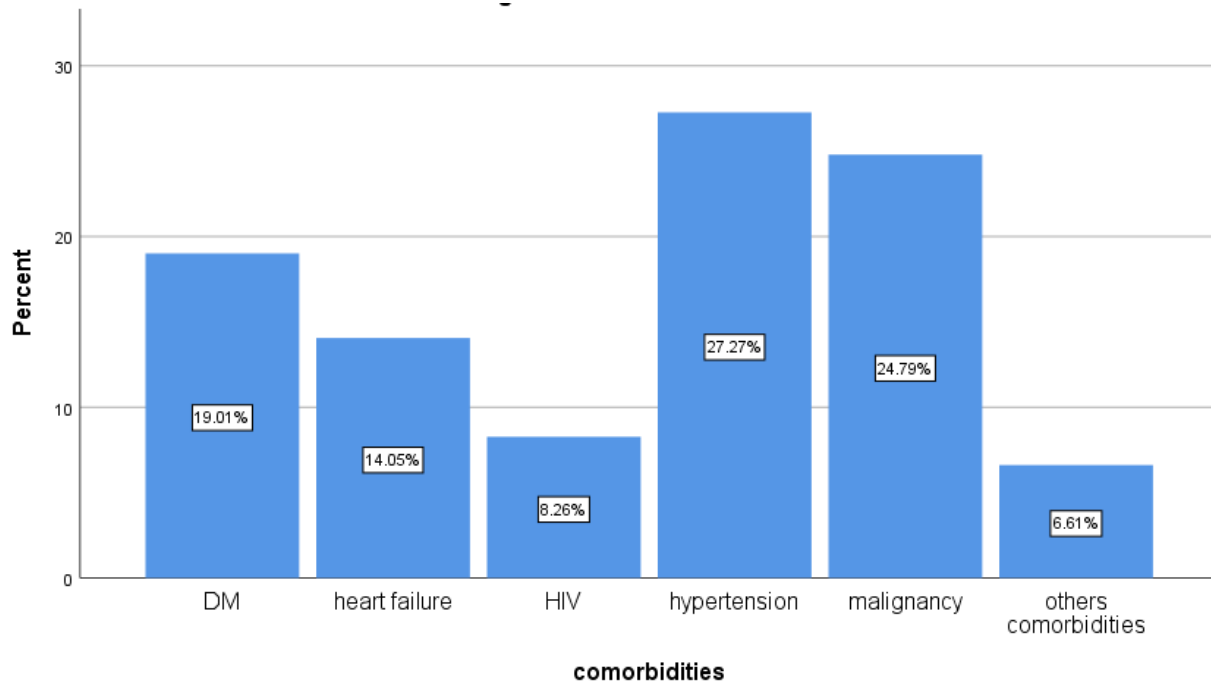


Figure 2: comorbidities of AKI Pts in adult ED of SPHMMC, June 1-2021-May-202

5.3 Causes and clinical presentation

The commonest causes of AKI were infection 71 (26.2 %), followed by acute glomerulonephritis 53 (20.4%), volume depletion due to vomiting, diarrheal) and other losses 34 (18.5%, cardiac disease 16 (7.34 %), and obstructive uropathy causes accounted 36 (16.5 %) patients. Acute glomerulonephritis was not a biopsy, but rather a clinical diagnosis with the sign and symptoms and urine analysis as documented by the treating physician. 81% of the patients were fully conscious (GCS=15/15) and 18% had moderately altered mental status (GCS of 9-14). The rest

0.9% of patients presented comatose (GCS= ≤ 8) at presentation to the emergency.

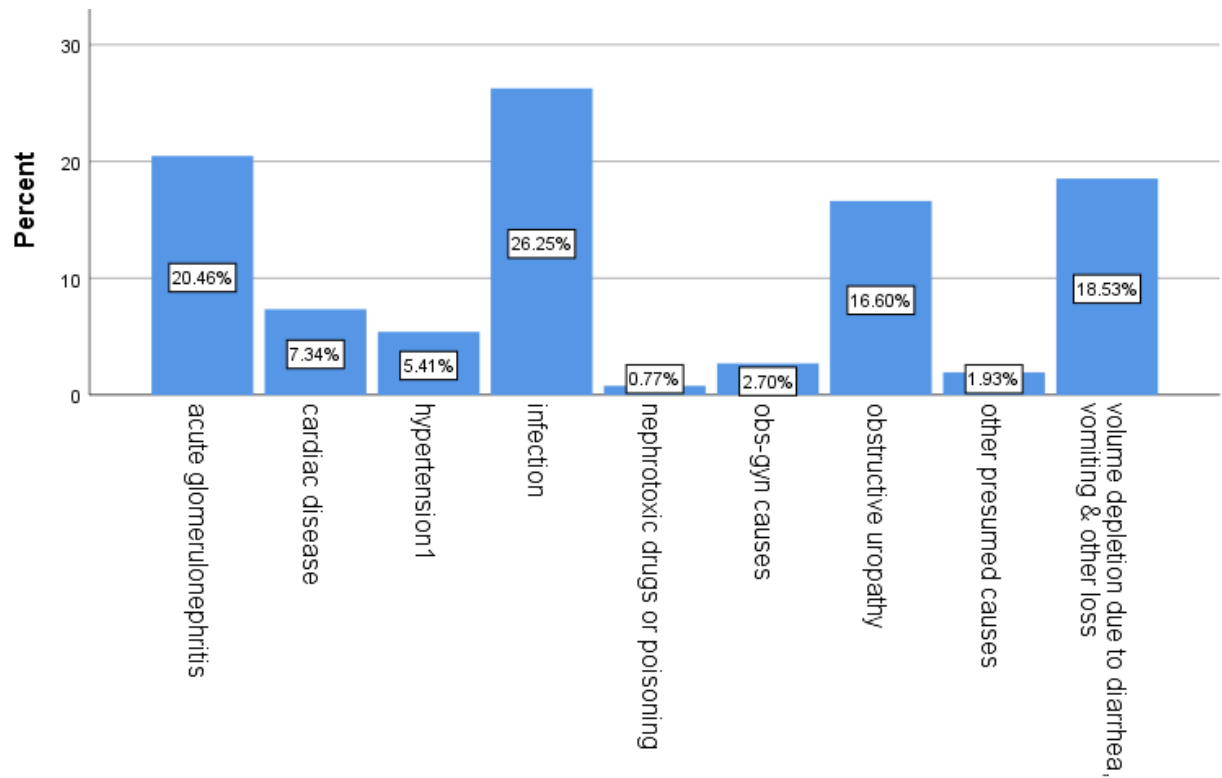


Figure 3: presumed causes of AKI Patients in adult ED of SPHMMC, June 1-2021-May 30-2022

The commonest presenting features were shortness of breath 46 (20.7 %), followed by body edema 44 (19.8 %), decreased urine output 43 (19.3 %), and 13.1 % of AKI patients presented with other main complaints.

