

ORIGINAL ARTICLE

Incidence of Acute Kidney Injury (AKI) Secondary to Acute Gastroenteritis in Patients Presenting to Ayub Teaching Hospital, AbbottabadNIGHAT JAMAL¹, FAIZAN BANARAS², MAHNOOR ASHFAQ³, TEHRIM TAHIR⁴, IQRA JADOON⁵, ALI RAZA⁶¹Assistant Professor of Medicine, Ayub Teaching Hospital, Abbottabad²Postgraduate Resident Medicine, Allied Ayub Teaching Hospital, Abbottabad^{3,4,5}Postgraduate Resident Medicine, Ayub Teaching Hospital, Abbottabad⁶Postgraduate Resident Medicine Allied, Ayub Teaching Hospital, AbbottabadCorresponding author: Faizan Banaras, Email: faizanbanaras958@gmail.com**ABSTRACT**

Background: Acute kidney injury is a decrease in kidney functions that results in reduced glomerular filtration rate, retention of nitrogenous waste products, and disturbances of extracellular volume and electrolytes. The incidence of acute kidney injury is about 20-200 per million, about 7-18% of patients in a hospital.² Acute diarrheal diseases are one of the important causes of preventable acute kidney injury. Improper fluid deficit restoration in diarrheal diseases results in acute kidney injury, manifested as decreased renal function and a rise in serum creatinine level with or without reducing urine output. The injury may range from mild to severe renal dysfunction; sometimes requiring renal replacement therapy.⁴The rapid and effective restoration of extracellular fluid can prevent acute kidney injury.

Materials and Methods: An observational cross-sectional Study, among patients with acute diarrheal illnesses presented to all medical units (A, B, C &D) and the emergency department of Ayub Teaching Hospital, Abbottabad. A total of 140 patients presented in 3 months duration from 1st July – 30th Sep 2022. Data were analyzed by using SPSS 16

Results: In the sample size of 140 patients, the minimum age was 14 years and the maximum age was 70 with a mean of 38 years with a standard deviation of +/- 14 y. Among 140, 80 patients were male and 60 patients were female. Out of 140 patients, 47 were having hypertension, 19 were diabetic and 16 were known, cardiac patients. Urine output of 13 (9.3%) patients was less than 100ml/day, while 46 (32.9%) patients were having 100-400ml/day, 37 (26.4%) patients was having 400-1200ml/day and 44 (31.4%) patients had greater than 1200ml/day. The serum creatinine level was greater than 2.8mg/dl (more than 2 times normal) in 35 patients (25%), and 18 patients were having creatinine levels in the range of 1.5-2.8mg/dl (up to 2 times greater than normal) and 87 patients had creatinine levels in the normal range (0.7-1.4mg/dl). Out of 140 patients, 41 (29.3%) presented to the tertiary care hospital in shock (systolic blood pressure less than 90mmhg), 96 (68.6%) were normotensive and 3 (2.1%) patients were hypertensive.

Conclusion: The incidence of acute kidney injury in patients presenting with acute gastroenteritis to a tertiary care hospital is 25%, due to hypovolemia caused by fluid losses in acute diarrheal illnesses. It can be prevented by prompt diagnosis and treatment by fluid administration.

Keywords: Acute kidney injury (AKI), Acute renal failure(ARF), Eschericia coli (E.Coli) RIFLE (Risk, Injury, Failure, Loss, End Stage kidney disease)

INTRODUCTION

Acute kidney injury (AKI) is a decrease in kidney functions that results in reduced glomerular filtration rate (GFR), retention of nitrogenous waste products, and disturbances of extracellular volume and electrolytes. The term AKI replaced acute kidney failure (ARF) as it describes kidney dysfunction as a continuum instead of a discrete finding of failed kidney function.¹ The incidence of AKI is about 20-200 per million, about 7-18% of patients in hospital and about 50% of patients admitted to the intensive care unit.²It can be caused by either decreased renal perfusion without damaging renal tubules or by the decrease in primary filtering capacity of the glomerulus. The mortality rate due to AKI rises to 50% among patients and has changed a little over the last 15 years.³

