

Research Article

J Ped. Nephrology 2014;2(2):76-78
<http://journals.sbmu.ac.ir/jpn>

Acute Kidney Injury in Children with Acute Gastroenteritis

How to Cite This Article: Moghtaderi M, Yaghmaii B, Allahwerdi B, et al. Acute Kidney Injury in Children with Acute Gastroenteritis. J Ped. Nephrology 2014;2(2):76-78.

Mastaneh Moghtaderi,^{1*}
Bahareh Yaghmaii,¹
Bahar Allahwerdi,²
Mojtaba Gorgi,³
Faezeh Javadilarijani,¹
Iran Malekzadeh,³
Seyedeh Taravat Sadrosadat,³
Javad Sabery nejad³

1Pediatric Nephrologist, Children's Medical Center Hospital, Pediatric Center of Excellence, TUMS, Tehran, Iran.

2Gastroentriologist, Children's Medical Center Hospital, Pediatric Center of Excellence, TUMS, Tehran, Iran.

3Pediatrician, Children's Medical Center Hospital, Pediatric Center of Excellence, TUMS, Tehran, Iran.

* Corresponding Author

Mastaneh Moghtaderi, MD
 Children's Medical Center Hospital,
 Tehran, Iran.
 E-mail: drmoghtaderi@gmail.com

Received: Jan-2014
Revised: Mar-2014
Accepted: Mar-2014

Introduction

Acute kidney injury (AKI), which was known as acute renal failure in the past, has increased in recent years. AKI leads to substantial morbidity and a high mortality rate [1]. We know that the

Introduction: This study was done in Children's Medical Center Hospital affiliated with Tehran University of medical science, Tehran, Iran.

Materials and Methods: The patients were 140 children who were admitted for gastroenteritis and we detected acute kidney injury in them. All of the patients were admitted and managed in the Emergency Department, and were evaluated for symptoms of AKI including dehydration, renal function tests, electrolytes, and urine output.

Results: The median age of the children with gastroenteritis and AKI was 2.5 years (ranging from 2 months to 12 years) and 78.6% of them were male. Acute kidney injury (AKI) was present in 116 (82.9%) patients at admission with 53 (37.8%) patients in the "failure" category (RIFLE). Twelve children had anuria and 54 patients had oliguria. At presentation, 24 patients (15%) had serum BUN levels between 30-75 and creatinine levels in the range of 0.9-2.1mg/dl. One patient had HUS that was excluded from this study. Seventy-six children had symptoms of severe dehydration and metabolic acidosis. After adequate fluid therapy, 30 children had polyuria of 6.4 (range 4-9) cc/kg/min. Twenty-three patients (16.4%) had hyponatremia and 41 patients (29.2%) had hypernatremia. Nine children (6.4%) suffered from hypokalemia. Some children had received ORS at home. All of them were managed in the emergency ward and discharged with normal GFR without any electrolyte abnormalities. The patients were followed for 3-6 months and all of them had normal renal function at the end of the study.

Conclusions: Early diagnosis and urgent management of gastroenteritis and dehydration can prevent AKI.

Keywords: Acute Kidney Injury; Child; Gastroenteritis.

Running Title: AKI in children with acute gastroenteritis

epidemiology of AKI in developing countries differs from the developed world in many important ways [2]. In developed countries,

elderly patients are more prevalent [3,4] while in developing countries, AKI is a disease of the young people and children in whom hypovolemic prerenal mechanisms are more common [5]. The most common causes of AKI in developing countries are volume-responsive prerenal causes, infections, or toxins; thus, inexpensive and simple interventions such as education on oral rehydration can help traditional healers and prevent renal impacts. Changes in the management strategy of fluid therapy and infection control can result in a dramatic reduction in the incidence and severity of AKI [2]. Because of the high costs of renal replacement therapies in developing countries, prevention is still the only realistic way to decrease the severe impacts of AKI on morbidity and mortality [6].

Materials and Methods

We studied a number of patients who were admitted to the Emergency Department of Children's Medical Center with acute gastroenteritis in the summer and fall 2013.

All patients who presented with acute gastroenteritis and severe dehydration or intractable vomiting or anuria for 6 hours after gastroenteritis were admitted to the Emergency Department and managed in the ward. Inclusion criteria were all patients who were 2 months to 12 years old and were admitted for gastroenteritis. Neonates and patients with previous renal impairment, hypertension, and anomalies of the urinary tract were excluded from the study. We had a case of hemolytic uremic syndrome who was excluded from the study. Anuria is urine output less than 0.5cc/kg/h, and oliguria is urine out less than 1cc/kg/h after the first year of life.

All patients had foley catheter and their urine output was recorded. All children were visited by a pediatric nephrologist and followed up for the next 3-6 months. Laboratory investigations were requested for all patients and repeated as needed. GFR estimated by Schwartz formula which uses height and serum creatinine with adjustment for sex and age. All of them received fluid therapy and ORT in the hospital and some of them with infectious diarrhea received antibiotics. They were discharged when symptoms of AKI disappeared and general condition and urine output were acceptable.

