

A Clinical-Epidemiological Assessment of Individuals with Acute Renal Damage

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Abstract

Aim: To examine the clinical characteristics and range of causes in individuals with acute renal damage at a tertiary care hospital.

Material and Methods: This study was conducted in the Department of Medicine, IGIMS, Patna, Bihar, India for 10 months. The study was a retrospective study, with 170 patients to characterize Acute Kidney Injury, defined by KDIGO classification. Patients with Increase in serum creatinine by $\geq 0.3\text{mg/dl}$ ($\geq 26.5\mu\text{mol/l}$) within 48hours. Increase in serum creatinine to ≥ 1.5 time's baseline which is known or presumed to have occurred within the previous seven days. Urine volume $< 0.5\text{ml/kg/hr}$ for more than six hours and Age group: More than 12 Years were included in this study.

Results: Average age is 51.76 years, standard deviation 18.68. Nearly 44.11% complained of reduced urine production. Many acute kidney damage patients in our area had acute gastroenteritis. Acute gastroenteritis (AGE) caused the most Pre-Renal Acute Kidney Injury in this research, followed by infections. All individuals with severe gastroenteritis and acute kidney injury had dehydration. This research found that snake bite and unknown bite caused the most renal Acute Kidney Injury, followed by poisoning. Four of the 15 poisonings were paraquat. In this research, Benign Prostate Hypertrophy (BPH) caused the most post-renal Acute Kidney Injury in older men. In this research of 170 individuals, 91 (53.5%) had pre-renal, 70 (41.2%) had intrinsic, and 9 (5.3%) had post-renal.

Conclusion: The most common causes of acute kidney injury were septicemia, severe gastroenteritis, multiple organ failure syndrome, snake bite, and nephrotoxic medications. Finally, early diagnosis and treatment improve patient outcomes.

Key Words: Acute kidney injury, KDIGO classification, Pre-Renal

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Introduction

Acute kidney injury (AKI) is a serious disorder marked by a rapid decrease in kidney function, which may result in significant illness and death if not immediately identified and treated. The clinical characteristics and range of causes of acute kidney injury (AKI) might differ significantly based on the specific population under study, geographic region, and healthcare environment. Gaining a comprehensive understanding of these variances is of utmost importance in order to create effective preventative and treatment measures. The clinical manifestation of acute kidney injury (AKI) may vary from asymptomatic increases in blood creatinine levels to severe situations necessitating renal replacement therapy. Typical indications of AKI include decreased urine production (oliguria), swelling (edema), tiredness (fatigue), disorientation,

and in extreme instances, symptoms related to uremia such as nausea, vomiting, and changes in mental state. Lab results usually show increased levels of serum creatinine and blood urea nitrogen (BUN), and sometimes, imbalances in electrolytes including hyperkalemia and metabolic acidosis. [1,2] The risk factors for acute kidney injury (AKI) are varied and include pre-existing chronic kidney disease (CKD), advanced age, diabetes mellitus, hypertension, heart failure, liver disease, and exposure to nephrotoxic medicines or contrast agents. Patients who are admitted to hospitals, especially those in intensive care units (ICUs), face a greater risk because of the intricate nature of their medical illnesses and the frequent use of invasive procedures and drugs that might negatively affect kidney function. The cause of acute kidney injury

(AKI) may be roughly classified as pre-renal, intrinsic renal, and post-renal factors. Each category includes a range of disorders that might hinder the functioning of the kidneys via various processes. Pre-renal acute kidney injury (AKI) is the most prevalent kind and is mostly caused by reduced blood flow to the kidneys, without any damage to the kidney itself. Possible causes include reduced blood volume due to dehydration or bleeding, decreased pumping ability of the heart due to heart failure or heart attack, and widening of blood vessels throughout the body due to sepsis or allergy. Swift identification and management of pre-renal reasons are crucial in order to avert the advancement of intrinsic renal harm. [3]

Intrinsic renal acute kidney injury (AKI), often referred to as intra-renal AKI, occurs when the kidney parenchyma is directly damaged. Typical causes of this condition include acute tubular necrosis (ATN), which may be caused by a lack of blood supply or by substances that are toxic to the kidneys, such as aminoglycosides, radiocontrast agents, and nonsteroidal anti-inflammatory medications (NSAIDs). Other intrinsic causes include glomerulonephritis, acute interstitial nephritis, and thrombotic microangiopathies. The pathogenesis of acute tubular necrosis (ATN) is characterized by tubular cell damage and death, accompanied by inflammation and microvascular dysfunction. Post-renal acute kidney injury (AKI), also known as obstructive AKI, is caused by a blockage in the passage of urine anywhere from the renal pelvis to the urethra. Causes include benign prostatic hyperplasia, urolithiasis, tumors, and strictures. Swift resolution of the blockage is crucial in order to avoid lasting harm to the kidneys. The occurrence of acute kidney injury (AKI) varies significantly in various environments. AKI, or acute kidney injury, is uncommon in the general population. However, its occurrence significantly rises in people who are hospitalized, undergoing major surgery, or experiencing critical disease. The outcome of AKI is determined by the underlying etiology, the extent of its severity, and the promptness of intervention. While a significant number of individuals regain their renal function, others may develop chronic kidney disease (CKD) or end-stage renal disease (ESRD). Long-term consequences include a heightened susceptibility to cardiovascular events and death. [4,5]

Material and Methods

This study was conducted in the Department of Medicine, IGIMS, Patna, Bihar, India for 10 months. The study was a retrospective study, with 170 patients to characterize Acute Kidney Injury, defined by KDIGO classification.

