

A Study on etiology and outcome of acute kidney injury patients requiring haemodialysis in a rural tertiary medical college hospital, Kishoreganj.

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ABSTRACT

Background and objectives: AKI is an increasingly common complication of critical illness, with some researches showing that as high as 1 in 5 adults and 1 in 3 children experiencing AKI per hospital admission. Whether occurring in the community or in the hospital, the clinical and public health importance of AKI is well established due to the association with high mortality and its separate independent effect on the risk of death and resource use. This study was aimed to find out the etiology and outcome of acute kidney injury patients requiring haemodialysis.

Methods: A retrospective study was done on 70 patients of AKI who required haemodialysis support in dialysis unit of medicine department of Jahurul Islam Medical College Hospital, Kishoreganj during the time period from Jan - 2018 to Dec – 2020. All patients of age 13 and above with AKI and have been dialyzed at least once during the study period were included.

Results: In this study, there was an overall male preponderance (70%) with age range of 13-40 years (48.57%). Most common features of presentation were oliguria, cough, respiratory distress, drowsiness, disorientation, reddish urine, pedal edema, fever and high blood pressure. The most common causes of AKI were sepsis (30%), hypovolemia (21.42%), acute glomerulonephritis (AGN) (14.29%) and pregnancy related causes (10%). Common indications for haemodialysis of AKI patients were refractory fluid overload (70%), features of uraemic encephalopathy (22.86%). In this study, 78.57% of AKI patients requiring haemodialysis were improved and discharged, 08.57% patients were progressed to end stage renal disease, 07.15% patients were expired and 05.71% patients were absconded.

Conclusion: It is concluded that sepsis, hypovolemia, AGN, obstetric causes, surgical causes and nephrotoxins were the primary causes of AKI patients requiring haemodialysis in this study. Most of these causes can be prevented with simple interventions such as appropriate management of infections, health education on oral rehydration, quality prenatal and emergency obstetric care and taking appropriate precautions when prescribing potentially nephrotoxic medications. Majority of the patients of AKI with complications were improved with haemodialysis. So, expansion of haemodialysis services to all parts of the country is necessary.

Key words: Acute kidney injury, Haemodialysis.

Introduction

AKI, previously known as Acute Renal Failure, is a clinical syndrome characterized by an abrupt decline in glomerular filtration rate sufficient to decrease the elimination of nitrogenous waste products (urea and creatinine) and other uremic toxins which is

reversible. According to the Kidney Disease – Improving Global Outcomes (KDIGO) criteria AKI is a decline in kidney function during 48 h as demonstrated by an increase in serum creatinine of more than 0.3 mg/dl or an increase in serum creatinine

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of more than 50 % upon admission during 7 days or the development of oliguria. According to the KDIGO criteria, stage 1 encompasses a SCr level increase of ≥ 0.3 mg/dL ($26.5 \mu\text{mol/L}$) within 48 h or increase in SCr to ≥ 1.5 times baseline, which is known or presumed to have occurred within 7 days; stage 2, increase in SCr to 2.0–2.9 times baseline; stage 3, increase in SCr to 3.0 times baseline or to ≥ 4.0 mg/dL ($353.6 \mu\text{mol/L}$), or receipt of renal replacement therapy (RRT).¹

AKI is an increasingly common complication of critical illness, with some researches showing that as high as 1 in 5 adults and 1 in 3 children experiencing AKI per hospital admission. Whether occurring in the community or in the hospital, the clinical and public health importance of AKI is well established due to the association with high mortality and its separate independent effect on the risk of death and resource use.²

In developing countries, sepsis (due to UTI, pneumonia, infected diabetic foot, viral hepatitis, bacterial peritonitis, leptospirosis) hypovolemia (due to diarrheal diseases, acute blood loss, acute pancreatitis) cardiogenic shock (due to acute myocardial infarction, LVF, complete heart block) acute glomerulonephritis, acute tubular necrosis, nephrotoxic drugs like NSAIDs, aminoglycosides are the common medical causes of AKI. Surgical causes like obstructive uropathy, postoperative sepsis, obstetric causes like puerperal sepsis, severe preeclampsia and severe post partal haemorrhage are also the causes of AKI in our country. Regardless of cause, the management of AKI is mainly supportive. Haemodialysis is the most efficient and commonly used renal replacement therapy when medical management fails to treat the complications of AKI.

The aim of this study is to find out the etiology and outcome of acute kidney injury patients requiring haemodialysis.