Acute diarrheal diseases are one of the important causes of preventable acute kidney injury. Improper fluid deficit restoration in diarrheal diseases results in AKI, manifested as decreased renal function and a rise in serum creatinine level with or without reducing urine output. The injury may range from mild to severe renal dysfunction, sometimes requiring renal replacement therapy.⁴Volume depletion as a result of diarrheal losses is the most common precipitating factor of acute kidney failure (ARF). The rapid and effective restoration of extracellular fluid can prevent ARF.⁵ Studies have shown that certain pathogens causing acute gastroenteritis, like E.coli O157:H7 serotype, Shigella dysenteriae may result in toxins-mediated injury of nephrons and subsequent loss of hyperfiltration, which can result in a long term systemic hypertension and decreased renal functions.⁶Among various causing factors in patients admitted with AKI in tertiary care Hospitals, more than 20% are due to acute diarrheal illnesses.⁷

Objective: The aim of our study is to determine the incidence of acute kidney injury (AKI) in infectious and non-infectious diarrheal illness requiring hospitalization and to identify correlates and outcomes of diarrhea-associated AKI in Ayub teaching hospital, Abbottabad.

MATERIALS AND METHODS

Acute kidney injury: Defined as, an increase in serum creatinine by 0.3mg/dl or more within 48 hours. By RIFLE criteria, AKI is defined as an increase in serum creatinine to 2 times baseline or more within the last 7 days or urine output less than 0.5 mL/kg/h for 12 hours.⁸

Acute gastroenteritis: The diarrheal disease of rapid onset with or without accompanying symptoms or signs such as nausea, vomiting, fever, or abdominal pain.

Study design, population and sample size: It's an observational cross-sectional study, done in patients who presented with the history, signs, and symptoms of acute diarrheal diseases without any prior known kidney diseases, to the Emergency Department and all units of Medicine (A, B, C, and D) of Ayub Teaching Hospital, Abbottabad. A total of 140 patients were stratified over the duration of 3 months, from 1st July- 30th Sep, 2022.

Data collection tools and analysis: A bioproforma containing relevant variables was made, after taking a detail history and confirming the acute diarrheal diseases among patients, fresh renal function tests were ordered and printed; reports were entered along with other diagnosing criteria of acute kidney injury and then analyzed by using SPSS 16. Data will be presented in the form of tables and diagrams.

RESULTS

A total of 140 patients, presented to the tertiary care hospital with signs and symptoms of acute gastroenteritis evaluated. The

minimum age was 14 years and the maximum age was 70 with a mean of 38 years with a standard deviation of +/- 14 y. Among 140, 80 patients were male and 60 patients were female. Out of 140 patients, 47 were having hypertension, 19 were diabetic and 16 were known, cardiac patients. Among 140 patients, the urine output of 13 (9.3%) was less than 100ml/day, while 46 (32.9%) patients was having 100-400ml/day, 37 (26.4%) patients was having 400-1200ml/day and 44 (31.4%) patients had greater than 1200ml/day. Out of 140 patients, 96 (68.6%) had normal serum urea levels (20-45mg/dl) while 44 (31.4%) had raised serum urea levels. The serum creatinine level was greater than 2.8mg/dl (more

than 2 times normal) in 35 patients (25%), and 18 patients were having creatinine levels in the range of 1.5-2.8mg/dl (up to 2 times greater than normal) and 87 patients had creatinine levels in the normal range (0.7-1.4mg/dl).

Among 140 patients, 90 patients had no history of any drug used in the last 2 weeks, 27 patients were using antibiotics, 11 patients had a history of NSAIDs usage, 5 patients were on Antituberculous therapy and 5 were receiving chemotherapy. Out of 140 patients, 41 (29.3%) presented to the tertiary care hospital in shock (systolic blood pressure less than 90mmhg), 96 (68.6%) were normotensive and 3 (2.1%) patients were hypertensive.

Table 1: Descriptive and Statistics of Study.

