

# Clinical Profile of Renal Involvement in Acute Gastroenteritis Patients

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## Abstract

**Background:** In India, acute kidney injury (AKI) due to diarrhea is not uncommon in adults and elderly people. Therefore, understanding of the clinical spectrum of the disease is needed to devise methods to improve the final outcome due to this problem.

**Materials and Methods:** We studied 100 patients admitted to medical wards who met the inclusion and exclusion criteria after obtaining the informed consent. The clinical and laboratory data were collected at admission and then on daily basis. All patients were followed up during the hospital stay and outcome of the patient was recorded (survivors/non survivors).

**Results:** Majority of patient in the present study are above fifth decade of age with a mean age of 53.50. The most common presenting manifestation in the patient with AKI following gastroenteritis is oliguria (30%). The common comorbid conditions noted in the present study are hypertension 7% and diabetes mellitus 6%. Hemodialysis was required in 30% of patients in the present study. The rest 70% were managed conservatively and had complete recovery. Mortality rate in our study was 4%.

**Conclusion:** AKI following acute gastroenteritis is not uncommon in developing country like ours. General improvement in standard of living, early use of oral rehydration therapy and fluid therapy to correct dehydration, and creating awareness in primary care physicians about the high incidence of AKI following gastroenteritis will solve this problem. Early detection and referral of these patients will bring down mortality in these patients. Hemodialysis plays an important role in improving the prognosis.

**Key words:** Acute kidney injury, Gastroenteritis, Hemodialysis

## INTRODUCTION

Acute kidney injury (AKI), previously known as acute renal failure (ARF), characterized by sudden impairment of kidney function resulting in retention of nitrogenous and other waste products normally cleared by kidneys. AKI is not a single disease but, rather a heterogenous group of condition that share a common diagnostic features, especially increase in the blood urea nitrogen concentration and/or increase in plasma or serum creatinine concentration, often associated with reduction in urine volume. AKI can range in severity from asymptomatic

and transient changes in laboratory parameters of glomerular filtration rate to overwhelming and rapidly fatal derangements in effective circulating volume regulation and electrolyte and acid-base composition of the plasma.<sup>1</sup>

AKI complicates 5-7% of acute care hospital admissions and up to 30% of admissions to Intensive Care Unit (ICU). AKI is associated with a markedly increased risk of death in hospitalized individuals, particularly in those admitted to the ICU where inhospital mortality rates may exceed 50%.

AKI is one of the most common clinical conditions encountered by physicians and nephrologists throughout the world. Due to the climatic conditions, overcrowding and poor socioeconomic factors, AKI in India differs from the world. There is no clear-cut data on the incidence, causes, and recovery from the disease. Most common causes of AKI in India are acute diarrheal disease, malaria, leptospirosis, snakebite, insect stings, intravascular hemolysis due to septicemia, chemical poisoning such as

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copper sulfate, vasmol, and pregnancy. Overall, these causes constitute 40% ARF in India.<sup>2</sup>

## MATERIALS AND METHODS

### Source of Data

The present study will be descriptive or exploratory in nature.

Patients who were diagnosed to have AKI following diarrheal disease and fulfill inclusion and exclusion criteria getting admitted to KR Hospital, Mysore, during December 2012 to September 2014.

### Method of Collection of Data

- Study design: Descriptive, non-interventional study in a tertiary care hospital
- Sample size: 100
- Sampling method: Purposive random sampling
- Duration of study: December 2012 to September 2014.

### Inclusion Criteria

- All individual subjects above 18 years presenting with acute Gastroenteritis
- patients with progressive elevation serum creatinine >0.3 mg/dl or 50% higher than baseline within a 24-48 h period or reduction in urine output to 0.5 ml/kg/h for longer than 6 h.<sup>1</sup>

### Exclusion Criteria

- Age younger than 18 years
- Patients with chronic renal insufficiency
- Patients who are initially considered as AKI but subsequently found to be suffering from long-standing renal disease.

### Method of Study

Data will be collected using a pretested pro forma meeting the objectives of the study. Detailed history and necessary investigations will be undertaken. The purpose of the study will be explained to the patient, and informed consent obtained.

Patients are selected for study who satisfied all inclusion and exclusion criteria.

patients with progressive elevation of serum creatinine >0.3 mg/dl or 50% higher than baseline within a 24-48 h period or reduction in urine output to 0.5 ml/kg/h for longer than 6 h. Hyperkalemia is defined when sr. potassium >5.5 mEq/L with suggestive electrocardiogram changes.

The clinical and laboratory data are collected at admission and then on daily basis. Data recorded include patients'

characteristics, comorbid medical conditions, dialysis requirement, total duration of hospital stay, and final outcome.

To all patients necessary investigations are carried out.

### Statistical Analysis

Data analysis and interpretation:

- Data was entered into Microsoft Excel and analyses were done using the Statistical Package for Social Sciences (SPSS) for Windows software (version 18.0; SPSS Inc., Chicago, USA)
- The level of significance was set at 0.05.