Methods:

A retrospective study was done on 70 patients of AKI who required haemodialysis support in dialysis unit of medicine department of Jahurul Islam Medical College Hospital, Kishoreganj during the time period from Jan-2018 to Dec-2020. The medical record of all

patients haemodialyzed during the study period were identified from the dialysis unit log book and the clinical records retrieved from the hospital record office. All patients of age 13 and above with AKI and have been dialyzed at least once during the study period were included. In the hospital patients of age 13 and above are considered as “adults” and admitted to the adult patient wards. Those patients who had dialysis for overdose of dialyzable drugs, those who were under the age of 13 or had incomplete or missing records were excluded. Data on socio-demographic, clinical presentation, laboratory variables, etiology, dialysis variables and outcome were collected using a structured questionnaire.

Qualitative data were expressed in the form of numbers, frequency and percentages. All calculations were carried out using a standard statistical package for Social Sciences (SPSS version 19, Inc. in Chicago, USA).

Results:

A total of 70 patients with AKI underwent haemodialysis from January-2018 to December-2020. In this study, there was an overall male preponderance (70%) with age range of 13-40 years (48.57%). In this study, most common features of presentation were oliguria, cough, respiratory distress, drowsiness, disorientation, reddish urine, pedal edema, fever and high blood pressure.

In this study, Sepsis was the leading (30%) cause of AKI requiring haemodialysis which was secondary to UTI, pneumonia, infected diabetic foot, viral hepatitis, febrile neutropenia, and secondary bacterial peritonitis. Hypovolemia due to diarrheal illness, vomiting, blood loss and acute pancreatitis was the cause of AKI in 21.42% of patients requiring haemodialysis.

Though difficult to accurately diagnose in our setup due to lack of availability of renal biopsy, AGN (diagnosed through clinical means) was found in 10 patients (14.29%) requiring haemodialysis. We diagnosed AGN clinically when there was an acute onset of oliguria followed by body swelling, with new onset hypertension, haematuria and some degree of proteinuria.

The pregnancy related causes of AKI requiring haemodialysis were found in 7 patients (10%) and mainly due to severe preeclampsia, puerperal sepsis and postpartum haemorrhage. 6 (8.57%) patients had AKI superimposed on CKD, with the most common cause of CKD being diabetes and hypertension. A majority of these patients had not been diagnosed initially with CKD as they were presenting to a health facility for the first time.

The common post renal obstructive causes were stone disease, followed by benign prostatic hyperplasia and strictures. Obstructive uropathy and postoperative AKI were found in 5 patients. The most common nephrotoxins were NSAIDs and aminoglycosides mainly gentamycin. Rhabdomyolysis following physical assault and RTA was found in 3 patients.

The most common indications for haemodialysis of AKI patients were refractory fluid overload (70%) leading to respiratory failure, uraemic encephalopathy (22.86%) and hyperkalemia (4.28%). Serum creatinine was > 6.8 mg/dl in most of the patients. Blood urea was > 180 mg/dl in 55 patients. 49 patients developed pulmonary oedema. Only 3 patients developed severe hyperkalemia that did not respond to medical treatment. Haemodialysis was done for 2 to 4 hours in every session. The average number of dialysis sessions was 4, with a maximum of 18 and a minimum of 3. In this study, 78.57% of AKI patients requiring haemodialysis were improved and discharged, 08.57% patients were progressed to end stage renal disease, 07.15% patients were expired and 05.71% patients were absconded.

Table-1: Age distribution of patients with AKI requiring haemodialysis (n= 70).

Age	Total number of patients	Percentage (%)
13-20	18	25.71%
21-30	12	17.14%
31-40	04	05.72%
41-50	07	10.00%
51-60	06	08.57%
61-70	15	21.43%
71-80	05	07.14%
>80	03	04.29%
Total	70	100%

Table-2: Sex distribution of patients with AKI requiring haemodialysis (n= 70).

Sex	Total number of patients	Percentage (%)
Male	49	70%
Female	21	30%
Total	70	100%

Table-3: Common clinical features of patients with AKI requiring haemodialysis (n= 70).

Clinical features	Number of patients	Percentage (%)
Oliguria	65	92.86%
Body swelling	62	88.57%
Reddish urine	55	78.57%
Cough	49	70.00%
Breathlessness	49	70.00%
Raised Blood Pressure	22	31.43%
Fever	18	25.71%
Drowsiness	16	22.86%
Disorientation	14	20.00%
Anuria	04	05.71%

Table-4: Common causes of AKI patients requiring haemodialysis (n= 70).

Clinical features	Frequency	Percentage (%)
Sepsis	21	30.00%
Hypovolemia	15	21.42%
AGN	10	14.29%
Pregnancy related causes	07	10.00%
AKI on CKD patients	06	08.57%
Surgical causes	05	07.14%
Nephrotoxic drugs	03	04.29%
Rhabdomyolysis	03	04.29%
Total	70	100%

Table-5: Selected Investigations findings of AKI patients requiring haemodialysis (n= 70).