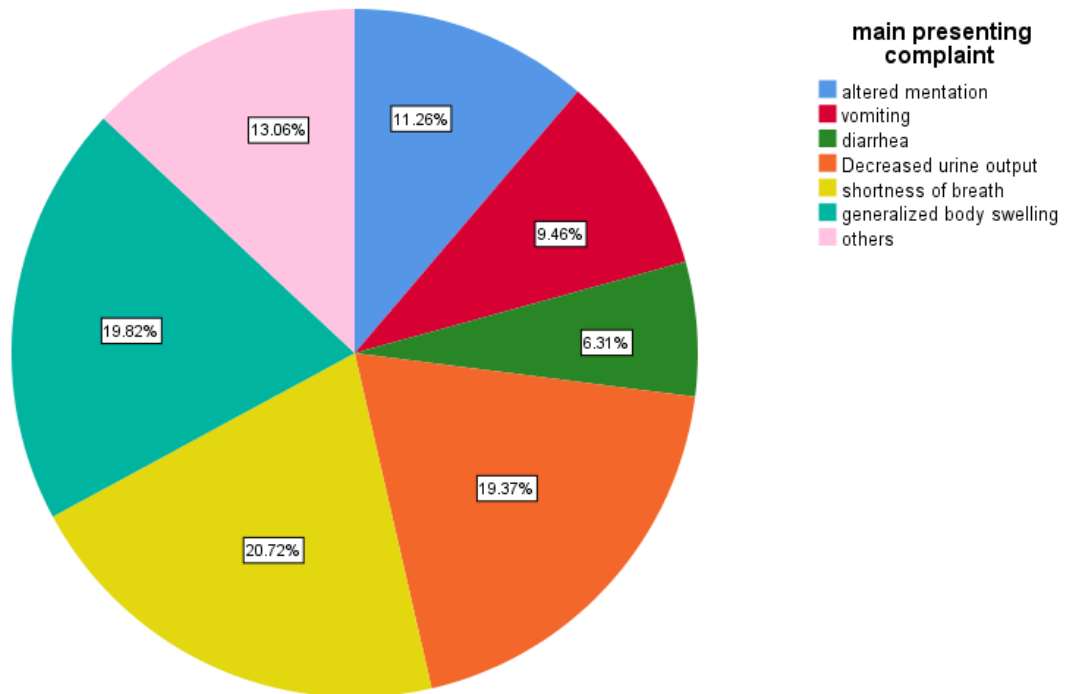


Figure 4: main presenting complaint of AKI Patients in adult ED of SPHMMC, June 1-2021-May 30-2022

The most common nephrotoxic drugs traced were antibiotics 28.4% (vancomycin and gentamycin) and diuretics (26.8%), NSAIDS (19.3%) followed by immunosuppressive drugs (17.8%).in this case, we took the nephrotoxic drugs as data was from chart review, we included drugs taken after diagnosis of AKI, because we considered as precipitating agents though some of them are part of therapy. Diuretics cause decrement of effective vascular volume. The immunosuppressive drug consists of most anti-cancer drugs like cisplatin.

Table. 3 List of nephrotoxic drugs AKI Patients in adult ED, SPHMMC, June1-2021-2022

Nephrotoxic drugs		N	Percent
nephrotoxic drugs	antibiotics	50	28.4%
	NSAIDS	34	19.3%
	diuretics	29	26.5%
	immunosuppressive drugs	49	17.8%
	ACEI	14	8.0%

The most common causes of obstructive uropathy are nephrolithiasis 37.7%, BPH accounting for 35.5%, and malignancy holding 26.6% of all obstructive causes.

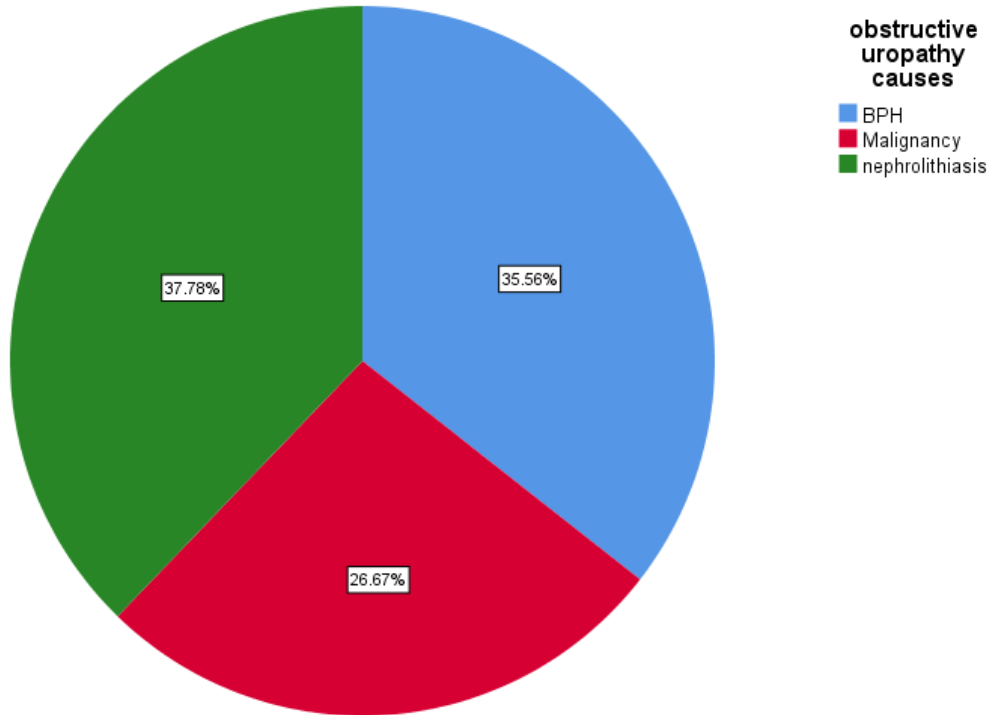


Figure 5: causes of obstructive AKI Patients in adult ED of SPHMMC, June 1-2021-May-2022

Regarding the focus of infection, sepsis accounts for 78.1% of all infection causes, pyelonephritis 11.4%, and pneumonia consist of 10.3%.