Following inclusion and exclusion criteria was used to select the study subjects. Increase in serum creatinine to ≥ 1.5 time's baseline which is known or presumed to have occurred within the previous seven days. Urine volume < 0.5 ml/kg/hr for more than six hours and Age group: More than 12 Years were included in this study.

Patients with Trauma and accidental case, Patients with diabetes mellitus and Patients with Chronic kidney disease were excluded from the study. After written consent, detail history was taken of all the selected study patients. Detail clinical examination conducted and the findings were recorded on a pre structured proforma sheet.

Data were analyzed using SPSS 25 software.

Results

Among the total of 170 individuals, there were 112 men and 58 females. The average age of the group was 51.76 years, with a standard deviation of 18.68. The male to female ratio in this research was 2:1. The research primarily observed a higher incidence of the condition among males, accounting for 66% of the cases. There is no substantial disparity in the result based on sex difference. The majority of individuals in this research group are above the age of 60. The average age of the group is 51.76 years, with a standard deviation of 18.68 years. The minimum age range in this research is 13 years, while the greatest age range is 86 years. The age group most often impacted in this research was those over 60 years old (38.23%), followed by those between 50 and 60 years old (15.88%). The age group least impacted in this research was 13-20 years, with a prevalence rate of 4.7%. The 170 patients were categorized based on their shared presenting symptoms. The most prevalent presenting symptoms were decreased urine production, edema in the feet and face, and vomiting, accounting for 44%, 45%, and 34% respectively.

Table 1: Clinical Symptomatology

Parameters	Frequency
Yellowish discoloration	40
Vomiting	58
Loose motion	40
Fever	57
Decrease urine output	75
Swelling	77
Hypotension	63

History of poisoning	14
History of bite	34

A major complaint was reported by over 44.11% of them, namely reduced urine flow. Acute gastroenteritis is a significant factor in the occurrence of acute renal damage in our region. The primary etiology of Pre-Renal Acute Kidney Injury

in this research was Acute gastroenteritis (AGE), with infections being the subsequent leading cause. All individuals with Acute Kidney Injury associated to acute gastroenteritis had signs of dehydration.

Table 2: Causes of pre-renal acute kidney injury

CAUSES	FREQUENCY
Acute gastroenteritis	34
Hepatic causes (liver cirrhosis, HRS, alcoholic liver disease)	15
Cardiac causes (ccf, cardiogenic shock)	15
Infective causes (malaria, dengue, ARDS, pneumonia, puerperal sepsis, septicemia, septic shock, viral hepatitis)	27

Table 3- table showing causes intrinsic acute kidney injury

CAUSES	FREQUENCY
Bite (unknown + snake)	32
paraquat, herbicidal, unknown)	15
Drugs (nsaids , steroid)	10
Multiple organ dysfunction syndrome	11
Other(pre-eclampsia, pyelonephritis)	3

Most common cause of renal Acute Kidney Injury in this study was snake bite and unknown bite followed by poisoning in this study. Among the 15 cases of poisoning four of them was paraquat poisoning.

Table 4: Causes post-renal acute kidney injury

CAUSES	FREQUENCY
Benign prostate hypertrophy	5
Bladder outlet obstruction	2
Carcinoma of cervix	1
Uterine prolapse	1

The primary etiology of post-renal Acute Kidney Injury in this research was Benign Prostate Hypertrophy (BPH), mostly affecting elderly male patients. Out of a total of 170 patients, 91 (53.5%) were diagnosed with Pre-Renal Renal Failure, 70 (41.2%) had Intrinsic Renal Failure, and only 9 (5.3%) had Post Renal Failure.

Table 5: Type of renal failure

TYPES OF RENAL FAILURE	NO OF PATIENTS
PRE-RENAL	91
RENAL	70
POST RENAL	9
TOTAL	170

As mentioned in various literature in this study also had Pre-Renal type of renal failure constitutes a major type of acute kidney injury.

