Original Research Article

A prospective study of aetiology and outcome of acute kidney injury in type 2 diabetes patients

Donapati Sathish Kumar Reddy[1*], Pavitra Burla[2]

[1]Consultant Physician, KIMS Hospital, Ongole, Andhra Pradesh, India
[2]Intensivist, Ramesh Sanghamitra Hospital, Ongole, Andhra Pradesh, India

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Abstract

Introduction: Acute kidney injury (AKI) describes the clinical syndrome earlier called acute renal failure. AKI is defined as structural or functional abnormality of the kidney that manifests within 48 h, as determined by blood, urine, tissue tests or by imaging studies. AKI is depicted by rapid (over hours to days) decline in glomerular filtration rate, retention of nitrogenous waste products and perturbation of the extra-cellular fluid volume, electrolytes and acid-base homeostasis. AKI constitutes approximately 5% of hospital admissions and up to 30% of admissions to intensive care units (ICU). **Materials and Methods:** A prospective study was conducted at Department of Internal Medicine, KIMS Hospital, Ongole from January 2021 to December 2021 (1 year). Type 2 diabetic patients 30 years or above, irrespective of gender, diagnosed to have acute kidney injury using KDIGO criteria, admitted to ICU or wards under the Department of Internal Medicine, KIMS Hospital, Ongole were included in the study. Patients with preexisting renal disease and those who received renal transplantation were excluded from the study. Type 2 diabetic patients admitted in the ICU and wards under Medicine and Nephrology department, KIMS Hospital, Ongole were evaluated in detail after taking prior consent. Evaluation includes detailed history taking and physical examination. Acute kidney injury will be assessed on the basis of their serum creatinine and/or urine output fulfilling the KDIGO criteria. **Results:** The study was conducted in a total of 150 diabetic patients who developed acute kidney injury. There were 94 males and 56 females. The aetiology and outcome of acute kidney injury in the above patients were found out. Blood urea, serum creatinine, serum electrolytes, fasting and post-prandial blood sugar, WBC count, platelet count and haemoglobin were included as the baseline parameters. **Conclusion:** Infection was the most common cause of AKI in Type 2 diabetes patients in our study. Among drug induced renal failure patients, NSAIDS were noted to be most common cause. Age >60 and male gender were prevalent in the majority of AKI patients. About 52.66% of the total patients recovered to normal renal function, 13.3% recovered partially, with 14% of the total patients progressed for maintenance hemodialysis. Crude mortality rate among patients with AKI in the study group was 20%.

Key Words: Acute kidney injury, NSAIDS, ICU, hemodialysis.

Introduction

Acute kidney injury (AKI) describes the clinical syndrome earlier called acute renal failure. AKI is defined as structural or functional abnormality of the kidney that manifests within 48 h, as determined by blood, urine, tissue tests or by imaging studies. AKI is depicted by rapid (over hours to days) decline in glomerular filtration rate, retention of nitrogenous waste products and perturbation of the extra-cellular fluid volume, electrolytes and acid-base homeostasis. AKI constitutes approximately 5% of hospital admissions and up to 30% of admissions to intensive care units (ICU).

Epidemiology of AKI differs amongst developed and developing countries, owing to differences in demographics, economics and co-morbid disease burden. Many aetiologies are region specific such as envenomation (snakes, spiders, caterpillars and bees), infectious causes (malaria, leptospirosis, scrub typhus, etc.,) and trauma (crush injuries, causing rhabdomyolysis).

The incidence and prevalence of diabetes mellitus (DM) have continuously been increased over the last 20 years. Meanwhile an estimated number of 387 million people worldwide suffer from DM. Morbidity and mortality of diabetic patients are substantially aggravated by cardiovascular complications including coronary artery, cerebrovascular, and peripheral artery disease. In addition, DM may significantly affect kidneys and urinary tract. The disease accounts for most cases of end-stage renal disease in Western-Europe and in the US.

*Correspondence
Dr. Donapati Sathish Kumar Reddy
Consultant Physician, KIMS Hospital, Ongole, Andhra Pradesh, India
E-mail: sunilsachdev1221@gmail.com

Approximately 40% of all patients requiring dialysis therapy on a regular basis suffer from diabetes mellitus as respective cause. Chronic renal insufficiency results from both, extra- and intrarenal atherosclerosis, and from diabetes-associated glomerular damage (diabetic nephropathy). In addition, diabetic kidneys are characterized by severe interstitial inflammation. Finally, patients are at higher risk for developing contrast-induced nephropathy (CIN) and frequently suffer from bacterial infections, often involving urinary tract and renal tissue *per se*.

The main objective of the study to study the aetiology and outcome of acute kidney injury in patients with type 2 diabetes in KIMS Hospital, Ongole.

Materials and methods

Study design

A prospective study.

Study location

Department of Internal Medicine, KIMS Hospital, Ongole.

Study Duration

January 2021 to December 2021 (1 year).

Study population

Type 2 diabetic patients with acute kidney injury irrespective of age and gender.