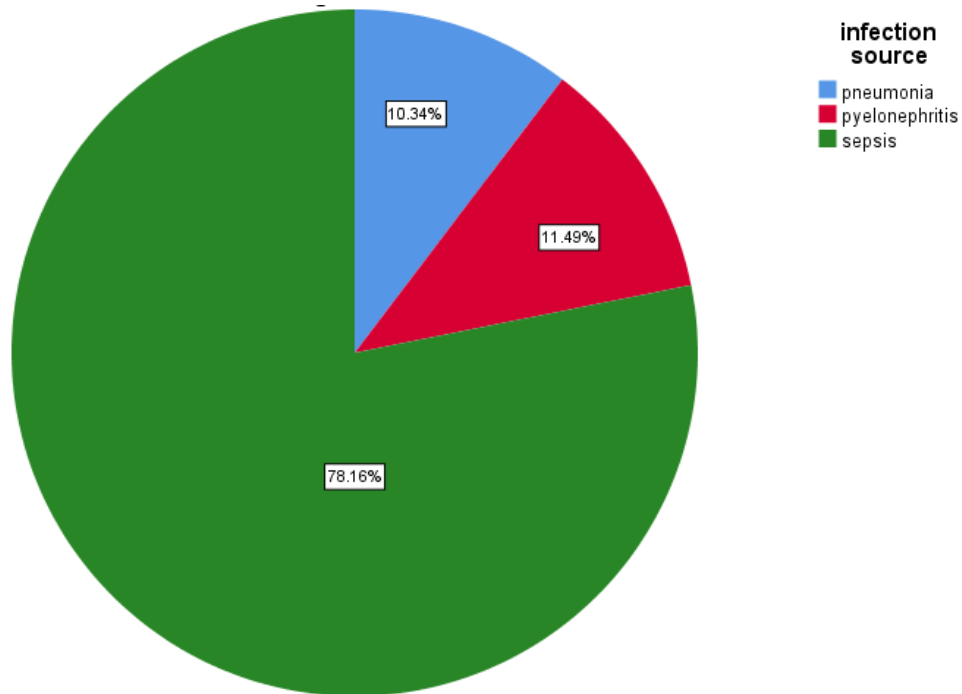


Figure 6: the focus of infection of AKI Patients in adult ED of SPHMMC, June 1-2021-May 30-2022

Most of the patients (81.3%) had a duration of complaint of two days to two weeks, and 13.6% had more than two weeks duration of complaint.

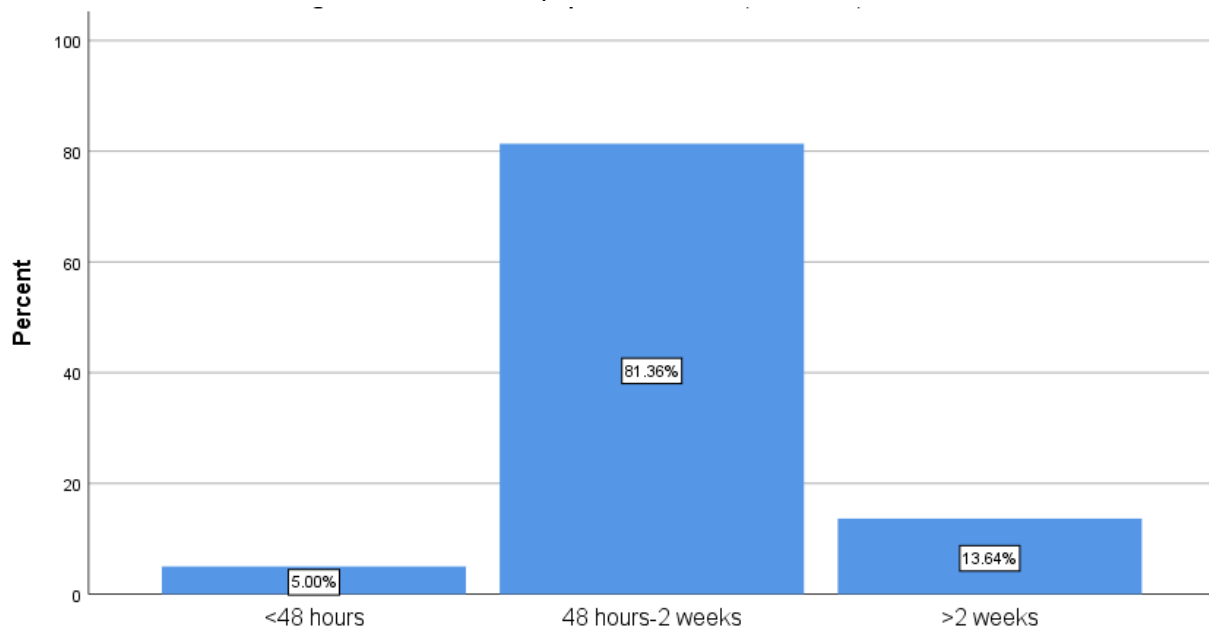


Figure 7: Duration of complaint of AKI Patients in adult ED of SPHMMC, June 1-2021-May-202

5.4 Investigation results

Out of 222 cases, one hundred thirty-seven (61.7%) had normal WBC on presentation to the emergency, seventy-five (33.8%) had leukocytosis, and ten (4.5%) had leukopenia.

One hundred twenty-six (56.6%) had normal range hemoglobin, and 43.4% of patients were anemic at presentation to the emergency. Thirty-one (16.2%) patients had mild anemia, forty-nine (22%) had moderate anemia and eleven (4.9%) had moderate anemia. A hundred twenty (47.7%) of patients had found was normal platelet count, 102 (65.8%) had thrombocytopenia, and fourteen (6.2%) had thrombocytosis. Out of 222 AKI patients, thirty-four (15.2%) patients had normal initial creatinine, one hundred eighty-eight (84.5%) patients had elevated initial creatinine, one hundred thirty-seven (61.7%) patients had normal range potassium, twenty-one (9.4%) had a result of consistent with hypokalemia and sixty-four (28.7%) had hyperkalemia. Hundred-four (46.8%) had normal range serum sodium, fifteen (6.8%) patients had a result consistent with hypernatremia, hundred-three (46.4%) patients presented with hyponatremia.