Discussion

The research comprised 170 patients, with 112 being men and 58 being females. The average age of the patients was 51.76 years, with a standard deviation of 18.68. This resulted in a male to female ratio of 2:1, which is comparable to the ratios seen in studies conducted by Patel U et al., Rajesh K et al., and Eswarappa M et al. In other developing nations, the

male-to-female ratio is 1.8 to 1, but in industrialized countries, the ratio is 1 to 1. We noticed a pattern indicating a rise in the incidence of Acute Kidney Injury among male patients in comparison to female patients. This research included individuals ranging in age from 13 to 86 years. When comparing all admissions, it was shown that patients with Acute Kidney Injury tended to be older and more likely to be male. There is a possibility that undiscovered hereditary factors may have had a role in the occurrence of Acute Kidney Injury among males. The most prevalent presenting symptoms were

oliguria, edema, and vomiting, accounting for 44%, 45%, and 34% respectively. This study's results were compared to those of a study conducted by Rajesh K et al. [5] The comparison revealed that oliguria was seen in 82% of patients and vomiting in 90% of patients. It is possible that these symptoms were more prevalent in patients with Diabetes and CKD. In research conducted by Patel et U al. [4], it was shown that edema was present in 28.5% of the patients. Fever is seen in 33.5% of patients, which is consistent with findings from previous studies conducted by Patel U et al. [4] and Soren B et al. [7] In the study conducted by Bhattacharya P et al. [7] out of every 10 patients had fever, accounting for 40% of the total patient population. In the research conducted by Bernieh B et al., hypotension was seen in 8 out of 52% of the participants. The occurrence of loose stools in this research is consistent with the findings of Soren B et al. [7], with a prevalence of 23.5%.

Recovered from jaundice A total of 76.67% of patients are exclusively male as a result of alcoholic liver disease and its related complications. The occurrence of hypotension in 37% of participants in this research is comparable to the findings of Liano F et al. [10] where 32.8% of patients had hypotension. In research conducted by Rajesh K et al., 28.6% of participants had hypotension. [5] The research found that 20% of patients had Acute Kidney Injury as a result of hypovolemia caused by diarrheal sickness. This percentage is comparable to the findings of previous studies conducted by Bhattacharya P et al. [8] and Soren B et al. (17.3% and 18% respectively). [7] The cause of this issue is likely attributed to insufficient hygienic practices and a lack of health education. Additionally, a significant percentage of these patients are not receiving proper care at the primary level, resulting in a higher rate of referrals to our tertiary center. Furthermore, Prakash J et al. have also documented a substantial decrease in Acute Kidney Injury associated with diarrhea in India. [11] In this research, 18.8% of patients had Acute Kidney Injury caused by renal complications resulting from snake bites. This may be attributed to the fact that the trial was done in an area with a high prevalence of snakes. Following Sepsis continues to be a significant cause of Acute Kidney Injury on a global scale. The research observed infectious etiologies in 15.8% of the population with Acute Kidney Injury. This aligns with the findings of Rajesh K et al. [5] In this research, instances of Acute Kidney Injury were attributed to tropical illnesses such as Dengue (1.76%) and malaria (1.17%). The frequency of Acute Kidney Injury generated by tropical illnesses is reduced in our location due to the early diagnosis and appropriate treatment received by patients. In this analysis, poisoning was shown to be another prevalent cause, accounting for 8.8% of cases, which is consistent with the findings of the Patel U et al. [4]

study. In this research, poisoning from an unknown substance is the most prevalent kind of poisoning. The research found that the ingestion of toxic substances such as corrosives, Cuso⁴, paraquat, rodenticide, pesticide, plant poison, alcohol, hair color, etc. led to acute kidney injury in 14 individuals. Cardiac conditions such as myocardial infarction, heart block, congestive cardiac failure (CCF), and acute respiratory distress syndrome (ARDS) leading to respiratory failure were responsible for causing acute kidney injury in 8.2% of our patients, which is consistent with research conducted by Vikrant S et al. [12] Within the present investigation, a total of 5.8% of patients experienced the occurrence of Acute Kidney Injury as a result of the administration of nephrotoxic medications. The assortment of medicines linked to Acute Kidney Injury in our investigation aligns with the evolving epidemiology of drug-induced Acute Kidney Injury documented by Prakash J et al. [11] and Vikrant S et al. [12] The nephrotoxic medicines examined in this research included nonsteroidal anti-inflammatory drugs (NSAIDs) such as diclofenac sodium, steroids, and angiotensin receptor blockers. Obstructive uropathy resulted from the presence of kidney, ureter, or bladder stones, cervical cancer, uterine prolapse, and prostate enlargement. Acute Kidney Injury is a particularly difficult problem during pregnancy in impoverished nations, often caused by inadequate prenatal care, giving birth at home in remote regions, and unsafe abortions performed by untrained individuals or with unreliable medications.

Conclusion

The primary causes of the highest prevalence of Acute Kidney Injury were medical illnesses, including septicemia, acute gastroenteritis, multiple organ failure syndrome, snake bite, and the use of Nephrotoxic medications. The primary determinants influencing the outlook of the patients were the existence of multi organ failure, elevated baseline blood creatinine level, and the emergence of complications over the duration of the disease. In conclusion, prompt identification and effective care of this medical problem result in a positive prognosis for the patient.

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