

**Clinical Profile of Acute Kidney Injury in Geriatric Patients in North Eastern Tertiary Care Hospital**Sachin M.P.<sup>1</sup>, Deuri A.<sup>2</sup>, Kausar N.<sup>3</sup>, Dhotre S.<sup>4</sup><sup>1</sup>Postgraduate Trainee. Department of General Medicine, GMCH, Guwahati<sup>2</sup>Professor, Department of General Medicine, GMCH, Guwahati<sup>3</sup>Assistant Professor, Department of General Medicine, GMCH, Guwahati<sup>4</sup>Postgraduate Trainee. Department of General Medicine, GMCH, Guwahati

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**Abstract:**

**Objective:** Improvements in the health care system, resulted in a greater number of geriatric patients diagnosed with acute kidney injury (AKI). We evaluated the incidence and outcome of AKI in geriatric patients, as studies in Indian population are few; moreover, treatment approaches, in addition to medical decisions, may require special consideration for advanced age to improve the outcomes.

**Results:** At Gauhati medical college and hospital, we recruited patients aged more than 60 years who were admitted to the medicine ward with AKI between December 2023 to July 2024. Patients were followed-up during hospital stay until discharge. 100 patients were admitted during the study period. Using the acute kidney injury network classification; stage 1, stage 2, and stage 3 disease were present in 24%, 41% and 35% of patients, respectively. Of the 23 patients who died before discharge, 13 had stage 3 and 10 had stage 2 AKI. The most common comorbidity in our study group was type 2 diabetes mellitus (17), 6 had hypertension, 5 patients had underlying malignancy and other comorbidities like coronary artery disease, chronic liver disease and chronic obstructive pulmonary disease with 4 patients in each group.

**Methodology:** Ours is a tertiary care teaching institute in North Eastern part of the country. This was a single-institute prospective observation study of clinical data collected from patients during December 2023 to July 2024. Data collection was started after obtaining permission from the Institutional Ethics Committee. Convenience sampling technique was used. The study followed the guidelines laid down in the Declaration of Helsinki (2008). This manuscript followed the STROBE guideline for reporting.

**Conclusion:** Prevention of AKI and early detection with reversal of cause, addressing complications and determining the need for RRT in geriatric patients will improve overall survival and decrease associated morbidity in this patient population.

**Keywords:** Acute kidney injury, Aged 60 and over, Etiology, Outcomes, Incidence.

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**Introduction**

A longer lifetime is a result of medical advancements such as the development of new drugs, procedures, and treatment protocols [1]. An aging population can necessitate fresh methods for assessment and therapy, however determining the hazards of AKI which might be unique to senior citizens could prevent increased mortality and morbidity. Research done to assess results in elderly patients often treat all cases in a similar manner, irrespective of the person's age. This practice isn't always a practical strategy, as we understand that survival in the elderly population differs from that in adult population[2,3]. In addition to functional changes, aging also results in structural and morphological changes at the kidney level, which may raise the chance of a reduction in renal performance[4,5]. With so many people

arriving at the at least 60 years old, longer life expectancy will raise the quantity of elderly persons receiving hospital care as well as individuals who have suffered an acute renal injury[6,7].

Hospitalized patients frequently develop AKI, and elderly patients are more likely to experience it due to their advanced age [8,9], several comorbidities, and consumption of large number of medications and other variables [10–13], with an increased risk of chronic kidney disease (CKD) development following AKI [14]. AKI can raise older people's mortality and morbidity rates, whether or not they require dialysis.