Inclusion criteria

Type 2 diabetic patients 30 years or above, irrespective of gender, diagnosed to have acute kidney injury using KDIGO criteria, admitted

to ICU or wards under the Department of Internal Medicine, KIMS Hospital, Ongole.

Exclusion Criteria

Patients with preexisting renal disease and those who received renal transplantation.

Type 2 diabetic patients admitted in the ICU and wards under Medicine and Nephrology department, KIMS Hospital, Ongole were evaluated in detail after taking prior consent. Evaluation includes detailed history taking and physical examination. Acute kidney injury will be assessed on the basis of their serum creatinine and/or urine output fulfilling the KDIGO criteria.

Statistical Analysis

Results were presented as frequency and percentages for Categorical variables and mean +/- SD for continuous variables. Statistical calculations were done using Chi-square tests for categorical data and on independent t-test. For continuous data. $P<0.05$ was considered significant. The calculations were carried out using SPSS (Statistical Package for the Social Sciences).

Results

The study was conducted in a total of 150 diabetic patients who developed acute kidney injury. There were 94 males and 56 females. The aetiology and outcome of acute kidney injury in the above patients were found out. Blood urea, serum creatinine, serum electrolytes, fasting and post-prandial blood sugar, WBC count, platelet count and haemoglobin were included as the baseline parameters.

Table 1: Age distribution

Age Group	Number of patients (Percentage)
<50 years	30(20%)
50-59	60(40%)
60-69	42(28%)
≥70	18 (12%)
Total	150 (100%)

Table 2: distribution of mortality among male and female diabetic AKI patient

Gender	Mortality		P Value
	Yes	No	
Male	34(23%)	116(77%)	0.096
Female	6(11%)	50 (89%)	

Table 3: distribution of mortality with various infections in diabetic AKI patients

Infection	Mortality		P Value
	Yes	No	
No infection	4(7%)	46(93%)	0.096
UTI	10(28.57%)	25(71.42%)	
LRTI	0(0%)	15(100%)	
Sepsis	5(33.33%)	10(66.66%)	
Leptospirosis	10(83.33%)	2(5.71%)	
UTI & Sepsis	4(100%)	0(0%)	

Leptospirosis and a combination of sepsis & UTI increased the mortality in diabetic AKI.

Table 4: distribution of mortality with aetiology in diabetic AKI patients

Aetiology	Mortality		P Value
	Yes	No	
Drugs	0(0%)	10(100%)	0.096
CAD/LVD	0(0%)	9(100%)	
Infection	11(22%)	37(78%)	
Volume depletion	0(0%)	3(100%)	
Urological obstruction	4(13%)	22(87%)	
IRCN	0(0%)	6(100%)	
Drugs and infection	2(100%)	0(0%)	
Accl HTN & CAD/LVD	0(0%)	4(100%)	
CAD/LVD & volume depletion	(0%)	3(100%)	
Infection & Urological obstruction	4 (100%)	0(0%)	
Infection &IRGN	2 (100%)	0(0%)	

Mortality in diabetic AKI patients was found to be increased when infections were associated with urological obstruction, drugs or IRGN.

Table 5: distribution of outcome of AKI in Type 2 diabetes

S.No	Outcome	Number of patients	Percentage
1	Fully recovered	79	52.66
2	Partially recovered	20	13.33
3	Dialysis dependent	21	14
4	Mortality	30	20

52.66% had full recovery and 13.33% had partially recovered. Dialysis dependent found to be 20% and 14% was put on maintenance hemodialysis (Dialysis dependent).

Discussion

Infections were found to be the most common cause of AKI in the study. It accounted for 54 % of cases, among which UTI was found in more than half of the cases. In a prospective study by Khan and Ahmed[7], the most common focus of infection was found to be urinary tract (71.2%).

Sepsis was found to be the most common cause for AKI in several studies. The lower proportion of sepsis in this study might be attributed to the fact, unlike the above studies, the majority of patients selected for were not critically ill patients from ICU, but from medicine and nephrology wards.

Urinary tract obstruction was the second most common cause in this study that accounted for 23%. Vakrani et al found sepsis (52.9%) and urinary tract obstruction (50%) as the leading causes for renal failure in diabetics[1]. Jha et al., and Prakash et al., which evaluated AKI had shown that nephrotoxic drugs were the most common cause of AKI.

The risk for mortality was found to be increased with increasing age, male sex, sepsis with UTI, BPH, increased mean blood urea and serum creatinine levels. Similar results were found in studies of Eswarappa et al.

Mortality was also found to be increased in patients with high mean FBS, PPBS, total WBC counts and serum potassium, and low serum sodium and platelet counts.

The increase in awareness of these risk factors will help in the early identification of kidney injury that is critical for treatment or prevention of AKI.

Conclusion

Infection was the most common cause of AKI in Type 2 diabetes patients in our study. Among drug induced renal failure patients, NSAIDS were noted to be most common cause. Age >60 and male gender were prevalent in the majority of AKI patients. About 52.66% of the total patients recovered to normal renal function, 13.3% recovered partially, with 14% of the total patients progressed for maintenance hemodialysis. Crude mortality rate among patients with AKI in the study group was 20%.

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