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Original Research Article

RISK FACTORS OF ACUTE KIDNEY INJURY PATIENTS PRESENTING TO TERTIARY CARE HOSPITAL

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ABSTRACT

Background: *Acute kidney injury (AKI) is a common and serious clinical condition with significant morbidity and mortality. Identifying precipitating risk factors is essential for early diagnosis and effective management. In developing countries, limited hospital data are available regarding the etiology and comorbidities associated with AKI.* ***Objective:*** *To evaluate the risk factors contributing to acute kidney injury (AKI) in patients admitted to a tertiary care hospital.* ***Study Design:*** *Descriptive cross-sectional study.* ***Setting:*** *Department of Medicine, Saidu Group of Teaching Hospital, Swat, Pakistan.* ***Duration of Study:*** *Six months (29-07-2023 to 29-01-2024).* ***Methods:*** *A total of 156 patients aged 18 to 80 years presenting with AKI were included using consecutive non-probability sampling. AKI was defined based on the Kidney Disease: Improving Global Outcomes (KDIGO) criteria as an increase in serum creatinine ≥0.3 mg/dL within 48 hours, a 1.5-fold increase from baseline within 7 days, or urine output <0.5 mL/kg/hour for 6 hours. Risk factors evaluated included sepsis, cardiovascular events, and diarrhea. Data were analyzed using SPSS version 26. Chi-square test was applied to assess associations with comorbid conditions, with a p-value ≤ 0.05 considered statistically significant.* ***Results:*** *The mean age was 51.2 ± 17.1 years, and 56.4% were male. Sepsis was identified in 41.0% of patients, followed by cardiovascular events in 17.3%, and diarrhea in 14.1%. Sepsis was more frequent in older adults (>60 years: 43.8%). Cardiovascular-related AKI was significantly associated with diabetes (70.4%, p = 0.0001) and hypertension (81.5%, p = 0.009).* ***Conclusion:*** *Sepsis, cardiovascular events, and diarrhea are leading risk factors for AKI in hospitalized patients. Advanced age, hypertension, and diabetes are strongly associated with these triggers. Early recognition and targeted management strategies are crucial to reduce AKI-related complications and improve patient outcomes.*

Keywords: Acute Kidney Injury, Sepsis, Cardiovascular Events, Diarrhea

INTRODUCTION

Sepsis remains a major cause of morbidity and mortality in pediatric Acute kidney injury (AKI) encompasses a range of conditions marked by alterations in urine output as well as serum creatinine levels. In recent years, the understanding of kidney injury as well as failure has progressed, leading to the replacement of the term “acute renal failure” with the Risk, Injury, and End-stage kidney disease criteria, followed by the adoption of the Kidney Disease Improving Global Outcomes criteria for AKI (1).The definition of AKI has evolved, and consequently, the approaches to its evaluation, early detection, and management have also transformed. It is advised that the etiology of AKI be identified promptly to inform treatment decisions. The evaluation process has been improved through the incorporation of advanced tools such as biomarkers, which complement traditional methods including patient history, volume assessment, diuretic response, urinalysis, as well as biopsy (2). Recent pharmacologic advancements have facilitated the development of targeted therapies for AKI associated with specific etiologies, including the use of terlipressin in instances of hepatorenal syndrome (3).

Recent research has yielded valuable insights into factors that can be optimized in AKI, such as volume and blood pressure status. Many practitioners have embraced a "goal-directed" approach to hemodynamic treatment, with further studies currently in progress (4). Recent advancements in dialysis modalities have led to a diversification of options, catering to various patient needs as AKI advances to a stage necessitating kidney transplantation (5).

Nevertheless, AKI has not been categorized for analysis within the elderly demographic. Furthermore, the acknowledged risk factors in the elderly, such as hypertension, heart disease, diabetes, infections, as well as trauma, align closely with those observed in the broader population (6, 8). Limited research has explored the connection between acute kidney injury and medical conditions that are prevalent among older populations, including dementia, and tumors. Understanding the specific risk factors as well as clinical hazards associated with AKI in older adults is essential for enhancing the overall management of this condition. Moreover, the impact of AKI on the clinical burden among older hospitalized patients remains a subject of debate (9, 10). Recorded risk factors were Sepsis (45%), Cardiovascular event (18%), and Diarrhea (17%) in patients of acute kidney injury (11).

Very limited studies have focused on the risk factors for AKI in adult patients. AKI is serious condition, which prolongs the length of hospitalization, rises the cost of hospitalization, and even upsurges the risk of death. Therefore, the aim of the study is to determine the risk factors of acute kidney injury patients presenting to tertiary care hospital, if we can ascertain the risk factors for AKI in patients early and initiate preventive measures, we could improve the prognosis of patients.

