



CLINICAL PROFILE AND OUTCOME OF GRADE III ACUTE KIDNEY INJURY OF PATIENTS ADMITTED IN THE INTENSIVE CARE UNIT OF A TERTIARY CARE CENTRE SINCE 2020-2023.

Internal Medicine

**Dr Prajakta
Sudhakar
Parchake**

Medicine Resident, Dr. Vasantrao Pawar Medical College Nashik, Vasantdada Nagar Adgaon Nashik 422003

Dr Chetan Patil

Associate Professor, Dr Vasantrao Pawar Medical College Nashik, Vasantdada Nagar, Adgaon Nashik 422003.

**Dr Steffi Thomas
Sheena**

Medicine Resident, Dr Vasantrao Pawar Medical College Nashik, Vasantdada Nagar, Adgaon Nashik 422003.

ABSTRACT

Background: Acute Kidney Injury (AKI) poses a significant challenge in intensive care settings, necessitating a comprehensive understanding of its etiology, clinical presentation, management, and outcomes. This study aims to delve into the multifaceted aspects of Grade III AKI in ICU patients, shedding light on its diverse factors and implications. **Materials And Methods:** A prospective observational study in an ICU of a tertiary care center examined 79 Grade III AKI patients. Data included demographics, etiology, treatments, and outcomes, analyzed with SPSS Version 21.0. **Results:** The study found acute gastroenteritis as the primary cause of Grade III AKI, alongside prevalent comorbidities like diabetes and hypertension. Clinical presentations varied, with conservative management being predominant. Most patients experienced favorable recovery, while a minority required ongoing dialysis or faced mortality. **Conclusion:** This study underscores the complex nature of Grade III AKI in ICU patients, providing valuable insights into its etiology, clinical course, and management strategies. The findings highlight the importance of early recognition, tailored interventions, and ongoing research to improve patient outcomes and inform evidence-based practices in AKI management.

KEYWORDS

Acute Kidney Injury, Grade III, Intensive Care Unit, Etiology, Clinical Presentation.

INTRODUCTION

Acute renal failure (ARF) is a generic term for an abrupt and sustained decrease in renal function resulting in retention of nitrogenous (urea and creatinine) and non-nitrogenous waste products.¹

As the renal function declines, the kidneys struggle to adequately filter and eliminate waste products, including urea and creatinine, which would typically be excreted in the urine.² The compromised filtration process results in the retention of these substances in the bloodstream. Concurrently, electrolyte imbalances may arise, disrupting the delicate equilibrium required for proper cellular and organ function.¹

The onset of AKI can be triggered by various factors, such as reduced blood flow to the kidneys (prerenal), damage within the kidney tissue itself (intrinsic renal), or obstruction in the urinary outflow (postrenal). These etiological factors contribute to the disruption of the normal physiological processes that the kidneys regulate.^{1,2}

Renal dysfunction leads to metabolic disturbances like acidosis and hyperkalemia, affecting fluid balance and organ systems, with even minor changes linked to increased mortality.^{2,4}

Acute kidney injury (AKI), is characterized by the sudden impairment of kidney function resulting in the retention of nitrogenous and other waste products normally cleared by the kidneys.⁵

As per AKIN criteria, AKI is defined as any of the following⁶

Abrupt (within 48 h) reduction in kidney function currently defined as an absolute increase in serum creatinine of 0.3 mg/dL or more ($\geq 26.4 \mu\text{mol/L}$) or A percentage increase in serum creatinine of 50% or more (1.5-fold from baseline) or A reduction in urine output (documented oliguria of $< 0.5 \text{ mL/kg/h}$ for $> 6 \text{ h}$).

Understanding Grade III AKI helps identify high-risk patients for targeted monitoring and interventions, enabling early recognition and intervention by identifying onset markers. This study aims to optimize treatment strategies, refining interventions like fluid management, and avoiding nephrotoxic agents to improve patient outcomes in the ICU setting.

AIM & OBJECTIVE

Aim

To evaluate the clinical profile and outcomes of patients with Grade III Acute Kidney Injury.

Objective

1. To evaluate the etiological profile of Acute Kidney Injury.
2. To study the clinical presentation of Acute Kidney Injury.
3. To study the outcomes of Acute Kidney Injury.

Methodology

Study Design - Hospital based Prospective Observational Study

Study Area - Department of Medicine of a tertiary care centre.

Study Population - Cases of Grade III acute kidney injury coming to our hospital and giving informed consent.

