National Journal of Multidisciplinary Research and Development
www.nationaljournals.com
ISSN: 2455-9040
Received: 04-05-2021, Accepted: 16-05-2021, Published: 30-05-2021
Volume 6, Issue 2, 2021, Page No. 42-43

Case series- Acute gastroenteritis (age) induced acute kidney injury (AKI) in ICU

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Abstract

Acute gastroenteritis is an important cause of preventable AKI. Inadequate or delayed restoration of diarrhoeal losses results in a very high incidence of AKI [1]. Diarrheal illness is a major reason for hospitalization, but data on consequent acute kidney injury are sparse [2]. Objec- tive of the study is to determine the incidence of AKI in infectious and non-infectious diarrheal ill-ness requiring hospitalization and to identify correlates and outcomes of diarrhea-associated AKI. Noneof the patients had any organism isolated in stool, probably due to prompt initiation of antibi- otics /inadequate culture growth. 3 out of our 6 cases did not require HD and AKI resolved on conservative management alone (fluids, electrolyte management and antibiotics). 3 out of 6 cases had a non-resolving AKI and were dependant on renal replacement therapy (RRT) even at one month post discharge as they still remained oliguric. One recent paper has reported recovery of renal function after a period of dialysis [3]. Frequent electrolyte abnormalities, risk of (catheter related/ bloodstream) infections, and severity of the primary disease are the chief reasons for the persistently high morbidity. Although, there was no mortality in our study.

Keywords: AKI– acute kidney injury, AGE– acute, gastroenteritis, DM– diabetes mellitus, HTN– hypertension

Introduction

Acute diarrhoeal diseases are important cause of preventable AKI in India. Inadequate or delayed restoration of diarrhoeal losses results in a very high incidence of AKI. Acute kidney injury is characterized by abrupt deterioration in kidney function, manifested by an increase in serum creatinine level with or without reduced urine output. The spectrum of injury ranges from mild to advanced, sometimes requiring renal replacement therapy.

The present case series focuses on AKI, offset by hypovolemia, secondary to extrarenal lossses like AGE. Study conducted by Carpenter CCJ, Mondal A, Sack RB, *et al* [4] shows that rapid and effective restoration of ECF volume within four hours can prevent ARF. Simi- lar 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*., it was found that among the medical causes of ARF acute diarrheal disease was the most common [5,6].

Approximately 70% of community-acquired cases of acute kidney injury are attributed to prerenal causes. In a study conducted by Kaufman J, Dhakal M, Patel B, Hamburger R. Community-acquired acute renal failure. American Journal of Kidney Disease. 1991;17(2):191–198, AGE was the most common cause of AKI followed by ischemic ATN (acute tubular necrosis). In these cases, underlying kidney function may be normal, but decreased renal perfusion associated with intravascular volume depletion (e.g., from vomiting or diarrhea) or decreased arterial pressure (e.g., from heart failure or sepsis) results in a reduced glomerular filtration rate.

Acute kidney injury is characterized by sudden kidney function impairment leading to nitrogenous and other waste products retention, which are normally cleared by kidneys [2].

The present case series consists of 6 patients, of which all were male, of age range between 38 and 75 years. A similar age and gender distribution are seen in Mahajan *et al*., and Kumar *et al*., studies. Diarrhea, nausea, and vomiting were the predominant complaints in all patients and oliguria, anuria, hypotension, and tachycardia were other symptoms observed among a few. Investigations revealed proteinuria noted in four of our cases with no comorbidities, except for two patients with a history of hypertension and diabetes mellitus. Also, the increased neutrophil-lymphocyte ratio (NLR) was highly peculiar in our case as there was no significant infection or another underlying cause was noted. This pattern of NLR elevation [7] and proteinuria with AKI,[8] in few patients were being observed in COVID-19 infection nowadays which gives a suspicion of prevalence during the study period before the announcement of the pandemic.

Materials and Methods

The present case series, was conducted on 6 patients, in the medical ICU of Sri amachandra Institute of Higher Education and Research Centre, Chennai, over a period of 3 months, i.e. 1 st January 2020 - 31 st March 2020. Outcomes in patients were studied who devel- oped AKI secondary to acute gastroenteritis.

Once the diagnosis of AKI was made, the underlying etiology was determined by combining history, examination, and investigative data. Risk factors of AKI such as chronic kidney disease (CKD), hypertension and diabetes mellitus, use of nephrotoxic drugs/ contrast agents administered in the past were ruled out on admission. At the same time, patients were started on appropriate conservative treatment.

Cases were followed up telephonically at 1 month after their discharge to assess recovery for AKI caused by diarrheal illness and/or requirement of HD. It was conferred that 3 out

of the 6 AKI cases were requiring maintenance HD at 1 month follow up, following which we terminated our study to prevent superimposing of COVID-19 infection, which could make the purpose of the case series inconclusive.

AKI was diagnosed according to any of the following criteria

1. Increase in SCr by X 0.3 mg/dl within 48 hours; or increase in SCr to X 1.5 times baseline, which is known or presumed to have occurred within the prior 7 days or
2. Urine volume <0.5 ml/kg/h for 6 hours
3. Normal kidneys on ultrasound / absence of pre-existing renal disease.

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Cases were followed up telephonically at one month post their discharge, to assess recovery for AKI caused by diarrhoeal illness and/or requirement of HD. It was conferred that 3 out of the 6 AKI cases were requiring maintainence HD at one month follow up, following which we terminated our study to prevent superimposing of COVID – 19 infection, which could make the purpose of the case series inconclusive.

Conclusion

In India, ARF occurs mainly due to acute diarrheal disease [1] similarly in our case food poisoning might be one of the reasons leading to such an entity. The high incidence of ARF is mainly due to delay in reporting to the hospital and delayed or inadequate restoration of diarrheal losses.[9] This can be highly related to our case as the patients reported late due to their negligence and were found to have severe uremia, and renal failure was detected. About 40% of cases of AKI in India are caused by acute diarrheal disease, malaria, leptospirosis, snakebite, insect stings, Intra vascular hemolysis due to septicemia, chemical poisonings such as copper sulphate and vasmol, and pregnancy [10, 11]. Mehta *et al*., in their prospective study, related climatic influence on AKI of infectious etiology [12]. Basu *et al*. reported a 41.1% incidence of AKI among the tropical acute febrile illnesses.[9] These infections present mostly with fever as a cardinal sign, which was not seen in any of our patients presented in this case series. However, on a microbiological investigation, few organisms isolated were *Pseudomonas* and *E-coli* which was evident in 2 of our patients. AKI, in these infections, may be a result of direct invasion of renal parenchyma by microbial agents, tubular necrosis due to hemodynamic disturbances, renal inflammation due to immune response, or iatrogenic renal injury associated with treatment.[9] Most studies to date have highlighted the causes of AKI in tropics or individual disease with AKI due to microbial infections, which was insignificant in our cases.

The optimal timing of renal support is still a matter of debate. According to the KDIGO review, delayed RRT was associated with increased mortality, longer duration of hospital stay and dependency on RRT [7].

A holistic approach by the physician by treating the comorbid conditions may not only halt the progression to CKD but will also improve the quality of life [8]. Acute kidney injury being the most common entity in a developing country like India, awareness of such potential renal complications and their prevention and early hospitalisation, being the single most cost-effective life saving measure should be emphasised among people [9]. The mortality has been dramatically brought down due to hemaodialysis therapy and appropriate medical management [10] and this has

Reflected in the above case series.

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