**Definition of Acute Kidney Injury:** Only lately has there been agreement on the concept of AKI,

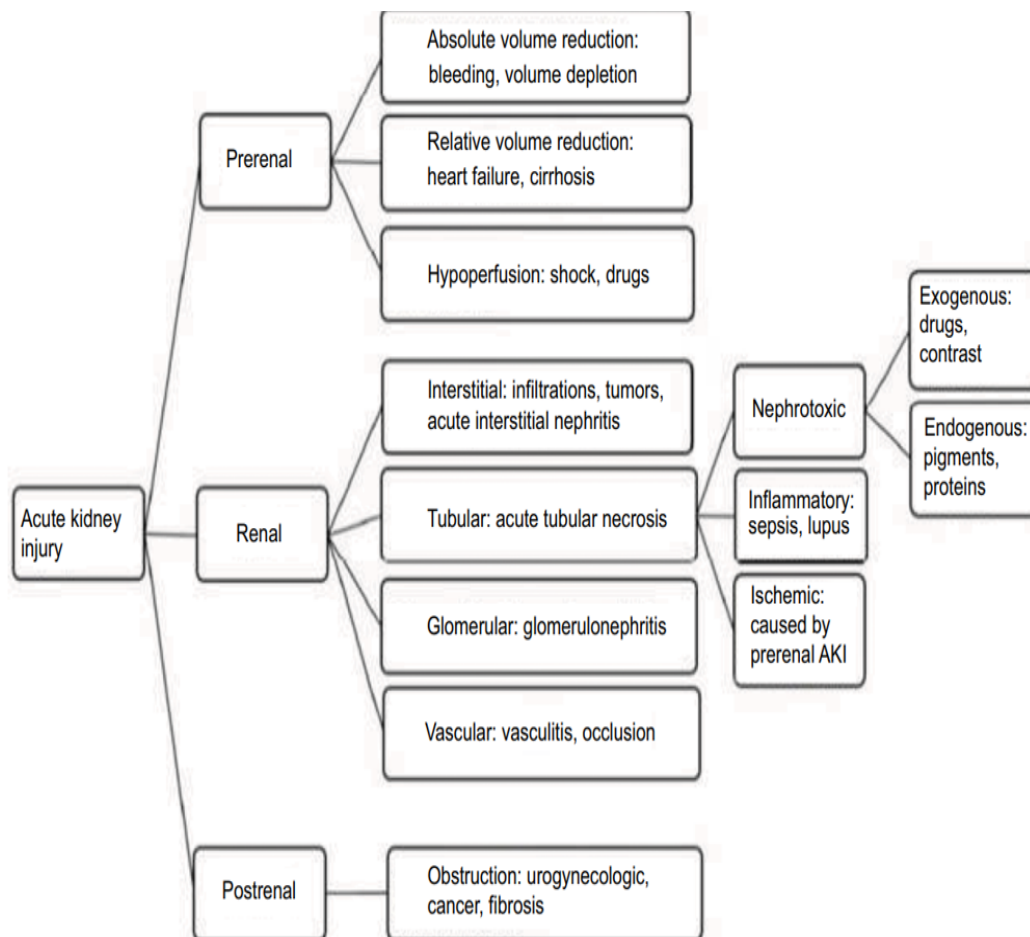
despite the fact that it is a common disorder with a high death rate: in 2012, a revised definition and staging criteria were established, covering both Acute Kidney Injury Network and Risk, Injury, Failure, Loss and End Stage criteria, was proposed by kidney disease: Improving Global Outcomes (KDIGO) Acute Kidney Injury Work Group. As a

result, AKI is currently characterized as a rise in serum creatinine of 0.3 mg/dL or higher within a 48-hour period or a rise of up to 1.5 times the baseline Serum Creatinine within seven days or, if more, a urine production of less than 0.5 mL/kg/hour more than six hours [15].

**Table 1: KDIGO classification criteria for acute kidney injury**

Stage	Serum creatinine (SCr)	Urine output (UO)
1	Baseline increase of 1.5 to 2 times in 7 days	<0.5 mL/kg/hour for 6–12 hours
2	Baseline increase of 2 to 3 times	< 0.5 mL/kg/hour for ≥12 hours
3	≥4 mg/dL or a baseline increase >3 times or initiation of renal replacement therapy	<0.3 mL/kg/hour for ≥24 hours or anuria for ≥12 hours

Another way to categorize AKI is based on its pathogenesis. Three primary causes could be the source of it: renal parenchymal injury, inadequate renal perfusion, and excretory system obstruction, which would result in prerenal, renal, and AKI post renal, as depicted in Figure 1.