Investigations findings	Number of patients	Percentage (%)
Urea >180 mg/dl	55	78.57%
Creatinine > 6.8 mg/dl	70	100%
Serum potassium > 7 mmol/L	03	04.29%
Blood P ^H < 7.2	02	02.86%
CXR P/A view findings of pulmonary oedema	49	70.00%

Table-6: Indications of haemodialysis of AKI patients (n =70).

Indications	Frequency	Percentage (%)
Refractory fluid overload	49	70.00%
Uraemic encephalopathy	16	22.86%
Hyperkalemia	03	04.28%
Metabolic acidosis	02	02.86%
Total	70	100%

Table-7: Outcome of AKI patients requiring haemodialysis (n= 70).

Outcome	Frequency	Percentage (%)
Improved	55	78.57%
Progressed to ESRD	06	08.57%
Absconded	04	05.71%
Expired	05	07.15%
Total	70	100%

DISCUSSION:

The present study was done on 70 patients of AKI who required haemodialysis support in dialysis unit of medicine department of Jahurul Islam Medical College Hospital, Kishoreganj during the time period from Jan-2018 to Dec-2020. In this study, there was an overall male preponderance (70%) with age range of 13-40 years (48.57%). Ibrahim et al. also found male preponderance and predominant young patients in their study in Ethiopia.³ The most common presenting features were oliguria, body swelling, haematuria, features of pulmonary edema and encephalopathy. Emen-Chioma from Nigeria and Bagshaw from Calgary, Alberta Canada also found oliguria, body swelling, haematuria, features of pulmonary edema and encephalopathy in their study.^{4, 5}

In this study, Sepsis was the leading (30%) cause of AKI requiring haemodialysis which was secondary to UTI, pneumonia, infected diabetic foot, viral hepatitis, febrile neutropenia, and secondary bacterial peritonitis. Hypovolemia due to diarrheal illness, vomiting, blood loss and acute pancreatitis was the cause of AKI in 21.42% of patients requiring haemodialysis. AGN was found in 10 patients (14.29%) requiring haemodialysis. The pregnancy related causes of AKI requiring haemodialysis were found in 7 patients (10%) and mainly due to severe preeclampsia, puerperal sepsis and postpartum haemorrhage. 6 (8.57%) patients had AKI superimposed on CKD, with the most common cause of CKD being diabetes and hypertension. Obstructive uropathy and postoperative AKI were found in 5 patients. The most common nephrotoxins were NSAIDs and aminoglycosides mainly gentamycin. Rhabdomyolysis following physical assault and RTA was found in 3 patients.

In contrast to developed countries infections, hypovolemia, AGN, obstetric complications, surgical causes and nephrotoxins are the major cause of AKI in the developing countries. This is also reflected in this study. Sepsis was the most common (53.1%) etiology of AKI followed by Hypovolemia (9.4%), biological toxins (8.4%), nephrotoxic drugs and chemicals (7.4%), cardiac causes (7.4%), and acute glomerulonephritis (1.9%) in the study conducted by Vikrant S et al. in India in 2018.⁶ The most common causes of AKI were hypovolemia (22.5%), AGN (21.9%) and pregnancy related causes (18.5%) in the study conducted by Ibrahim et al. in Ethiopia in 2016.³ Similar results were found in studies done in Africa, where sepsis, hypovolemia and AGN were the common causes of AKI.⁷⁻¹¹

All the pregnancy related causes which includes severe preeclampsia/eclampsia, puerperal sepsis and postpartum haemorrhage are preventable. This indicates the need for increasing access to appropriate and good quality prenatal and emergency obstetric care services.

The most common indications for haemodialysis of AKI patients were refractory fluid overload (70%) leading to respiratory failure, uraemic encephalopathy

(22.86%) and hyperkalemia (4.28%). Serum creatinine was > 6.8 mg/dl in most of the patients. Blood urea was > 180 mg/dl in 55 patients. 49 patients developed pulmonary oedema. Only 3 patients developed severe hyperkalemia that did not respond to medical treatment. Haemodialysis was done for 2 to 4 hours in every session. The average number of dialysis sessions was 4, with a maximum of 18 and a minimum of 3. Ibrahim et al. in Ethiopia in 2016 also found most common indications to be refractory fluid overload (89.4 %), followed by uremic signs and symptoms (61.1%) for haemodialysis and average number of dialysis session was 4.8 in their study.³ Our results are in contrast to those from an ICU center in Morocco and that of three health boards in Scotland, which has found the most common indications to be refractory hyperkalemia, followed by metabolic acidosis.^{8,9}

