

## ORIGINAL ARTICLE

**Incidence of Gastroenteritis Induced Acute Renal Failure and its Associated Risk Factors**NABIHA RIZVI<sup>1</sup>, IQRA IFTIKHAR<sup>2</sup>, ALI ABBAS<sup>3</sup>, MEHRIN FAROOQ<sup>4</sup>, SYED KHURRAM SHEHZAD KAZMI<sup>5</sup>, WASEEM AMIR<sup>6</sup><sup>1</sup>Assistant Professor, Deptt. of Nephrology, LMDC, Lahore<sup>2</sup>Senior Registrar, Deptt. of Medicine, LMDC, Lahore<sup>3</sup>Post Graduate Trainee, Deptt. of Medicine, LMDC, Lahore<sup>4</sup>Associate Professor, Deptt. of Medicine, LMDC, Lahore<sup>5</sup>Assistant Professor, Deptt. of Medicine, LMDC, Lahore<sup>6</sup>Professor, Deptt. of Medicine, LMDC, Lahore

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**ABSTRACT****Objective:** To record the incidence of AKI following acute gastroenteritis and to poor prognostic factors in patients having AKI following gastroenteritis.**Methodology:** We enrolled 92 cases with above 14 years of age diagnosed to have acute kidney injury due to gastroenteritis. Detailed history, clinical examination and laboratory investigations were done at admission. Serum creatinine, urea, potassium were done daily. Other investigations done were liver function tests, urine complete examination, serum sodium levels, ultrasound abdomen and renal failure and its associated factors were recorded.**Results:** We studied 92 patients admitted to our hospital with acute gastroenteritis. Among those 48(54%) patients had AKI whereas 44(46%) patients didn't developed AKI following acute gastroenteritis. AKI was more common in males(72%) as compared to females(28%). The most common manifestation was oliguria and anuria in( 66%)of the cases, (43%) of the patients having AKI had hypertension and (29%) had DM.(94%) patients were managed conservatively and (6%) required hemodialysis.**Conclusion:** We concluded that AKI is highly prevalent in patients with gastroenteritis whereas diarrhea is a major risk factor of AKI.**Keywords:** Gastroenteritis, Acute renal failure(AKI), risk factor**INTRODUCTION**

Gastroenteritis is commonly encountered illness in both developed and developing countries<sup>1</sup>. Although the frequency of diarrhoea seems to be much greater in Pakistan, we do not have access to reliable statistics about this matter. It is believed that the average number of bouts of diarrhoea in industrialised countries is between 0.5 and 2 per person per year. The mortality and morbidity due to AKI associated with diarrhea has decreased in developed countries however developing countries still accounts for more than 2 million deaths annually<sup>2,3</sup> and is associated with impaired physical and cognitive development in resource limited countries<sup>4</sup>. According to the KDIGO definition, acute kidney damage is indicated by a rise in serum creatinine of 0.3 mg/dL or more within 48 hours, an increase in serum creatinine of 1.5 times baseline or more over the previous 7 days, or a urine output of less than 0.5 mL/kg/h for 6 hours.<sup>5</sup>

AKI is very commonly seen in both hospitalized and non hospitalized patients.6.5-7% of hospitalized patients encounters AKI whereas 30% of patients admitted in intensive care unit suffer AKI<sup>7</sup>. There are multiple etiologies of AKI out of which gastroenteritis is one of the very common etiology in developing countries. Data on incidence of gastroenteritis induced AKI is lacking. The purpose of this study is to identify the gastroenteritis induce AKI in our population and factors influencing it<sup>6</sup>.

**MATERIALS AND METHODS**

In this study, we enrolled 92 cases of patients older than 14 years of age who were diagnosed to have acute kidney injury due to gastroenteritis as defined by KDIGO (increase in serum creatinine by 0.3mg/dL or more within 48 hours or increase in serum creatinine to 1.5 times baseline or more within the last 7 days or urine output less than 0.5 mL/kg/h for 6 hours). This diagnosis was made over the course of the previous three months in our hospital. Patients who had been diagnosed with acute kidney injury (AKI) for reasons other than gastroenteritis, chronic kidney disease (CKD) patients who had acute gastroenteritis, and patients who had left the hospital against medical advice were not included in the research. Detailed history, clinical examination and laboratory investigations were done at admission and daily subsequently and recorded in a performa. Serum creatinine, urea, potassium were

done daily. Other investigations done were liver function tests, urine complete examination, serum sodium levels, ultrasound abdomen.