**Figure 1: AKI classification according to its pathophysiology**

An accumulation of nitrogenous products as a result of decreased glomerular filtration rate (GFR) and renal plasma flow is known as the prerenal or "functional" AKI. It represents the majority of AKI cases (40–60%)[16] And can be reversed when the underlying issues are addressed. The primary reasons for prerenal are the following are AKI: absolute volume reduction (bleeding and volume loss), a relative decrease in volume in cirrhosis and

cardio renal syndrome (heart failure), as well as hypoperfusion caused by medicine or shock. Renal AKI, commonly referred to as "intrinsic" or "structural," arises from a malfunction inside the kidney and can manifest in many renal structures, vascular (vasculitis and occlusion), glomerular (glomerulonephritis), tubular (acute tubular necrosis [ATN]), and interstitial (infiltrations, tumors and acute interstitial nephritis).

The most typical reason for renal AKI is ATN (>70%) and may present with toxic or ischemia symptoms the cause[17,18,19,20]. The following are other, less common causes of renal AKI: glomerulonephritis, cortical necrosis (1%–10%), and tubulointerstitial nephritis (10%–20%) brought on by medications or illnesses. Post renal AKI, commonly referred to as "nonobstructive" AKI, develops as a result of stones, clots, tumors, or retroperitoneal fibrosis obstructing the urinary path. It is the least common form of AKI (2%–4%), and patient age might cause an increase of up to 10%[21,22,23].

#### Risk factors for AKI in the elderly:

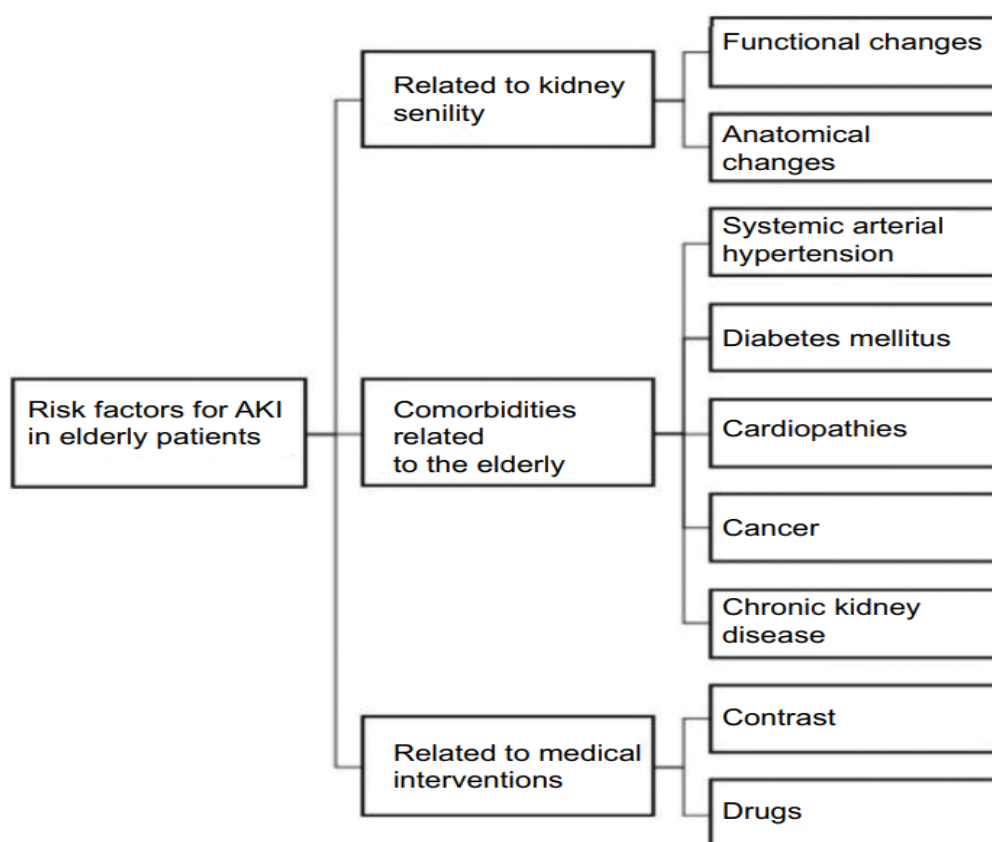


Figure 2:

In an era where the number of geriatric patients and even older people in our country is increasing, we assessed the incidence and outcome of AKI in patients older than 60 years in north eastern India. Studies in this age group are scarce, and the impact of AKI on morbidity, mortality, hospitalization, and need for renal replacement therapy (RRT) needs to be determined and addressed.