In this study, 78.57% of AKI patients requiring haemodialysis were improved and discharged, 08.57% patients were progressed to end stage renal disease, 07.15% patients were expired and 05.71% patients were absconded. Ibrahim et al. found 53% of AKI patients requiring haemodialysis were improved, 07.30% patients were progressed to end stage renal disease, 29.1% patients were expired and 10.6% patients were absconded.³ A global meta-analysis of studies done across the globe which has shown a pooled AKI-associated mortality rate 49.4% for AKI requiring haemodialysis.²

The mortality rate of 7.15 % of our study is much lower than other study most probably due to early diagnosis, proper counseling of patients about fatality of AKI and early initiation of hamodialysis. 05.71 % of AKI patients requiring haemodialysis were absconded most probably due to poor economical conditions.

Conclusion:

Consistent with other studies from developing world, this study has also shown that sepsis, hypovolemia, AGN, obstetric causes, surgical causes and

nephrotoxins are the primary causes of AKI requiring haemodialysis. Most of these causes can be prevented with appropriate management of infections, simple interventions such as health education on oral rehydration, quality prenatal and emergency obstetric care, and taking appropriate precautions when prescribing potentially nephrotoxic medications. Haemodialysis played an important role in the treatment of complications of AKI patients. So, expansion of haemodialysis services to all parts of the country is necessary.

Abbreviations: AKI - Acute Kidney Injury; AGN - Acute Glomerulonephritis; KDIGO - Kidney Disease- Improving Global Outcome; RRT - Renal Replacement Therapy; SPSS - Standard Statistical Package for Social Science; UTI - Urinary Tract Infection; LVF - Left Ventricular Failure; NSAIDS - Non Steroidal Anti Inflammatory Drugs; USA - United States of America; CKD - Chronic Kidney Disease; ESRD - End Stage Renal Disease.

Conflict of interest: We have no conflict of interest.

References:

1. Kidney Disease: Improving Global Outcomes (KDIGO) Acute Kidney Injury Work Group. KDIGO clinical practice guideline for Acute kidney injury. *Kidney International Supplements*. 2012;2(1):1-138.
2. Susantitaphong P, Cruz DN, Cerda J, Abulfaraj M, Alqahtani F, Koulouridis J, et al. World incidence of AKI: a meta-analysis. *Clin J Am Soc Nephro*. 2013; 18(1):1482-93.
3. Ibrahim A , Momina M. Ahmed , Seman Kedir and Delayehu Bekele. Clinical profile and outcome of patients with acute kidney injury requiring dialysis. *BMC Nephrology* 2016;17:91.
4. Emem-Chioma PC, Alasia DD, Wokoma FS. Clinical outcome of dialysis treated acute kidney injury patients at the university of port Harcourt teaching hospital. *Nigeria ISRN Nephrology*. 2013;13:1-6.

5. Bagshaw SM, Laupland KB, Doig CJ, Mortis G, Fick GH, Mucenski M, Gondinez-Luna T, Svenson LW, Rosena T. Prognosis for long term survival and renal recovery in critically ill patients with severe acute renal failure: a population based study. *Critical Care*. 2005;9(6):R700–9.
6. Vikrant S, Gupta D, Singh M. Epidemiology and outcome of acute kidney injury from a tertiary care hospital in India. *Saudi J Kidney Dis Transpl*. 2018;29:956-66.
7. Floege J, Johnson RJ, Feehally J. *Comprehensive clinical nephrology*. 4th ed. St. Louise: Elsevier Saunders; 2010.
8. Maoujoud O, Zajjari Y, Asseraji M, Aatif T, Ahid S, Oualim Z. Commentary: the practice of dialysis in the ICU in a developing country. *Ethn Dis*. 2014; 24(2):226–8.
9. Okunola Y, Ayodele O, Akinwusi P, Gbadengesin B, Oluyombo R. Haemodialysis practice in a resource-limited setting in the tropics. *Ghana Med J*. 2013;47(1):4–9.
10. Kaballo BG, Khogali MS, Khalifa EH, Khaiii EA, Ei-Hassan AM, Abu-Aisha H. Patterns of “severe acute renal failure” in a referral center in Sudan. *Saudi J Kidney Dis Transplant*. 2007;18(2):220–5.
11. Godara S, Kute V, Trivedi H, Vanikar A, Shah P, Gumber M, Patel H, Gumber V. Clinical profile and outcome of AKI related to pregnancy in developing countries: a single center study from India. *Saudi J Kidney Dis Transpl*. 2014; 25(4):906–11.