## RESULTS

The age of patients with AKI following gastroenteritis in our study ranged from 18 to 80 years with mean age 53.50 years. Majority of patients were after the fifth decade with peak incidence in the age group of 51-60 (28%) followed by 61-70 (25%).

AKI following gastroenteritis was more common among males (54%) when compared to females (46%).

Diarrhea, nausea and vomiting were present in all patients. Other common complaints were fever (33%) followed by oliguria (30%), pain abdomen (20%), dyspnea (13%). Neurological manifestation such as altered sensorium was present in 6% of cases. Uncommon manifestations are anuria (2%), abdominal distension (2%), and bleeding manifestations (1%).

In our study, 18% of AKI patients had associated comorbid conditions. Hypertension and diabetes were common with an incidence of 7% and 6%, respectively. Other comorbid conditions found were ischemic heart disease (IHD) (2%), pulmonary tuberculosis (TB) (1%), HIV (1%), malignancy (1%). Hypovolemic shock was the most common complication found in 61% of cases. Other frequent complications observed were anemia (19%), pulmonary edema (14%), hyperkalemia (7%), and metabolic encephalopathy (7%). Other complications encountered in our study were volume overload (2%) and bleeding manifestation (1%).

Hb <12 g/dl was found in 19% of cases. The most common electrolyte abnormality observed in the present study is hyponatremia (22%), and hyperkalemia was noted in 7% of cases.

Urinalysis revealed albuminuria in 13% of cases and glucosuria in 6% of cases.

Out of 100 cases studied, 70 cases were treated conservatively and 30 cases required hemodialysis.

Most of the patients (52%) were discharged within 1 week, while 37% of patients were discharged between 1 and 3 weeks. 11% of patients were treated for more than 3 weeks.

Out of 100 cases studied, 96 patients were completely recovered and death occurred in 4%.

## DISCUSSION

AKI is one of the most common clinical conditions encountered by physicians and nephrologists throughout the world. It is associated with significant mortality and morbidity. The incidence of in hospital AKI is difficult to estimate as there is no registry of its occurrence exists and because up to recently there was no standardized definition.

- The epidemiology of AKI differs tremendously between developed and developing countries owing to difference in demographics, economics, geography, and comorbid disease burden. Diarrheal illness, infections such as malaria and leptospirosis, envenomation from snake are common medical causes in developing countries including India. Complications of major surgeries, hemolytic uremic syndrome are common in developed countries
- The spectrum of renal failure in the adult population and the factors predicting poor outcome is not well defined in literature. Identification of risk factors and poor prognostic markers in these patients help in planning strategies to prevent AKI and to prioritize the utilization of sparse and expensive therapeutic modalities, especially in developing countries like ours
- There is very little data in the incidence of AKI in India due to the lack of central registry. The etiology, course, and outcome differ in various parts of India
- Prakash *et al.*, noted that the main etiological factor for ARF encountered was volume depletion secondary to gastrointestinal fluid loss (35.2%). Similar results were found in Mahajan *et al.*, where in it was noted that the volume depletion was the most common precipitating factor for ARF and in Jayakumar *et al.*, study it was found that among the medical causes of ARF acute diarrheal disease was the most common<sup>3,4</sup>
- AKI following volume depletion due to gastrointestinal fluid loss is common in India. Diarrheal diseases are common in India due to poor socioeconomic conditions, poor access to treatment, ignorance about personal hygiene, overcrowding, and climatic conditions which supports the propagation of

infection. Lack of health-care facilities in rural areas and delay in correction of dehydration are probably responsible for AKI following gastroenteritis

- The present study consisted of 100 patients in the age group between 18 and 80 years with the mean age of 53.50 with 54% being male and 46% female. Majority of patients were >50 years of age. The similar age distribution is seen in Mahajan *et al.*, and Kumar *et al.*, studies.<sup>5,6</sup> Sex distribution was different in Mahajan *et al.* study with males being 70.5%. This is probably due to varied etiology of the study; we have considered only one etiology that is gastroenteritis. Jayakumar *et al.*, had similar sex distribution
- The clinical features observed in our study apart from diarrhea, nausea and vomiting which were present in all patients were fever 33%, oliguria 30%, pain abdomen 20%, dyspnoea 13%, altered sensorium 6%, anuria 2%, abdominal distension 2%, and bleeding manifestations 1%. The observations in Prakash *et al.* study were oliguria 47%, anuria 27%, central nervous system (CNS) manifestations 27%, bleeding diathesis in 10.3%, edema 12.9%, and pulmonary edema in 4.2%. The disparity in clinical features among the two studies may be due to varied etiology considered by Prakash *et al.*
- The comorbid conditions observed in the present study are hypertension-7%, diabetes mellitus-6%, IHD-2%, pulmonary TB-1%, HIV-1%, malignancy-1%. In Prakash *et al.* study, comorbidity was seen in 24 (52%) patients; hypertension (34.7%), diabetes mellitus (28.3%), and coronary artery disease (30.4%). The difference was probably because the study was done in ICU setting only
- The major complications noted in our study were hypovolemic shock-61%, volume overload-2%, pulmonary edema-14%, anemia-19%, bleeding manifestations-1%, hyperkalemia-7%, and metabolic encephalopathy-7%. The complications noted in his study were CNS manifestations in 27%, bleeding diathesis in 10.3%, edema in 12.9%, hyperkalemia in 2.7%, and pulmonary edema in 4.2%
- Out of 100 patients studied, 70 were treated conservatively and 30 required hemodialysis. The indication for dialysis is the presence of uremic symptoms, persistent extracellular volume expansion, and hyperkalemia unresponsive to conservative measures. The dialysis requirement was similar to other studies. In Mahajan *et al.*, dialysis requirement was 33.5% and in study by Liano *et al.*, it was 36%.<sup>7</sup> Contrary to our study, dialysis requirement in Jayakumar *et al.* was 69% in the Program to Improve Care in Acute Renal Disease (PICARD) study was 64% and Shivakumar *et al.*, was 83%.<sup>8,9</sup> This was probably due to indications for dialysis considered and