#### Methods and Materials

**Patient selection and data collection:** Ours is a tertiary care teaching institute in North Eastern part of the country. This was a single-institute prospective observation study of clinical data collected from patients during December 2023 to

July 2024. Data collection was started after obtaining permission from the Institutional Ethics Committee. Convenience sampling technique was used. The study followed the guidelines laid down in the Declaration of Helsinki (2008). This manuscript followed the STROBE guideline for reporting.

Despite the fact that the epidemiology of AKI in the elderly is not consistent because different authors have used different diagnostic criteria and because in population populations in various regions, all research points to the high prevalence and AKI mortality in senior individuals.

The risk factors that increase the likelihood of AKI in the elderly can be separated into three categories [24]:

1. Connected to the aging of the kidneys
2. Secondary to the comorbidities of the geriatric patients, and
3. Connected to medical intervention.

July 2024. Data collection was started after obtaining permission from the Institutional Ethics Committee. Convenience sampling technique was used. The study followed the guidelines laid down in the Declaration of Helsinki (2008). This manuscript followed the STROBE guideline for reporting.

Considering the prevalence of AKI in patients more than 60 years to be around 15% in the area a total of 100 patients who fulfilled the inclusion criteria were taken up for the study.

#### Inclusion criteria

- Patients with age more than 60 years

- Develops AKI after admission.
- Patients providing informed consent for the study.

**Exclusion criteria**

- Age less than 60 years
- Advanced CKD with Glomerular Filtration Rate (GFR) less than 30 ml/min in stages 4 and 5
- End stage renal disease (ESRD) patients who are already on chronic dialysis.
- Data collection

**Data Collection**

Detailed history and medical assessment of the included patients were carried out at the time of first contact with the treating team.

The patients underwent laboratory and imaging study as requested by the treating team.

We collected data on age, clinical presentation and laboratory parameters on a prespecified data collection sheet. Demographic data, including age, gender, comorbidities, and the cause of admission, medications, and laboratory data were collected.

**Results**

A hospital based observational research was conducted on 134 patients who attended Gauhati

Medical College and Hospital between December 2023 to July 2024. The study included patients aged more than 60 years attended the medicine department of Gauhati Medical College and Hospital who developed AKI after admission.