Table. 4 Initial Investigation of AKI patients in adult emergency of SPHMMC, June 1-2021-2022

Variable	Male	Female	Total
Hgb			
Mild anemia	14(6.3%)	22(9.9%)	31(16.2%)
Moderate anemia	21(9.4%)	28(12.6%)	49(22%)
Severe anemia	4(1.8%)	7(3.1%)	11(4.9 %)
Normal	71(31.9%)	55(24.7%)	126(56.6%)
WBC			
Leukocytosis	36(16.2%)	39(17.5%)	75(33.7%)
Leukopenia	4(1.8%)	6(2.7%)	10(4.5%)
Normal range	70(31.5%)	67(30.1%)	137(61.6%)
platelet			
normal platelet	48(21.6%)	58(26.1%)	120(47.7%)
thrombocytopenia	55(24.7%)	47(21.1%)	102(65.8%)
thrombocytosis	7(3.1%)	7(3.1%)	14(6.2%)
creatinine			
normal	17(7.6%)	17(7.6%)	34(15.2%)
elevated	93(41.8%)	95(42.7%)	188(84.5%)
K+			
Normal	68(30.6%)	69(31%)	137(61.7%)
hypokalemia	11(4.9%)	10(4.5%)	21(9.4%)
hyperkalemia	31(13.9%)	33(14.8)	64(28.7%)
Na+			
135-145	53(23.8%)	51(22.9%)	104(46.8%)
>145	7(3.1 %)	8(3.6%)	15(6.8%)
< 135	50(22.5%)	53(23.8%)	103 (46.4%

The patients had complete blood counts, selected electrolytes, and renal function tests during admission and upon discharge. Most of the patients (84.5%) presented to emergency with elevated creatinine. Only 15.2% of the AKI patients presented with normal creatinine and developed AKI in the hospital.

The mean white cell count is 12219.50 ± 10385.291 and 13689.46 ± 21444.763 on admission and discharge respectively. There is a good decrement of creatinine upon discharge from a mean of 4.54 ± 4.73 to 3.6 ± 3.81

Table. 5 laboratory values of AKI Patients in adult ED, SPHMMC, June 1-2021-2022

	Mean	Std. Deviation
initial WBC	12219.50	10385.291
discharge WBC	13689.46	21444.763
initial hemoglobin	11.87	2.880
discharge hemoglobin	11.462	2.6642
initial platelet	263936.94	123036.669
Discharge platelet	273783.33	153007.077
initial BUN	108.63	95.476
Discharge BUN	92.50	84.927
initial Cr	4.5456	4.73147
Discharge Cr	3.608	3.8136
initial K+	4.748	1.1873
discharge K+	4.458	.9375
initial Na+	134.50	8.953
discharge Na+	136.03	7.496

5.5 Treatment, duration of stay, and complications

From a total of 222 AKI patients in adult emergency, more than half of them (62.1%) were treated conservatively (drugs, fluids, urinary catheterization). Around 16% of patients were operated on for the underlying disease and in addition to the conservative management, 21.1% of patients were treated with dialysis. Most of the AKI patients (68.0%) stayed in ED for 1-5

days, 30.1% stayed more than 5 days & 1.8 % of the patients stayed less than a day. we accepted as limitation not mentioning maximum and minimum numerically, as our data was collected in interval form.

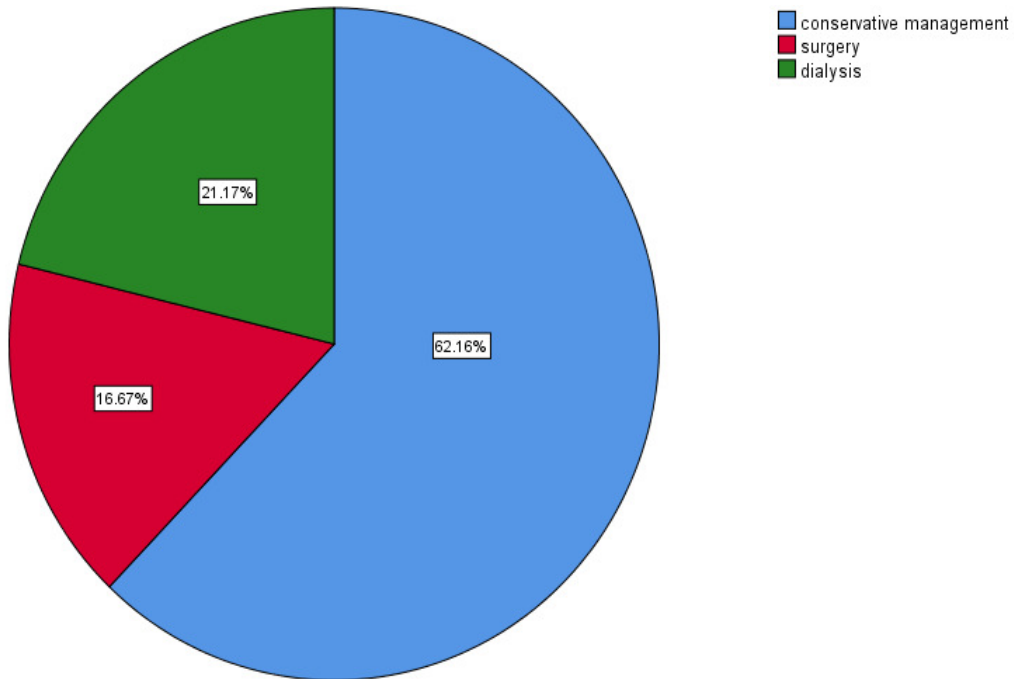


Figure 8. management modalities of AKI Patients in adult ED of SPHMMC, June 1-2021-May 30-2022

Out of 222 AKI patients seen in the emergency 52 (23.4%) patients had undergone hemodialysis. The identified indications for dialysis were refractory fluid overload (57.6%), uremic complications (30.7%), and refractory hyperkalemia (11.5%).

Table. 6 indications for dialysis in AKI Patients in adult ED, SPHMMC, June 1-2021-2022

indication for dialysis in AKI patients	Frequency	Percent
hyperkalemia	6	11.5
fluid overload	30	57.6
uremic complications	16	30.7

The most common complication identified in the ED was hyponatremia accounting for 32.5%, hyperkalemia at 22.7%, pulmonary edema at 18.7%, uremic gastropathy at 12.1% other complications at 7.4 %, and uremic encephalopathy 6.3 % respectively as showed in the following figure 7.