METHODOLOGY

This cross-sectional study was carried out in the General Medicine Department of Saidu Group of Teaching Hospital, Swat from 29-July-2023 to 29-January-2024 after obtaining ethical approval from the hospital. One hundred and fifty six patients aged 18 to 80 years diagnosed with acute kidney injury (AKI) were enrolled using non-probability consecutive sampling in this study. Sample of patients was selected based on prior incidence of diarrhea in AKI patients which was 17% (11), error margin 5.9% and confidence level 95%. AKI was labelled as an increase in serum creatinine by ≥0.3 mg/dL within 48 hours a rise to 1.5 times the baseline within seven days or urine output <0.5 mL/kg/hour for six hours. Patients with liver cirrhosis or those who were pregnant were not enrolled.

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Data collection commenced once consent was secured. Demographic details along with clinical assessments were recorded. Risk factors, which were sepsis. diarrhea and cardiovascular events were evaluated. Sepsis was diagnosed if patients exhibited at least two of the following criteria: fever >100°F, white cell count >10×10⁹/L, hypotension (MAP <70 mmHg), tachypnea (>20 breaths/min), tachycardia (>90 beats/min) or positive blood cultures. Diarrhea was defined as the sudden onset of >3 loose stools per day for up to 14 days while cardiovascular events involved heart failure or acute myocardial infarction confirmed by electrocardiogram.

Data was analyzed with SPSS 20. For age and duration of disease mean and SD were used. For gender, comorbidities and risk factors we used frequencies and percentages. Chi Square test was used for association of risk factors with various parameters, keeping P value notable at ≤ 0.05.

RESULTS

Mean age of the patients in our study was 51.22 ± 17.13 years and the mean disease duration was 4.18 ± 2.12 days. Among the patients about 56.4% were male (Figure 1). In our study 60 (38.5%) patients had diabetes while 92 (59.0%) had hypertension (Table 1).

Sepsis was observed in 64 (41.0%) patients while cardiovascular events and diarrhea were less frequent occurring in around 27 (17.3%) and 22 (14.1%) patients respectively (Table 2). Sepsis was more common in older individuals (>60 years) 28 (43.8%) but could not reach the point of significance. Cardiovascular events were associated with advanced age with 19 (70.4%) (p=0.0001). Diabetes was linked with cardiovascular events 19 (70.4%) (p=0.0001). Hypertension was related with cardiovascular events 22 (81.5%) (p=0.009). Disease duration also influenced outcomes. Cardiovascular events were more likely in patients with a disease duration > 5 days (18 66.7% p=0.0001) while sepsis and diarrhea showed no notable variation with disease duration (p=0.95 and p=0.10 respectively). These stratifications can be viewed from table no 3 to table no 6.

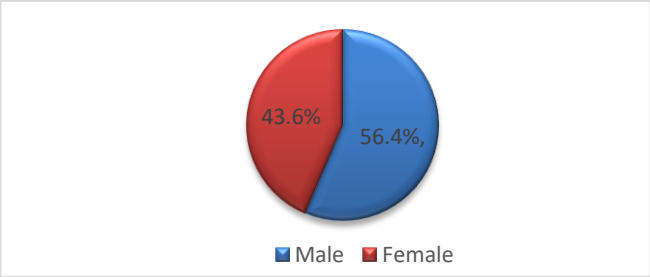

Figure 1: Gender distribution

Table 1: Clinical profile of the patients

Clinical profile		N	%
Gender	Male	88	56.4%
	Female	68	43.6%
Diabetes	Yes	60	38.5%
	No	96	61.5%
Hypertension	Yes	92	59.0%
	No	64	41.0%

Table 2: Risk factors of AKI

Risk factors of AKI		N	%
Sepsis	Yes	64	41.0%
	No	92	59.0%
Cardiovascular event	Yes	27	17.3%
	No	129	82.7%
Diarrhea	Yes	22	14.1%
	No	134	85.9%

Table 3: Stratification of risk factors with age

Risk factors of AKI		Age distribution (Years)						P value
		18 to 40		41 to 60		> 60		
		N	%	N	%	N	%	
Sepsis	Yes	14	21.9%	22	34.4%	28	43.8%	0.12
	No	34	37.0%	28	30.4%	30	32.6%	
Cardiovascular event	Yes	4	14.8%	4	14.8%	19	70.4%	0.0001
	No	44	34.1%	46	35.7%	39	30.2%	
Diarrhea	Yes	9	40.9%	6	27.3%	7	31.8%	0.53
	No	39	29.1%	44	32.8%	51	38.1%	

Table 4: Stratification of risk factors with diabetes

Risk factors of AKI		Diabetes				P value
		Yes		No		
		N	%	N	%	
Sepsis	Yes	28	43.8%	36	56.2%	0.25
	No	32	34.8%	60	65.2%	
Cardiovascular event	Yes	19	70.4%	8	29.6%	0.0001
	No	41	31.8%	88	68.2%	
Diarrhea	Yes	8	36.4%	14	63.6%	0.82
	No	52	38.8%	82	61.2%	