**RESULTS**

92 cases admitted included in this study with the complaint of acute gastroenteritis. Among those 48(54%) patients had AKI whereas 44(46%) patients didn't developed AKI following acute gastroenteritis. The age ranged from 14 to 90 years and the mean age of patients was 49.4. Majority of the patients who developed AKI were above 50 years of age(79%). AKI was more common in males(72%) as compared to females(28%). The most common manifestation was oliguria and anuria in( 66%)of the cases. The severity of diarrhea and vomiting had direct relation with AKI development. Patients who had mild, moderate and severe diarrhea were (12%), (27%) and (60%) respectively who developed AKI. Whereas the patients who developed AKI having mild vomiting were (35%), moderate were (29%) and severe were (31%) and (4%) had no vomitings. The other associated symptoms were fever(18%), pain abdomen(53%), dyspnea(14%), neurological symptoms(8%). The complications noted were hypovolemic shock(16%) and pulmonary edema(8%). Most common electrolyte imbalance was hyponatremia(33%) whereas (12%) patients had hyperkalemia. (43%) of the patients having AKI had hypertension and (29%) had DM. (94%) patients were managed conservatively and (6%) required hemodialysis.

**DISCUSSION**

The epidemiology of AKI varies widely in developed and under developed countries due to economic, geographic and comorbid disease burden. Gastroenteritis is one of the major cause of AKI in hospitalized patients due to contaminated water and unhygienic conditions and poor access to timely management of dehydration which is probably responsible for AKI. Ainan et al reported diarrhea an important risk factor of AKI with a prevalence of (23%) which is one of the most easily preventable cause by timely and adequate hydration<sup>8</sup>. If not managed properly and timely it can lead to adverse and serious consequences. Gastroenteritis can cause AKI in 1/10 cases and significantly associated with a 5 times more in mortality<sup>9</sup>.

The incidence of AKI following gastroenteritis is not very well studied in our country. In this study the incidence comes out to be quiet high that is about (54%) and is probably due to ignorance leading to delayed treatment resulting in renal compromise. Mostly patients having AKI are above 50 years of age which is similar to most of the other studies<sup>10-12</sup>. The results of this study revealed that male population suffered AKI more that is (72%) which is comparable to study done by J Ibanathan et al in our neighbouring country India<sup>10</sup>. The severity of diarrhea and vomiting has definitive role in renal injury as manifested by our results. (60%) patients had severe diarrhea whereas there is not much difference in different categories of vomiting because most of the patients in mild and moderate group had severe diarrhea as well which led to AKI.

The other clinical features include oliguria and anuria(66%), pain abdomen(53%), fever(18%),dyspnea(14%),neurological symptoms(8%).Oliguria and pain abdomen was quiet high in our study as compare to study done by J Ibanthan i.e (32%) and (20%) respectively whereas patients who were febrile were (18%) lower percentage than Ibanthan study( 33%),rest of the symptoms were comparable to Ibanthan i.e dyspnea (13%) and neurological manifestations (6%). The complications encountered were hypovolemic shock(16%) and pulmonary edema(8%).Most common electrolyte imbalance was hyponatremia(33%) and (12%) patients had hyperkalemia. Association of AKI with common comorbid that is hypertension and diabetes mellitus was quite high in our study.(43%) of the patients having AKI had hypertension and (29%) had DM. In our study (94%) patients were managed conservatively and (6%) required hemodialysis.

Acute diarrheal diseases are the most common cause of ARF<sup>13</sup> and our research suggests that food poisoning could be one of the factors that contribute to the development of such an entity. The high frequency of acute respiratory distress syndrome (ARFS) is mostly attributable to the delay in reporting symptoms to a medical facility as well as the delayed or poor restoration of diarrheal losses.<sup>14</sup> This may have a significant bearing on our situation because the patients reported their symptoms late owing to their own neglect, and it was revealed that they had severe uremia as well as renal failure. Approximately forty percent of cases of acute kidney injury are brought on by acute diarrheal disease, malaria, leptospirosis, snakebite, insect stings, intravascular hemolysis brought on by septicemia, chemical poisonings such as copper sulfate and vasmol, and pregnancy. Other causes include venomous snakebite, leptospirosis, and leptospirosis.<sup>15-16</sup> In their prospective investigation, Mehta and colleagues connected the influence of climate on AKI that was caused by infectious agents.<sup>17</sup> Basu et al. found that acute kidney injury was present in 41.1% of patients with tropical acute febrile infections.<sup>14</sup> The predominant symptom of these infections at the time of presentation is a high temperature, although none of the patients we presented in our case series exhibited this symptom. *Pseudomonas* and *E. coli* were shown to be present in three of our patients, despite the fact that only a few organisms were found throughout the microbiological analysis. AKI can occur as a consequence of direct invasion of the renal parenchyma by microbiological agents, tubular necrosis as a result of hemodynamic abnormalities, renal inflammation as a result of the immunological response, or iatrogenic renal injury as a result of treatment.<sup>14</sup> The majority of studies that have been conducted to this point have focused on the factors that contribute to AKI in tropical regions or individual diseases that are associated with AKI due to microbial infections; however, these factors were not relevant in our patients' cases.