Age of patients	Gender	Comorbidities	Urine output Normal: (0.5ml/kg/h or >1200ml/day)	Blood urea levels Normal 20-45mg/dl)	Blood creatinine levels (normal 0.7-1.4mg/dl)	Drug used in last 2 weeks	Blood pressure
Min: 14 Max: 70 Mean: 38 Std. Deviation: +/- 14	Total: 140 Males: 80 (57.1%) Females: 60 (42.9%)	Hypertension: 47 (33.6%) Diabetes Mellitus: 19 (13.6%) Ischemic Heart disease: 16 (11.5%) Tuberculosis: 5 (3.5%)	<100ml: 13 (9.3%) 100-400ml: 46 (32.9%) 400-1200ml: 37(26.4%) >1200ml: 44 (31.4%)	Normal: 96 (68.6%) Increased: 44 (31.4%)	<1.4mg/dl: 87 (62.1%) 1.5-2.8: 18 (12.9%) >2.8: 35 (25%)	No Drug: 90 Antibiotics: 27 Nsaids: 11 Anti TB: 5 Chemotherapy: 5	Shock: 41 (29.3%) Normal: 96 (68.6%) Hypertensive: 3 (2.1%)

DISCUSSION

This study was conducted among patients with acute diarrheal illnesses. A total of 140 patients were presented to tertiary care hospital with signs and symptoms of acute diarrheal illnesses within the age range of 14-70 years old with a mean value of 38 years and standard deviation of +/-14. Among them 80 (57.1%) were male and 60 (42.9%) were female. It is in concordance with Mahajan et al., Kumar et al., and Inbanathan et al.^{9,10,11} The males are more exposed to environmental factors causing food poisoning outside the home. The comorbid conditions observed in the present study were hypertension in 47 (33.6%) patients, Diabetes mellitus in 19 (13.6%) patients, and ischemic heart diseases in 16 (11.5%) patients. Prakash et al. study, comorbidity was hypertension (34.7%), diabetes mellitus (28.3%), and Ischemic heart disease (30.4%). The difference is due to the latter study being conducted in the intensive care unit while this study was conducted in all medical wards of tertiary care hospitals.⁵

Among 140 patients, 44 (31.4%) had normal urine output about greater than 1200ml/day (0.5ml/kg/h), 37 (26.4%) had urine output within the range of 400-1200ml/day (0.5ml/kg/h in 6hrs), 13 (9.3%) were anuric i.e. urine output less than 100ml/day (0.5ml/kg/h in 24 hr) while 46 (32.9%) patients were having oliguria i.e. urine output within the range of 100-400ml (0.5ml/kg/h in 12 hr) which is similar to the result shown by Inbanathan et al.¹¹ out of 140 patients, about 44 (31.4%) having raised serum urea levels i.e. >45mg/dl while the rest were having normal serum urea levels (20-45mg/dl). The serum creatinine levels of 87 (62.1%) patients was in normal range (0.7-1.4mg/dl), 18 (12.9%) patients were having up to 2 times normal (1.4-2.8mg/dl) and 35 (25%) patients had more than 2 times normal (>2.8mg/dl). By RIFLE criteria,⁸ among 140 patients presented with acute gastroenteritis, included in this study, and 35 (25%) were having acute kidney injury which is in concordance with various studies done previously i.e. 25%, 23.8%, and 20% by Marzuillo et al., Mostafi et al., and Arshad et al respectively.^{12,13,7}

In our study, 90 patients had no history of any drug used in the last 2 weeks while 27 patients used antibiotics for the control of symptoms. 11 were using NSAIDs for pain relief, 5 were on anti-tuberculous therapy and 5 were on chemotherapy. 41 (29.3%) patients were presented to the tertiary care hospital in hypovolemic shock (systolic blood pressure less than 90mmhg) along with signs of dehydration.

CONCLUSION

In this prospective cross-sectional study, done for 3 months duration from 1st July to 30th Sep 2022 among 140 patients who presented with signs and symptoms of acute gastroenteritis, 35 (25%) patients developed acute kidney injury. It suggests that one-quarter of patients who progressed to acute kidney injury are due to hypovolemia caused by fluid losses in acute diarrheal illnesses. It can be prevented by prompt diagnosis and treatment by fluid administration.

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