Total Sample Size - 79

Inclusion Criteria

1. Patient age > 18 years.
2. Diagnosed cases of Grade III AKI as per AKIN Criteria

Exclusion Criteria

1. Age < 18 yrs.
2. Established End Stage Renal Disease
3. Death within 1 day of admission
4. Any other grade of AKI other than Grade III

Methodology

The study includes patients aged 18 years and above diagnosed with Grade III AKI based on AKIN criteria. Detailed history regarding various etiologies such as infections, trauma, nephrotoxic drugs, etc., was recorded. Investigations include hemogram, urine analysis, renal function tests, imaging, and specific tests as needed. AKIN staging was assigned based on investigation reports.

Complications such as electrolyte imbalances will be treated accordingly. Dialysis was performed if indicated, with details recorded. Patients were categorized into pre-renal, renal, and post-renal groups based on etiology. Outcome was assessed in terms of recovery, death, or discharge on dialysis.

Data recorded in a pre-designed proforma underwent statistical analysis using SPSS Version 21.0, presenting qualitative data as frequency, and quantitative data as Mean $\pm$ SD or Median & IQR. Graphs were generated using Microsoft Excel 2010.

RESULT & OBSERVATIONS—

Table 1 Age & Gender Distribution

Age in years	No of patients (N)	Percentage (%)
< 20	0	0.00
21 - 40	25	31.65
41 - 60	36	45.57
61 -80	16	20.25
> 80	2	2.53
Total	79	100

In table 1 the distribution of Grade III AKI patients across age categories. The highest number of cases (45.57%) falls within the 41 to 60 age range, followed by 31.65% in the 21 to 40 age group, 20.25% in the 61 to 80 age group, and 2.53% below 80 years old. In the gender distribution, with 45.57% of Grade III AKI patients being female and 54.43% male, resulting in a male-to-female ratio of 1:1.19. (Figure 1)

Etiology Study Of Grade III AKI Patients

The primary etiological factors contributing to Grade III Acute Kidney Injury include acute gastroenteritis (32.91%) and Viral Haemorrhagic Fever (12.66%). Other notable contributors include pneumonia (13.92%), pancreatitis (6.33%), and hepatorenal syndrome (3.80%). Additionally, various conditions like abdominal Kochs, congestive cardiac failure, and NSAID-related issues contribute to smaller percentages, ranging from 1.27% to 3.80%.

Comorbidities Study Of Grade III AKI Patients

Among Grade III Acute Kidney Injury patients, diabetes mellitus is the most prevalent comorbidity (22.78%), followed by hypertension (27.85%) and coronary artery disease (6.33%). Less common comorbidities include HIV, acute gastroenteritis, hepatitis C, and chronic liver disease, each affecting a smaller percentage of the patient population.

Table 2 Type Of Renal Failure In Grade III AKI Patients

Type of Renal Failure	No of patients (N)	Percentage (%)
Intrinsic	51	64.56
Postrenal	2	2.53
Prerenal	26	32.91
Total	79	100

In the distribution of renal failure types in Grade III AKI patients, with 64.56% classified as intrinsic renal failure, 2.53% as postrenal renal failure, and 32.91% as prerenal renal failure. (Table 2)

Mode Of Treatment In Grade III AKI Patients

Most Grade III AKI patients (82.28%) received conservative management, with hemodialysis used in 15.19% for impaired kidney function. A combination of hemodialysis and bilateral Double-J (DJ) stenting was employed in 2.53% of cases. (figure 2)

Requirement Of Dialysis In Grade III AKI Patients

Among the total of 79 patients, 13.92% (11 individuals) required dialysis, having more severe degree of kidney dysfunction.

Table 3 - Outcome Of Treatment In Grade III AKI Patients

OUTCOME	No of patients (N)	Percentage (%)
Complete recovery	71	89.87
Discharged on dialysis	5	6.33
Expired	3	3.80
Total	79	100

In Grade III AKI patients, 89.87% experienced a favorable outcome with complete recovery, while 6.33% were discharged with ongoing dialysis requirements. Tragically, 3 individuals (3.80%) did not survive, underscoring the gravity of Grade III AKI's life-threatening nature. (Table 3)

Correlation Of Renal Impairment With Outcome, Mode Of Treatment, Requirement Of Dialysis, Complications In Grade III AKI Patients

The correlation between renal failure type and outcomes in Grade III AKI patients was notable, favoring intrinsic renal failure for favorable outcomes and postrenal failure often requiring discharge on dialysis. Treatment mode and dialysis necessity strongly correlated with outcomes, with complications playing a crucial role.