According to Prakash et al findings, the most common cause of acute respiratory distress syndrome (ARF) was volume depletion caused by gastrointestinal fluid loss (35.2% of cases).<sup>18</sup> The findings of Mahajan et al. and Jayakumar et al. were very similar. In Mahajan et al study, it was found that among the medical causes of ARF, acute diarrheal disease was the most common. Jayakumar et al found that volume depletion was the most common precipitating factor for ARF. In Jayakumar et al

study, it was found that volume depletion was the most common factor.<sup>19</sup>

It stresses the importance of primary care doctors learning more about AKI management. A number of theories on how to best avoid and treat AKI have surfaced in recent years.<sup>20</sup> Risk evaluation, identification, reaction, renal support, and rehabilitation all correspond to distinct interactions with the medical system.<sup>21</sup> It's crucial to know when to seek medical attention and send the patient to a nephrologist as soon as possible.

## REFERENCES

1. Stone DH, Mitchell S, Packham B, Williams J. Prevalence and first-line treatment of diarrhoeal symptoms in the community. *Public Health* 1994; 108:61-8.
2. Cohen ML. The epidemiology of diarrhoeal disease in the United States. *Infect Dis Clin North Am* 1988; 2: 557-70.
3. Kosek M, Bern C, Guerrant RL. The global burden of diarrhoeal disease, as estimated from studies published between 1992 & 2000. *Bull World Health Organ* 2003; 81: 197-204.
4. Guerrant RI, Kosek M, Lima AA, Lorentz B, Guyatt HL. Updating the DALYs for diarrhoeal disease. *Trends Parasitol*: 2002; 18: 281.
5. Piper Julie Hughes, MD, MS; Chief Editor: Vecihi Batuman, MD, FASN. What are the KDIGO criteria of acute kidney injury (AKI)? Updated: Jan 05, 2021
6. Chugh KS, Sakhuja V. Acute renal failure in tropical countries. *Hospmedica* 1987;5:55-9.
7. Kasper DL, Braunwald E, Fauci AS, et al. *Harrison's principles of internal medicine*. 19th edn. New York: McGraw-Hill Medical Publishing Division 2015
8. Arshad A, Ayaz A. Prevalence of risk factors of acute kidney injury in a tertiary care hospital in Pakistan. *J Pak Med Assoc*. 2020 Aug;70(8):1439-1441.
9. Bradshaw C, Zheng Y, Silver SA, Chertow GM, Long J, Anand S. Acute Kidney Injury Due to Diarrheal Illness Requiring Hospitalization?: Data from the National Inpatient Sample. *J Gen Intern Med*. 2018; 33:1520-7.
10. Ibanathan J, Lavanya BU. Clinical Profile of Renal Involvement in Acute Gastroenteritis Patients. *Int J Sci Stud* 2016;4(8):48-52.
11. Mahajan S, Tiwari S, Bhowmik D, Agarwal SK, Tiwari SC, Dash SC. Factors affecting the outcome of acute renal failure among the elderly population in India. A hospital based study. *Int Urol Nephrol* 2006;38:391-6.
12. Kumar SS, Paramananthan R, Muthusethupathi MA. Acute renal failure due to acute diarrhoeal disease. *J Assoc Physicians India* 1990;38:164-6.
13. Carpenter CC, Weatherall DJ, Ledingham JG, Warrell DA. *Cholera*. Oxford Text Book of Medicine 1983 Oxford Oxford University Press:195-8
14. Basu G, Chrispal A, Boorugu H, Gopinath KG, Chandy S, Prakash JA, et al. Acute kidney injury in tropical acute febrile illness in a tertiary care centre – RIFLE criteria validation. *Nephrol Dial Transplant*. 2011;26:524-31
15. Dan LL, Kasper DL, Jameson JL, Fauci AS, Hausel SL, Loscalzo, et al. *Harrison's Principles of Internal Medicine*. 2012 18th ed New York The McGraw-Hill Companies, Inc:2293-308
16. Ahuja MM. *Progress in Clinical Medicine in India*. 1979 3rd ed New Delhi Arnold-Heinemann Publishers:312-26
17. Mehta RL, Pascual MT, Soroko S, Savage BR, Himmelfarb J, Ikizler TA, et al. Spectrum of acute renal failure in the Intensive Care Unit: The PICARD experience. *Kidney Int*. 2004;66:1613-21
18. Kumar SS, Paramananthan R, Muthusethupathi MA. Acute renal failure due to acute diarrhoeal Diseases. *JAPI* 1990;38:164-6
19. Prakash J, Tripathi K, Malhotra V, Kumar O, Srivastava PK. Acute renal failure in Eastern India. *Nephrol Dial Transplant*. 1995;10:2009-12
20. Jayakumar M, Prabakar MR, Fernando EM, Manoranjan R, Venkatraman R, Balaraman V. Epidemiologic trend changes in acute renal failure – A tertiary center experience from South India. *Ren Fail*. 2006;28:405-10
21. Lewington AJ, Cerda J, Mehta RL. Raising awareness of acute kidney injury: A global perspective of a silent killer. *Kidney Int*. 2013;84:457-67
22. Kellum JA, Lameire N. Diagnosis, evaluation, and management of acute kidney injury: A KDIGO summary (Part 1). *Crit Care*. 2013;17:204