Table 5: Stratification of risk factors with diabetes

Risk factors of AKI		Hypertension				P value
		Yes		No		
		N	%	N	%	
Sepsis	Yes	43	67.2%	21	32.8%	0.08
	No	49	53.3%	43	46.7%	
Cardiovascular event	Yes	22	81.5%	5	18.5%	0.009
	No	70	54.3%	59	45.7%	

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Diarrhea	Yes	11	50.0%	11	50.0%	0.35
	No	81	60.4%	53	39.6%	

Table 6: Stratification of risk factors with duration of disease

Risk factors of AKI		Duration of disease (Days)				P value
		1 to 5		> 5		
		N	%	N	%	
Sepsis	Yes	42	65.6%	22	34.4%	0.95
	No	60	65.2%	32	34.8%	
Cardiovascular event	Yes	9	33.3%	18	66.7%	0.0001
	No	93	72.1%	36	27.9%	
Diarrhea	Yes	11	50.0%	11	50.0%	0.10
	No	91	67.9%	43	32.1%	

DISCUSSION

In our study sepsis occurred in 41.0% AKI cases in this study which aligns well with the previous studies showing sepsis as a leading contributor to AKI. Arshad et al found sepsis in 45% AKI patients (11). Abbas et al. reported sepsis in 13.8% AKI patients. The discrepancy may stem from differences in patient populations as Abbas et al. focused more on severe cases necessitating dialysis whereas our study included a broader AKI spectrum (12). Notably sepsis was present more frequently in older patients (>60 years 43.8%). Anees et al. observed that advanced age notably increased AKI risk in COVID-19 patients (13). This infers that aging with its associated immune decline and comorbidities may aggravates sepsis-related kidney injury.

Cardiovascular events were observed in 17.3% AKI cases demonstrated a notable link with older age (70.4% in patients >60 years) and diabetes (70.4%). These findings sit well with Abbas et al. where congestive heart failure (CHF) was observed in 17.1% AKI patients particularly those with hypertension and diabetes (12). The high prevalence of cardiovascular events in hypertensive and diabetic patients higlights the role of chronic metabolic and vascular stress in AKI pathogenesis. Furthermore our findings that cardiovascular events were more likely in patients presenting with prolonged disease duration (>5 days 66.7%) infers that sustained illness exacerbates cardiac strain which potentially worsening renal perfusion. This aligns with Fisher et al. who stated that prolonged hospitalization can increase AKI risk due to cumulative hemodynamic instability (14).

Diarrhea though less frequent (14.1%) in our cohort but remains a clinically notable risk factor particularly in resource-limited settings where dehydration and electrolyte imbalances are common. Arshad et al reported diarrhea in 17% AKI cases highlighting its preventable nature (11). While our study did not find a notable age or diabetes-related association with diarrhea its presence in 40.9% of younger patients (18–40 years) infers that acute gastrointestinal infections may disproportionately affect this demographic possibly due to higher exposure to an unhealthy lifestyle and pathogens or delayed medical intervention. Hypertension and diabetes were quite prevalent in our cohort (59.0% and 38.5% respectively) highlighting their huge role in AKI development. Abbas et al. similarly identified hypertension (46.8%) and diabetes (35.7%) as major comorbidities in AKI patients (11). The strong link between hypertension and cardiovascular events in our study further supports the notion that uncontrolled blood pressure can lead to renal and cardiac dysfunction. Diabetes was linked to cardiovascular events in our study. This aligns well with Khalili et al. (2021) who found that diabetic COVID-19 patients had a higher AKI incidence.

Our results resonate with the current literature regarding AKI. We recommend patients presenting with AKI specially with advances age must be monitored for diabetes and hypertension, as these factors can lead to severe progression of AKI in later stages.

CONCLUSION

We conclude that sepsis, cardiovascular events, and diarrhea are notable factors for AKI having association with older age hypertension and diabetes. These findings highlight the need for targeted interventions in high-risk groups to reduce AKI incidence and improve outcomes.

DECLARATIONS

Data Availability Statement
All data generated or analysed during the study are included in the manuscript.

Ethics approval and consent to participate
Approved by the department Concerned. (19-ERB-/023)

Consent for publication
Approved

Funding
Not applicable

CONFLICT OF INTEREST

The authors declared an absence of conflict of interest.

AUTHOR CONTRIBUTION

ASAD KHAN (Postgraduate Resident)
Conception of Study, Development of Research Methodology Design, Study Design, Review of manuscript, Data collection, and Anslysis. Manuscript drafting.
WASIL KHAN (Professor)
Manuscript revisions, critical input, and Final approval of draft.
ABDUL JABBAR (Professor)
Critical Input
AMINULLAH (Professor)
Critical Input, Review of Literature.
MOMIN KHAN (Associate Professor)
Literature review
ZIA ULLAH (Associate Professor)
Literature review

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