DISCUSSION

The study on Grade III AKI patients at a tertiary care center highlights the multifactorial nature of AKI, emphasizing the importance of early recognition and intervention to mitigate complications and improve outcomes.

In the recent study on AKI, the age distribution revealed a predominant representation in the 41-60 age category (45.57%), showcasing demographic diversity across different age groups. Gender distribution analysis showed a higher proportion of male patients (54.43%), aligning closely with findings from **Dipendra Singh et al.**⁷ in 2022, reported a significant disparity in gender demographics. The etiological spectrum revealed acute gastroenteritis as the primary cause (32.91%), deviating from previous emphasis on sepsis and leptospirosis.

The comorbidity profile of Grade III AKI patients reveals diabetes mellitus and hypertension as prevalent conditions, differing from **Dipendra Singh's**⁷ study where diabetes mellitus was notably higher (52.6%). Intrinsic renal failure dominates the types of renal failure, aligning with **Suraj M. Godara's**⁸ study highlighting cortical necrosis predominantly associated with sepsis and obstetric complications. The present study indicates a predominantly conservative approach in managing Grade III AKI, with a lower percentage requiring dialysis compared to **J Prakash's**⁹ study, which reported a higher mortality rate in the dialyzed group (80%). Outcomes show a significant proportion of patients achieving complete recovery (89.87%), aligning with Maskey et al., 2015 findings, indicating positive trends in patient outcomes.

Complications occurred in 16.46% of Grade III AKI cases, consistent with previous research. Intrinsic renal failure correlated with favorable outcomes, contrasting with challenges in postrenal AKI cases. Treatment modalities and the necessity for dialysis significantly influenced patient outcomes, underscoring critical management strategies for AKI.

CONCLUSION

It comprehensively evaluates the diverse factors contributing to AKI, categorizing patients based on AKIN criteria for precise analysis. Clinical manifestations and management strategies, including the necessity for dialysis, are meticulously examined. The study's findings offer a deeper understanding of AKI's origins, severity, and prognosis, emphasizing evidence-based approaches in managing this critical condition. These insights underscore the importance of ongoing research to enhance clinical strategies and optimize patient outcomes.

REFERENCES

1. Lameire N, Van Biesen W, Vanholder R. Acute renal failure. *Lancet* 2005; 365: 417-30
2. Mangano CM, Diamond stone LS, Ramsay JG, Aggarwal A, Herskowitz A, Mananga DT, for the multicenter Study of perioperative ischemia research group: Renal dysfunction after myocardial revascularization: Risk factors, adverse outcomes and utilization. *Ann Inter Med*. 1998; 128:194-203.
3. Shusterman N, Strom BL, Murray TG, et al. Risk factors and outcome of hospital acquired acute renal failure. *Clinical epidemiologic study. Am J Med*. 1997; 83: 65-71.
4. Mehta RL, Kellum JA, Shah SV, Molitoris BA, Ronco C, Warnock DG, et al: Acute Kidney Injury Network. Acute Kidney Injury Network: report of an initiative to improve outcomes in acute kidney injury. *Crit Care* 2007; 11: 31-35.
5. Longo, Fauci, kasper, Hauser, Jameson, Lascenzo Harrison's principles of Internal Medicine 18th edition; 2012; 2293-99.
6. Mehta RL, Kellum JA, Shah SV, Molitoris BA, Ronco C, Warnock DG, et al. Acute Kidney Injury Network: report of an initiative to improve outcomes in acute kidney injury. *Crit Care*. 2007. 11(2):31–40.
7. Dipendra Singh, et.al., Clinical profile and outcome of acute kidney injury in a tertiary care center of eastern Nepal, F1000Research 2022, 11:556 Last updated: 2022, 1-12.
8. Godara SM, Kute VB, Trivedi HL, Vanikar AV, Shah PR, Gumber MR, Patel HV, Gumber VM. Clinical profile and outcome of acute kidney injury related to pregnancy in developing countries: A single-center study from India. *Saudi J Kidney Dis Transpl* 2014; 25:906-11.
9. Prakash J, Singh TB, Ghosh B, Malhotra V, Rathore SS, Vohra R, et al. Changing epidemiology of community- acquired acute kidney injury in developing countries: analysis of 2405 cases in 26 years from eastern India. *Clin Kidney J* 2013; 6:150-5.