Results

A total of 140 children were included in this study. The median age of the children with gastroenteritis was 2.5 years (ranging 2 months to 12 years) and 78.6% of them were male. Acute kidney injury was detected in 116 (82.9%) children at admission with 53 (37.8%) children in the "failure" category. (RIFLE)

Twelve children had anuria and 41 patients had oliguria. At presentation, 24 (17.1%) children had BUN levels between 30 and 75 and creatinine levels in the range of 0.9-2.1mg/dl. Median creatinine was 1.6mg/dl. The authors evaluated GFR of study group by Schwartz formula at admission time. GFR decreased in 116 (82.9%) children. One patient had HUS who was excluded from this study. Seventy-six children had symptoms of severe dehydration and metabolic acidosis. After fluid therapy, 30 children had polyuria of 6.4 (range 4-9) cc/kg/min. Twenty-three patients (16.4%) had hyponatremia and 41 patients (29.2%) had hypernatremia. Nine children had (6.4%) hypokalemia. Some of them had received ORS at home. All of them were managed in the emergency ward with fluid therapy and electrolyte management. None of them required replacement therapy and they were all discharged with normal GFR without any electrolyte abnormalities. The patients were followed for 3-6 months and all of them had normal renal function.

Discussion

Acute diarrhea is still prevalent and one of the most common diseases resulting in hospital referral in developing countries but only a few of the patients require hospitalization [7]. Patients who were admitted to our hospital were severe cases that did not respond to outpatient therapy; therefore, AKI was common in them. The increasing incidence of AKI in both developed and developing countries of the world is documented, and gastroenteritis as the underlining cause of AKI is a frequent finding in hospitalized children [8-10].

We included "R" and "I" in our study from the pRIFLE score which were not usually recognized as AKI criteria in previous studies as in a Nigerian study [11]. In our study, 53 (37.8%) patients were in the "failure" category (RIFLE). In the study that was performed in Nigeria, the prevalence of AKI (failure) was 70% [11]. In our study, 78.6% of the patients were male. In studies conducted in India [7] and Nigeria [11], males were also more

affected. The reason for this finding is not that gastroenteritis is more common in male but may be that the male patients are admitted more commonly. Proper feeding and early ORS therapy can prevent AKI in most cases, so it seems that popular education is necessary for diarrheal patients and their parents.

Conclusions

Oral rehydration therapy at home may protect children against AKI. Early diagnosis and urgent management of gastroenteritis and dehydration can prevent AKI. Hand washing is also important.

Acknowledgement

The authors wish to thank the nursing staff of the emergency ward of Children's Medical Center who helped us to perform this study.

Conflict of Interest

None declared

Financial Support

None declared

References

1. Rajasree Sreedharan, Prasad Devarajan, Scott K. Van Why. Pathogenesis of Acute Renal Failure. Text book of Pediatric Nephrology. Springer-Verlag Berlin Heidelberg 2009.
2. Cerda J, Lameire N, Eggers, Neesh Pannu P et al. Epidemiology of Acute Kidney Injury. Clin J Am Soc Nephrol 2008;3:881-886.
3. Xue JL, Daniels F, Star RA, et al. Incidence and mortality of acute renal failure in Medicare beneficiaries. J Am Soc Nephrol 2006;17:1135-1142.
4. Waikar SS, Curhan GC, Wald R, McCarthy EP, Chertow GM. Declining mortality in patients with acute renal failure. J Am Soc Nephrol 2006;17:1143-1150.
5. Khakurel S, Satyal PR, Agrawal RK, Chhetri PK, Hada R. Acute renal failure in a tertiary care center in Nepal. JNMA (J Nepal Med Assoc) 2005;44:32-35.
6. Moosa MR, Kidd M: The dangers of rationing dialysis treatment: The dilemma facing a developing country. Kidney Int 2006;70:1107-1114.
7. Muhammad Ilyas Baig M, Ahmad Randhawa F, Tarif n. Acute renal involvement in acute gastroenteritis; Professional Med J 2012;19(6):905-908.
8. Vachvanichsanong P, Dissaneewate P, Lim A, McNeil E. Childhood acute renal failure: 22-year experience in a university hospital in southern Thailand. Pediatrics 2006;118: e786-791.
9. Andreoli SP. Acute kidney injury in children. Pediatr Nephrol 2009;24:253-63.
10. Bailey D, Phan V, Litalien C, et al. Risk factors of acute renal failure in critically ill children: A prospective descriptive epidemiological study. Pediatr Crit Care Med 2007;8:29-35.
11. Imokhuede Esezobor C, Augustina Ladapo T, Osinaike B, Afolabi Lesi E. Paediatric Acute Kidney Injury in a Tertiary Hospital in Nigeria: Prevalence, Causes and Mortality Rate, PLOS ONE 2012;7(1):51229.