**Table 1: Correlation between the line of management and different parameters**

Parameters	n	Mean	SD	t	P
SBP					
Medical	70	95.97	19.079	1.757	0.085
Hemodialysis	30	87.87	21.965		
DBP					
Medical	70	63.54	10.374	0.952	0.346
Hemodialysis	30	60.80	14.245		
RR/min					
Medical	70	14.39	1.852	-3.132	0.004
Hemodialysis	30	17.03	4.468		
Blood urea (mg/dl)					
Medical	70	104.86	32.125	-4.401	0
Hemodialysis	30	148.60	50.210		
Serum creatinine (mg/dl)					
Medical	70	3.501	1.1218	-8.210	0
Hemodialysis	30	7.237	2.3812		

SBP: Systolic blood pressure, DBP: Diastolic blood pressure, SD: Standard deviation, RR: Relative risk

**Table 2: Correlation between the line of management and different parameters**

Parameters	Hemodialysis	Medical management	Total	P
Dyspnoea				
Present	10	3	13	<0.001 (F)
Absent	20	67	87	
Altered sensorium				
Present	6	0	6	<0.001 (F)
Absent	24	70	94	
Oliguria				
Present	17	13	30	<0.05
Absent	53	17	70	
Hypertension				
Present	3	4	7	0.35 (F)
Absent	27	66	93	
Diabetes mellitus				
Present	2	4	6	0.58 (F)
Absent	28	66	94	
IHD				
Present	1	1	2	0.51 (F)
Absent	29	69	98	
Dehydration				
Present	28	66	94	0.58 (F)
Absent	2	4	6	
X-ray				
Congestion	14	1	15	<0.001
Normal	16	69	85	

IHD: Ischemic heart disease

difference in study population

- In our study, most patients were discharged within 1<sup>st</sup> week (48%) and by 1-3 weeks 41% were discharged and only 11% required treatment for more than 3 weeks. The median length of hospital stay was 25 days in PICARD study. This was probably because PICARD study was undertaken in critically ill patients and varied etiology considered
- The prognosis of patients with AKI is directly related to cause of renal failure and, to great extent,

to the duration of renal failure before therapeutic intervention. In our study, 70% recovered with conservative management and 26% recovered with hemodialysis. Mortality was 4%. Prognostic factors are older age, multiorgan failure (i.e., the more the organ that fails, the worse is prognosis), circulatory failure, vasopressor support, and need for renal replacement therapy (RRT)

- Our mortality rate was much lesser compared to other studies. In Shivakumar *et al.* study, the mortality rate was 53.7%. The most significant factor for high mortality was the time interval from the onset of ADD to the diagnosis of ARF. The difference in mortality rate was probably due to the increasing percentage of patients needed RRT (83%) in this study and varied indications for dialysis. Mortality in Mahajan *et al.*, the study was 41.2%. Among the survivors, 22.7% had complete renal recovery, 31.1% had partial renal recovery while 8.6% remained dialysis dependent. The factors which were found to be associated with+ increased mortality were; age  $\geq 70$  years, presence of previous chronic illness, ARF precipitated by cardiac failure and infection, need for RRT, oliguria, and increasing numbers of failed organs.

On comparing the groups taken up for medical management and hemodialysis it was found that there was no statistically significant difference between the groups with regards to age, gender, co-morbid conditions, blood pressure (both systolic and diastolic) at presentation and presence of dehydration. However statistically significant difference was found with regards to parameters like respiratory rate, blood urea, serum creatinine levels and with presence of oliguria, dyspnoea, altered sensorium and congestion in chest X-ray. This shows that the parameters which showed statistically significant difference were among the ones which influenced the line of management-patients were taken up for hemodialysis (Tables 1 and 2). This distinction of studying parameters which influence the line of management was not done in other studies reviewed.

## CONCLUSION

AKI following acute gastroenteritis is not uncommon in developing country like ours. General improvement in standard of living, early use of oral rehydration therapy, and fluid therapy to correct dehydration, and creating awareness in primary care physicians about the high incidence of AKI following gastroenteritis will solve this problem. Early detection and referral of these patients will bring down mortality in these patients. Hemodialysis plays an important role in improving the prognosis.

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