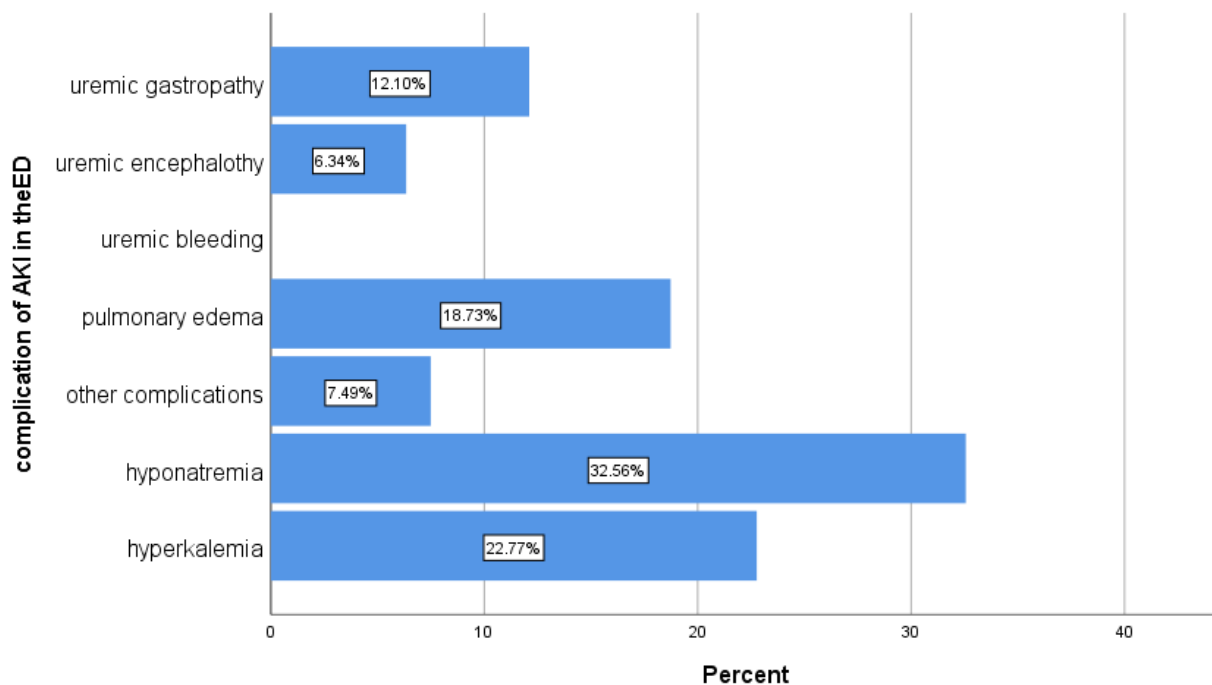


Figure 9 complication of AKI Patients in adult ED of SPHMMC, June 1-2021-May 30-2022

Of all two hundred twenty-two AKI patients seen in an adult emergency. Almost half of the patients (50.9%) were admitted to the ward or ICU, one-third (33.3%) were discharged home, twenty-two (9.9%) patients with AKI died in the emergency and (5.9%) were transferred to other hospitals. See summarized figure 10. below.

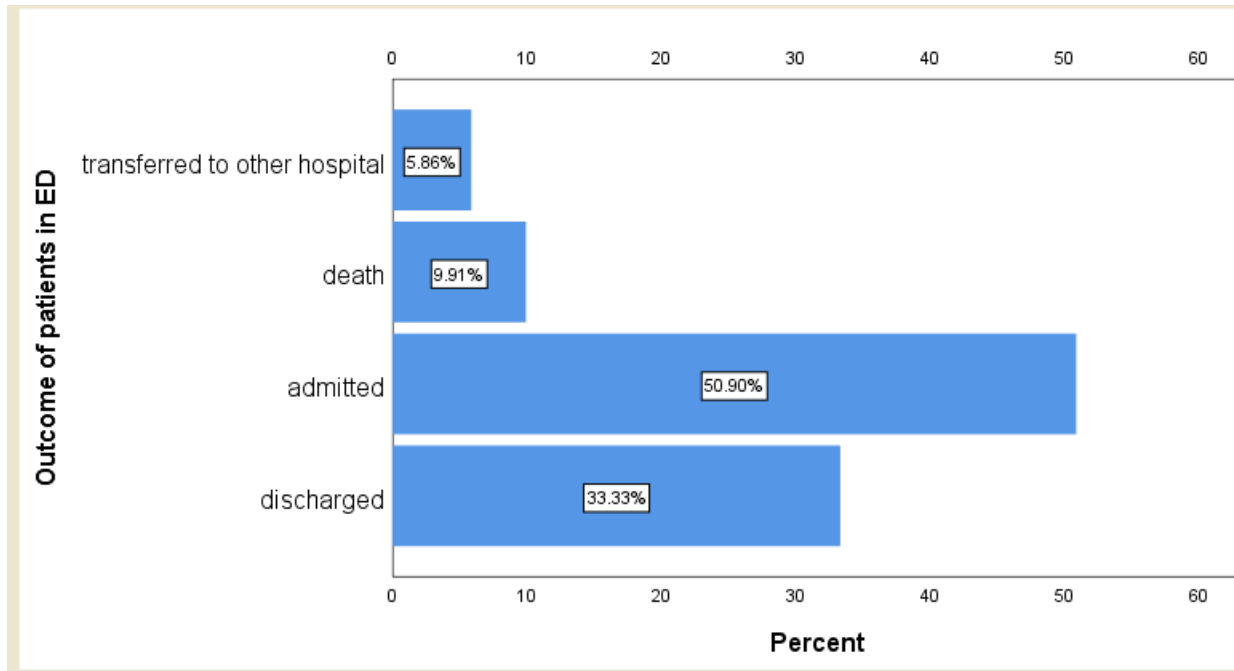


Figure 10: outcome of AKI Patients in adult ED of SPHMMC, June 1-2021- May 30-2022

The most common immediate cause of death is refractory septic shock (72.7%), hypoxia (22.7%), and massive Pulmonary embolism (4.5%).