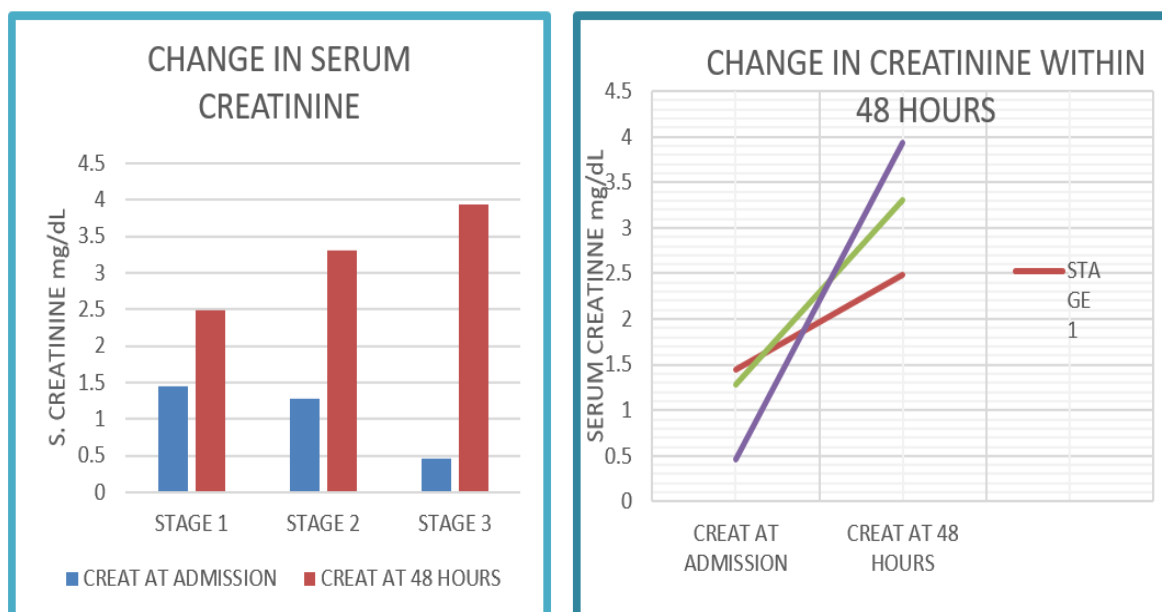
**Age Distribution**

**Population:** Mean age of our study population is 80.92 years. The majority of the prevalence in our study was in the age group of 81 to 90 years (42%) as compared to other age groups. The mean age of patients with stage 3 AKI (86.95 years) is more when compared to cases with stage 1(75.29 years) and stage 2 AKI (79.05 years). The mean age of prerenal, renal and post renal is 80.95 years, 79 years and 82.42 years respectively. Patients who underwent renal replacement therapy during the hospital treatment had a mean age of 84.1 years when compared to cases who didn't underwent HD who had a mean age of 78.8 years. The mean age of the patients who got discharged was 80.21 years and who succumbed in the hospital was 83.2 years.

**Staging of Acute Kidney Injury:** The increase in serum creatinine after 48 hours when compared to admission time is highest in AKI 3 when compared to AKI stage 2 and stage 1.

**Table 2:**

Aki Stag- ing	Mean Bun At Admission	Mean Bun At 48 Hours	Mean Creat At Admission	Mean Creat At 48 Hours	Mean Increase In Creat
Stage 1	31.04	90.12	1.45	2.48	1.7
Stage 2	32.56	88.71	1.28	3.3	2.57
Stage 3	31.03	90.66	0.46	3.93	10.55



**Figure 3:**

**Comorbidities:** The most common comorbidity in our study group was type 2 diabetes mellitus (17), 6 had hypertension, 5 patients had underlying malignancy and other comorbidities like coronary artery disease, chronic liver disease and chronic obstructive pulmonary disease with 4 patients in each group.

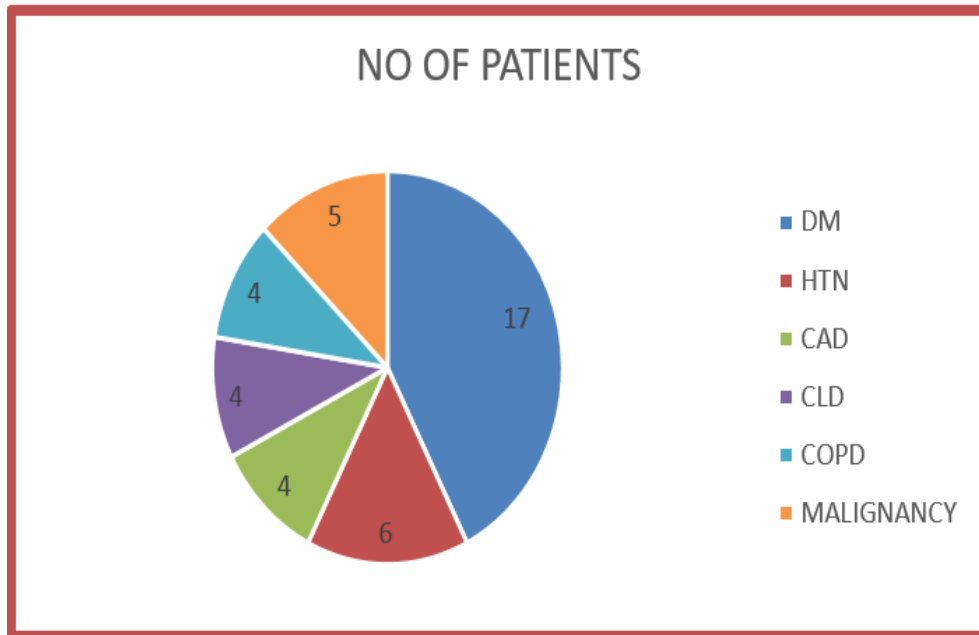


Figure 4:

**Etiologies of Acute Kidney Injury:** Most common cause of prerenal injury was sepsis (40 patients). Acute tubulointerstitial disease was the most common disease causing the renal injury. Renal calculi and malignancy obstructing the urinary tract was the main cause leading to postrenal injury.

Table 3:

Type Of Renal Failure	Causes	Number Of Patients
Prerenal	Acute Gastroenteritis	10
	Heart Failure	9
	Hepatorenal Syndrome	7
	Sepsis	40
Renal	Acute Tubulointerstitial Disease	7
	Drug Induced	5
	Snake Bite	2
	Urinary Tract Infection	2
Postrenal	Benign Prostatic Hyperplasia	1
	Carcinoma Bladder/Prostate	7
	Renal Calculi	7

**Outcome:**

Table 4:

Type	Number	HD%	Discharged	Mean Duration Of Hospital Stay	Expired
Stage 1	24	0	100	4.54 Days	0
Stage 2	41	36.58	75.61	9.85 Days	10
Stage 3	35	68.57	62.86	16.8 Days	13

Among the AKI Stage 1 group of patients (24), all of them got discharged without any help of HD with mean hospital duration of 4.54 days. Among the AKI Stage 2 group (41), 31 patients got

discharged (mean hospital duration of 9.85 days) and 15 of them needed HD. Among the AKI stage 3 group (35), 22 got discharged (mean hospital duration of 16.8 days) and 24 of them needed HD.

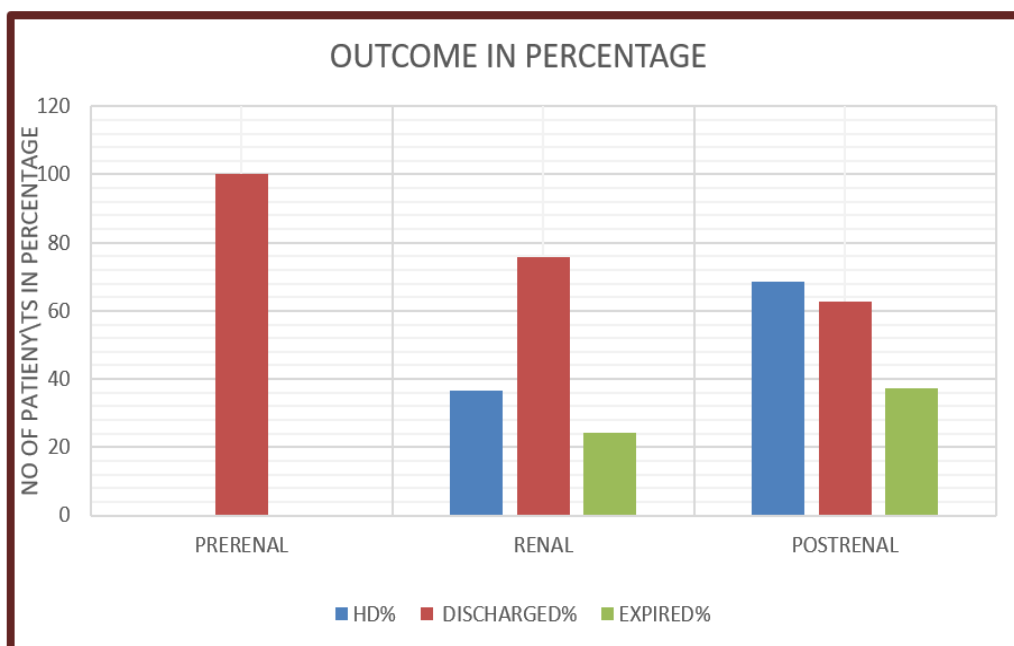


Figure 5:

### Discussion

Multiple studies have demonstrated that the elderly are more susceptible to developing AKI. In our study, mean age of our study population is 80.92 years and maximum number of patients are from 9<sup>th</sup> decade (42%). In a similar study conducted by Bani Hani, A., Abu Abeeleh, M., Al-Najjar, S. et al.2023[25] the mean age is 85.9 years. In a Spanish hospital cohort conducted by Pascual, J et al.,[26] the incidence of AKI was 3.5-times higher in patients older than 70 years than in their younger counterparts. A subsequent study in the same population and setting revealed that patients aged >80 years were 5-times more likely to develop AKI than the general population. In an Italian hospital cohort conducted by Abdel-Kader K et al., the elderly ( $\geq 65$  years) had 10 times the incidence rate of AKI compared to those < 65 years of age[27].

The mean age of patients with stage 3 AKI (86.95 years) is more when compared to cases with stage 1(75.29 years) and stage 2 AKI (79.05 years). The mean age of prerenal, renal and postrenal is 80.95 years, 79 years and 82.42 years respectively. More the age more is the severity of renal disease. Among the 100 cases in our study, 24% had stage 1 disease, 41% had stage 2 disease and 35% had stage 3 disease. In a similar study conducted by Bani Hani, A., Abu Abeeleh, M., Al-Najjar, S. et al.2023[25], 59% had stage 1 disease while stage 2 and stage 3 disease were present in 17.5% and 23.5%, respectively. One can think that the chance of having smaller changes in creatinine as in stage 1 is far more common than having bigger jumps in serum creatinine as in stages 2 and 3, which make it more sensible to find a larger number of patients in stage 1 than others. But contrary to this we got

more cases in stage 2 disease probably because the study was conducted in referral centre. According to Yosra et al. 2019[28], the cases were divided into Acute Kidney Injury Network 1, 2, or 3, respectively, in 29.9%, 24.8%, and 45.3% of cases.

The most common comorbidity in our study group was type 2 diabetes mellitus (17), 6 had hypertension, 5 patients had underlying malignancy and other comorbidities like coronary artery disease, chronic liver disease and chronic obstructive pulmonary disease with 4 patients in each group. Similar findings has been found in Bani Hani, A., Abu Abeeleh, M., Al-Najjar, S. et al.2023[25]. According to Selmi, Yosra et al. 2019[28], hypertension and diabetes were the most frequently found comorbidities seen in 69.2% and 48.7% of patients, respectively The most common etiology in our study is sepsis causing prerenal failure (40%), acute tubulointerstitial disease is the main cause of intrinsic renal failure (7%). In a study conducted by Yosra et al. 2019[28] Organic etiologies were observed more frequently (53.8%) followed by functional etiologies (37.6%) and then by obstructive ones (8.5%). The percentage of patients who underwent renal replacement therapy, the duration of hospital stay and mortality varied significantly between different KDIGO AKI staging with p value less than 0.05.

No patients from stage 1 AKI underwent RRT, whereas 36.58% patients underwent RRT in stage 2 AKI and that percentage increased up to 68.57% in stage 3 AKI. The mean duration of hospital stay was 4.54, 9.85 and 16.8 days respectively among the Acute Kidney Injury Network 1, 2, or 3. All patients from stage 1 were discharged whereas 10 patients were expired in stage 2 and 13 in stage 3.

In a similar study conducted by Yosra et al. 2019[28], 70.1% had favourable outcome, 49.6% of patients recovered totally. There was aggravation of the AKI in 29.9% of cases. Death occurred in eight cases (6.8%).

### Conclusion

Prevention of AKI and early detection with reversal of cause, addressing complications and determining the need for RRT in geriatric patients will improve overall survival and decrease associated morbidity in this patient population.

**Limitations:** Our study was a single-center study which is the main limitation, due to study design; the cause of AKI was difficult to identify, as well as the nutritional status data, which might have a role in serum creatinine level interpretation.

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