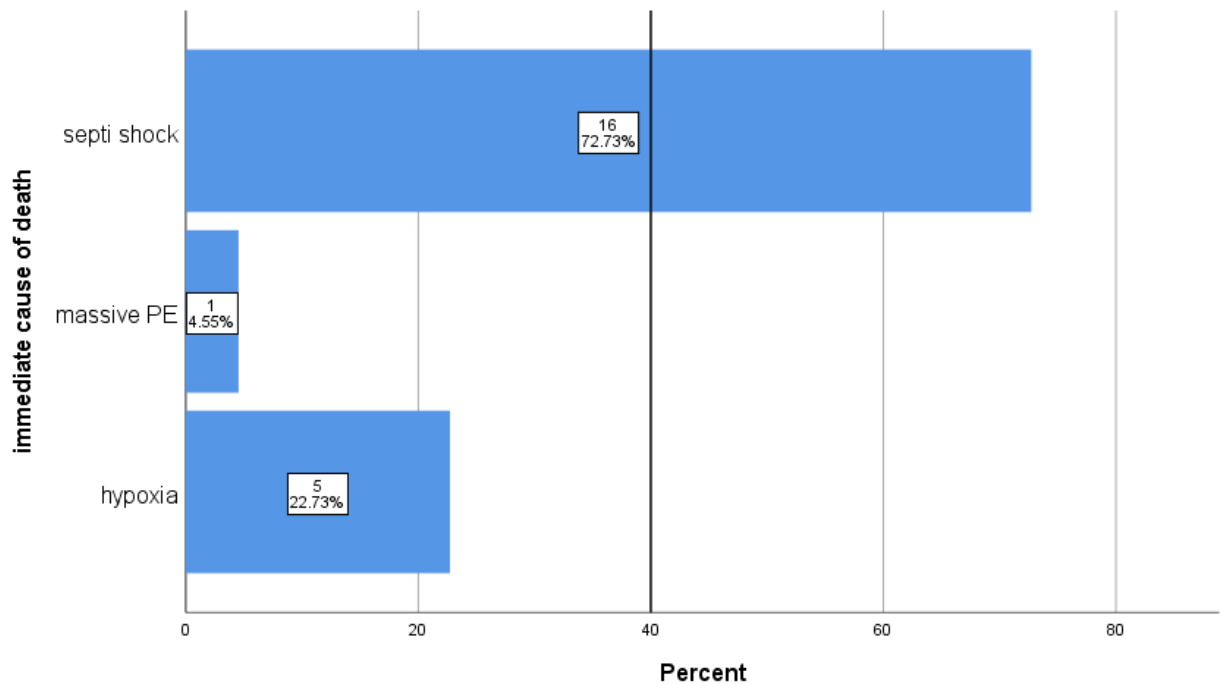


Figure 11: immediate cause of death of AKI Patients in adult ED of SPHMMC, June 1-2021-May 30-2022

A paired t-test has been conducted to evaluate the impact of AKI treatment on change in laboratory values during emergency admission and upon discharge from emergency. The result showed a significant decrease in creatinine ($M=4.5\text{mg/dl}$, $SD=4.7$) to ($M=3.6\text{ mg/dl}$, $SD=3.8$), $t=4.3$, $p=0.000$. The mean decrement in creatinine is 0.937 mg/dl with a 95% confidence interval ranging from 0.51 to 1.36. There was also a significant change in mean sodium increase ($M=134$, $SD=8.9$) to ($M=136$, $SD=7.5$), $t=-2.7$, $p=0.007$. The initial sodium increased with a mean value of 1.5 with a 95% confidence interval ranging from -2.6 to 0.4.

Regarding the change of WBC, there was an increase of leukocyte ($M=12219$, $SD=10385$) to ($M=13689$, $SD=21444$), $t=-1.06$, $p=0.290$ with 95% confidence interval ranging from 4203 to 1263. But it was not a significant change as the p-value is greater than 0.05. On the other hand, there was a significant change in hemoglobin decrease by a mean value of 0.4 mg/dl from the admission value, $t= 3.2$, $p=0.002$ at a 95% confidence interval ranging from 0.15 to 0.65. There was also a significant change in potassium increase with mean value 0.2896, $t=4.2$, $p=0.000$ with a 95% Confidence interval ranging from 0.12 to 0.42.

Table. 7 Paired T-test of laboratory values of AKI Patients of adult emergency, SPHMMC, June1-2021-2022

		Paired Differences					t df		Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	initial WBC - discharge WBC	-1469.955	20667.410	1387.106	-4203.602	1263.692	-1.060	221	.290
Pair 2	initial hemoglobin - discharge hemoglobin	.4072	1.8815	.1263	.1584	.6561	3.225	221	.001
Pair 3	initial platelet - Discharge platelet	-9846.396	145788.517	9784.685	-29129.62	9436.832	-1.006	221	.315
Pair 4	initial BUN - Discharge BUN	16.128	79.504	5.336	5.613	26.644	3.023	221	.003
Pair 5	initial Cr - Discharge Cr	.93770	3.21683	.21590	.51222	1.36319	4.343	221	.000
Pair 6	initial K+ - discharge K+	.2896	1.0242	.0687	.1541	.4251	4.213	221	.000
Pair 7	initial Na+ - discharge Na+	-1.533	8.436	.566	-2.649	-.418	-2.708	221	.007

5.6 Outcome predictors

Binary logistic regression (95% confidence interval with $p < 0.05$) was implemented to determine the independent predictors of mortality among AKI patients. Overall AKI patients' mortality was significantly correlated with the presence of Uremic encephalopathy, infection, nephrotoxic-antibiotics, malignancy, and low initial GCS. As shown in Table 8 below it was also correlated with discharge potassium and pulmonary edema solely before adjustment of the odd ratio.

Table. 8. Binary logistic regression analysis between different factors and death in AKI patients, SPHMMC, June1-2021- 2022

death				
	COR (95% CI)	P-value	AOR (95% CI)	P-Value
Uremic encephalopathy	12.9(4.6-36)	0.000	17(5-60)	0.000
Pulmonary edema	2.6(1.1-6.5)	0.03	2.1(0.7-6)	0.167
infection	4(1.7-11.2)	0.001	3.2(1.2-8.5)	0.017
Discharge K+	1.6(1.08-2.5)	0.002	1.54(0.88-2.6)	0.126
Nephrotoxic antibiotics	2.6(1.074-8.7)	0.035	2.7(1.038-7.29)	0.042
malignancy	4.1(1.4-11.9)	0.007	3.5(1.3-9.6)	0.012
Initial GCS	4.7(2.06-10.9)	0.000	3.7(1.5-9.06)	0.003

Binary logistic regression (95% confidence interval with $p < 0.05$) was further implemented to determine the independent predictors of admission from emergency to the wards or ICU among AKI patients. In all AKI patients' admission to the ICU and ward from an emergency was significantly affected by those who were taking nephrotoxic antibiotics, patients with hyponatremia, acute glomerulonephritis, and infection as shown in table 9 below.

Table. 9. Binary logistic regression analysis between different factors and admission from ED to ward and ICU in AKI patients, SPHMMC, June-1-2021- May 30 -2022

	COR (95% CI)	P-value	AOR (95% CI)	P-value
Nephrotoxic antibiotics	2.5(1.2-4.8)	0.007	0.24(0.11-0.55)	0.001
infection	2.3(1.1-4.3)	0.014	2.1(1.04-4.3)	0.039
hyponatremia	2.1(1.25-3.6)	0.005	0.45(0.25-0.83)	0.011
Acute glomerulonephritis	0.39(0.20-0.75)	0.005	0.45(0.22-0.91)	0.027

6. DISCUSSION

In the current study, we conducted a cross-sectional study on the clinical profile and outcome of patients with acute kidney injury in adult emergency of SPHMMC from June1-2021 to May 30-2022. The most common presenting complaints are shortness of breath (20.7%), generalized body swelling (19.8%), and decreased urine output (19.37%). the most common identified comorbidities are hypertension (27.2%) and malignancy (24.7%). Infection (26.2%), acute glomerulonephritis (20.46%), volume depletion due to diarrhea & other loss are the most common presumed causes of AKI. In our study, infection consists of sepsis (78.1%), acute pyelonephritis (11.4%) pneumonia (10.3%). Hyponatremia, hyperkalemia, and pulmonary edema are the most common identified complications of AKI identified in the emergency. Nearly half of the patients (50.9%) were admitted to the wards or ICU from the emergency for further management. Of 222 AKI patients,22 patients passed away in an emergency with the most common cause of death, septic shock, as sepsis is the most common cause of AKI.

Most of the published data estimating the incidence of AKI were from high-income countries and included patients admitted to critical care units; settings where the ability to trace and detect suspected cases remains high. In a systematic review by Susantitaphong et al., the world incidence of AKI among hospitalized adults was estimated to be 21.6%, and the condition was found to be associated with a 23.9% increase in mortality(15)

This study elucidated the referral area, presenting vital signs, triage categories, main presenting complaint, causes, complications, the practice of management, and outcomes of patients with AKI. The presentation of the patients at a younger age coincided with results from other African countries as well as those done in Ethiopia(10, 22, 31)

Most of our AKI patients are from Addis Ababa and Oromia regions. Most of them were referred from government health facilities, though there are a few patients referred from private health facilities and self-referred. The gender proportion of patients is almost 1:1 with a median age of 47 years But, in the previous study of the same hospital, the mean age was 37 years(19, 22, 24).

Forty-nine patients (22.1%) of the study population were over the age of sixty-four in our study, as opposed to the study conducted by JIMMA Hospital, which included 28% of AKI patients in

this age range. AKI-affected patients who were younger than 65 years old made up more than three-fourths of the total patient population(27).

The most frequent comorbid conditions in our study were hypertension (27.2%), malignancies (24%) diabetes mellitus (19%), and heart failure (14%). The comorbidities were hypertension (30.5%), HIV (32.6%), and diabetes (13.3%), which are similar to research conducted in South Africa in 2017. However, research conducted in Uganda found that HIV accounts for 60% of all comorbid conditions(12). This may be due to lower triggering factors to screen HIV in AKI patients. But, HIV, its complications, and the medications taken could cause significant renal derangement.

The most presenting complaint of AKI patients to the emergency was shortness of breath (20.7%), generalized body swelling (19.8%), and decreased urine output (19.3%). Our finding was consistent with a study done in Tanzania emergency(19).

The most common cause of AKI identified in our study were infections, acute glomerulonephritis, and hypovolemia 26%,20%, and 18.5% respectively. In a previous study done in the same hospital, the commonest cause identified was hypovolemia. Obstructive uropathy accounts for the fourth most common cause of AKI in our study, which is similar to studies done in the same city and same setup. But the most common cause of obstructive uropathy identified in our patients is nephrolithiasis rather than cervical cancer in the comparative studies done in the same study.(10, 22, 27)

Regarding AKI-associated complications, hyponatremia (32.5%), hyperkalemia (22.7%), and pulmonary edema (18.7%) are the most common. Though our findings with hyperkalemia and pulmonary edema are similar in other studies(19), hyponatremia was a different finding in our study.it could be dilutional as most patients were edematous.

Of the all patient enrolled in the study 21% of patients required dialysis, and 62% managed conservatively with fluids, antibiotics, steroids, and other methods of management for the cause of AKI.in this case conservative management is management other than operation or dialysis. The rest 16.6% of patients were operated on as part of treatment for the underlying cause of AKI. some of the operated patients came back to the ED and some of the admitted to surgical side.

Our finding regarding management is more or less similar to previous studies done in another hospital of the same city and a study done in Tanzania, on an emergency set up.

The most common indication for dialysis was refractory fluid overload (57.6%), other uremic complications (uremic encephalopathy, uremic pericarditis, uremic gastropathy, and uremic bleeding all accounting for 30.7 % indication for dialysis) and hyperkalemia (11.5%). As compared to other studies done in a similar city and the same setup, uremic encephalopathy (72%) is the most common indication for dialysis, followed by hyperkalemia (27%) and fluid overload (22%). metabolic acidosis could not be diagnosed in our hospital, as there is no arterial blood gas analysis (24)

Regarding treatment outcome, half (50.9%) of the AKI patients were admitted to the wards or ICU, whereas, one-third of patients were discharged improved and death outcome accounted for 9.9 %. Around 84% of patients had elevated initial creatinine on admission to the emergency and 77% of patients were disposed of with persistently elevated creatinine. Only 23% of patients disposed of resolved AKI from emergency. This indicates that our result is similar to a study done in Ghana where 70-90% of AKI is community-acquired(31). The mortality of patients in the study done in Tanzania, emergency set up was 39 % which is high than our result(19). The same higher result mortality of AKI has been observed study done in TASH which is a tertiary teaching hospital, in the same capital city. It may be due to the inclusion of AKI in CKD patients(24). The mortality rate of 9.9% in our study is much lower than the data from a global meta-analysis of studies done across the globe which has shown a pooled AKI-associated mortality rate of 49.4 % for dialysis requiring AKI(16).it could be due to the availability of dialysis in our hospital that decreased mortality due to AKI complications. There were few patients not mentioned specifically who were differed dialysis and intubation for poor underlying disease. But The result of our death rate closes the range put in the metanalysis done in Ghana, which puts the AKI death rate at 11.5-43.5%. (31)

In our current study uremic encephalopathy (AOR=17,95%CI:5-60, P=0.000), infection (AOR=3.2,95%CI:1.2-8.5, P=0.017), malignancy (AOR=3.5,95%CI:1.3-9.6, P=0.012), and low initial GCS (AOR=3.7,95%CI:1.5-9.06, P=0.003) were significantly contributed to death rate. In the other study done in JIMMA, the duration of AKI, the severity of AKI, and hyperkalemia are associated with the death rate(27).In our case its our limitation to classify AKI severity but

binary regression was tried for all demographic characteristics, comorbidities, complications and laboratory values.

Similarly, a study done in Sudan showed that increased age, the severity of AKI, presence of sepsis and liver disease all contributed to increased mortality in AKI patients. (15)

In the same manner, binary logistic regression showed that the presence of nephrotoxic antibiotics (AOR=0.24,95%CI:0.11-0.55, P=0.001), infection (AOR=2.1,95%CI:1.04-4.3, P=0.039), hyponatremia (AOR=0.45,95%CI:0.25-0.83, P=0.011) significantly contributed to admission rate to the wards and ICU.

7. CONCLUSION

Infections, acute glomerulonephritis, and hypovolemia are the most frequent causes of AKI at Saint Paul's Hospital. Pneumonia (10.3%), pyelonephritis (11.4%), and sepsis (78.1%) were the three most prevalent conditions among the patients. With a fatality rate of 9.9%, over 50% of patients with AKI were admitted to the wards or ICU for further management. Significant mortality predictors included uremic encephalopathy, infection, malignancy, and low GCS at presentation.

8. RECOMMENDATION

Based on the finding the following recommendation will be forwarded to the concerned bodies.

For health institutions

The majority of these causes are preventable with straightforward actions like creating awareness about preventable infectious diseases and maintaining good hygiene. Health organizations should raise awareness of the consequences of frequent, preventable causes of AKI. In raising public knowledge of preventative interventions and lifestyle changes, the private health sector should also participate.

For health professionals

Infection should be properly managed and treated as soon as possible. And using the required caution when recommending potentially nephrotoxic medications.

For Researchers

As there is insufficient information about AKI in the general population of poor countries, it would be crucial to concentrate future research on this issue, with a prospective multicenter study.

7. Strength and limitation

7.1 strength

The study assessed clinical patterns and outcomes of AKI patients in adult emergency and we tried to formulate an association between outcomes and predictors affecting outcomes by regression analysis. Our data collection was done by well-oriented emergency residents with the principal investigator.

7.2 Limitations

This is a single-center cross-sectional observational hospital-based study and the results cannot be generalized to the general population. Due to the study design, we could not set cause and effect.

Acute glomerulonephritis was a clinical diagnosis rather than biopsy proven.

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9. ANNEX

checklist

1. Socio-demographic

A) MRN-----

B). AGE -----

C). SEX -----

D). Address

☐ Addis Ababa

☐ Amhara

☐ Oromia

☐ SNNPR

☐ others, specify

2. patient referred from

☐ self-referral ☐ government hospital ☐ private health facility

3. Any known chronic medical illness (you can select more than one option)

☐ HTN ☐ DM

☐ heart failure ☐ HIV ☐ malignancy ☐ any other, specify-----

4. Vital signs at presentation

BP

RR

☐ less than 90/60

☐ 12-22

☐ 90/60-130/80

☐ 22-34

☐ 130/80-185/110

☐ > 35

☐ <12

PR

temperature

☐ 60-100

☐ >38

☐ >100

☐ <36.5

☐ <60

☐ 36.5-38

RBS

☐ 70-140 mg/dl

☐ 140-180

☐ >180

☐ <70

GCS -----

SPO2

5. What was the main presenting complaint of the patient?

☐ Altered mentation ☐ vomiting ☐ diarrhea ☐ decreased urine output

☐ Shortness of breath ☐ generalized/ bilateral lower leg swelling ☐ others

6. what was the duration of the complaint?

☐ <48 hours ☐ 48 hours -2 weeks ☐ >2 weeks

7. triage category A. Yellow-Green B. Red C. Orange

8. Presumed causes of AKI (more than one option is possible)

☐ infection

☐ hypertension and hypertension crisis

☐ cardiac disease

☐ volume depletion due to vomiting, diarrhea, blood loss

☐ acute glomerulonephritis

☐ obstructive uropathy

☐ Obstetric causes

☐ Nephrotoxic drug or poisoning

☐ others

9. If the cause was obstructive uropathy, what was the specific cause

☐ malignancy

☐ BPH

☐nephrolithiasis ☐ Others

10) Nephrotoxic drugs

☐Antibiotics (aminoglycosides, vancomycin)

☐NSAIDS

☐Diuretics

☐Immunosuppressive drugs (cyclosporine, tacrolimus), others specify

☐ACEI

☐Drugs of abuse (cocaine, ethanol), other specify

☐Others, specify.....

11. If the cause of AKI is an infection, what is the focus of the infection?

Specify.....

☐Sepsis ☐pneumonia ☐ pyelonephritis ☐ CNS infection ☐others

12. Treatment is given in an emergency

☒Conservative management

☐Surgery

☐Dialysis

13. Length of stay in emergency

☐ < 1 day ☐ 1-5 days ☐ >5 days

14. Outcome of the patient in the emergency

- A) Discharged improved
- B) Death
- C) Admitted to the wards or ICU
- D) Transferred to other hospitals
- E) Others, specify _____

15. Complication of AKI identified in the emergency (you can select more than one option)

- A) Encephalopathy
- B) Hyperkalemia
- C) Hyponatremia
- D) Pulmonary edema
- E) uremic gastropathy
- F) uremic pericarditis
- G) Other, specify.....

16. Laboratory value of patient in emergency and discharge

	At initial emergency	At discharged
WBC		
Hemoglobin		
platelet		
BUN		
Cr		
K		
Na		