e-ISSN: 0976-822X, p-ISSN:2861-6042

Available online on http://www.ijcpr.com/

International Journal of Current Pharmaceutical Review and Research 2023; 15(1); 200-203

Original Research Article

A Retrospective Identification of the Etiologies and Short-Term Outcome of ARF in A Pediatric Tertiary Care Center

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Received: 10-11-2022/ Revised: 05-12-2022 / Accepted: 28-12-2022
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Conflict of interest: Nil

Abstract

Aim: The present study was undertaken to identify the causes and short-term outcome of ARF in a pediatric tertiary care center.

Methods: This retrospective study was conducted in the pediatrics department of AIIMS, Patna. The study was approved by the institute's ethics committee. Records of all children aged one month to 12 years, diagnosed with ARF during the study period, were retrieved. The study included 200 children with ARF, either at admission or acquired during stay in the hospital.

Results: The major causes of ATN were sepsis, acute gastroenteritis in 32 (16%) and Plasmodiumvivax malaria in seven patients (3%). The isolated organisms included Escherichia coli, coagulase-negative Staphylococcus, Klebsiella species, Pseudomonas and Staphylococcus aureus. 100% survival rate was observed in Acute gastroenteritis and Glomerular diseases followed by Acute on chronic renal failure 82%.

Conclusion: The study concluded that ATN consequent to septicemia was the most common cause of ARF in this study. RRT was required in patients and PD was the mainstay of RRT in our patients.

Keywords: Acute Renal Failure, Tertiary Care Centre, Outcome.

Introduction

Acute kidney injury (AKI) is defined as reversible inability of kidney in secreting nitrogenous waste products, balancing fluid and electrolytes that occurs during hours or days.[1] The exact incidence of AKI is not clear in pediatric population; however, an increase in its incidence in hospitalized neonates and children has been reported recently.[1-4] The etiology of AKI varies in different countries.[5-7] In addition, the etiology of AKI in hospitalized children is multifactorial.[1] Among the causes of AKI, diseases resulted in acute tubular necrosis such as sepsis, nephrotoxic medication and ischemia were more prevalent.[8] The importance of diagnosed AKI is not only because of short-term high morbidity and mortality rate, but also for its effect on developing chronic kidney disease.[9]

Acute renal failure (ARF) is characterized by a rapid deterioration of renal function resulting in retention of nitrogenous wastes and other fluid and electrolyte derangements, which are usually reversible.[10] In the absence of a universally accepted definition, and in recognition that ARF actually includes a spectrum of clinical conditions, the term acute kidney injury (AKI) has recently been proposed for the entire spectrum of the

syndrome. More recently, a classification of AKI has been proposed based on the serum creatinine and urine output.[3] The incidence of ARF in neonatal and pediatric units varies between 10 and 25%, depending on the criteria used for its definition. [3,4] The etiology of ARF may be pre-renal, intrinsic renal or post-renal and has changed over the past decades from primary renal diseases to multi-factorial causes. Despite advances in therapy, mortality due to the condition is still high (30–40%) and a proportion of patients may progress to chronic kidney disease and dialysis dependency.[10]

The present study was undertaken to identify the causes and short-term outcome of ARF in a pediatric tertiary care center.

Materials And Methods

This retrospective study was conducted in the pediatrics department of AIIMS, Patna. The study was approved by the institute's ethics committee. Records of all children aged one month to 12 years, diagnosed with ARF during the study period, were retrieved. The study included 200 children with ARF, either at admission or acquired during stay in the hospital. ARF was diagnosed on the basis of acute worsening of renal function as evidenced by rising blood creatinine with or without decreased urinary output.

Neonatal and post-operative ARF were excluded as patients with these conditions were not admitted to the pediatric wards. Patients with dehydration, oliguria and deranged kidney function that corrected promptly on rehydration were also excluded.

Details of clinical features, etiology, biochemical parameters, treatment including the need for renal replacement therapy (RRT), duration of hospital stay and outcome were noted from the retrieved records. Presence of anemia, hypertension, edema, encephalopathy and seizures was recorded. The biochemical parameters noted were blood urea, serum creatinine, electrolytes, venous blood gas and bicarbonate levels. The causes of ARF were assigned using standard definitions and only the primary cause of ARF was included. Short-term outcome was defined as the condition at discharge. Data were analyzed using descriptive statistics of the excel program.

Results

Table 1: Distribution of etiology of acute renal failure according to age

Etiology	Age groups (years)		
	≤1	1–5	6–12
Hemolytic uremic syndrome	3 (1.5%)	15 (7.5%)	6 (3%)
Acute gastroenteritis	20 (10%)	10 (5%)	2 (1%)
Sepsis	35 (17.5%)	15 (7.5%)	8 (4%)
Glomerular disorders	0	3 (1.5%)	8 (4%)
Structural anomalies	5 (2.5%)	5 (2.5%)	8 (4%)
Urinary tract infections	3 (1.5%)	5 (2.5%)	0
Nephrolithiasis	0	4 (2%)	3 (1.5%)
Intravascular hemolysis	0	0	2 (1%)
Plasmodium vivax malaria	0	3 (1.5%)	3 (1.5%)
Acute-on-chronic renal failure	2 (1%)	5 (2.5%)	10 (5%)
Takayasu'svasculitis	0	0	4 (2%)
Others	3 (1.5%)	3 (1.5%)	7 (3.5%)

The major causes of ATN were sepsis, acute gastroenteritis in 32 (16%) and Plasmodiumvivax malaria in seven patients (3%). The isolated organisms included Escherichia coli, coagulase-negative Staphylococcus, Klebsiella species, Pseudomonas and Staphylococcus aureus.

Table 2: Etiology of acute renal failure and survival rates

Causes of acute renal failure	Survival rates (%)
Acute gastroenteritis	100%
Glomerular diseases	100%
Structural anomalies	80%
Acute on chronic renal failure	82%
Sepsis	60%
Hemolytic uremic syndrome	58%

100% survival rate was observed in Acute gastroenteritis and Glomerular diseases followed by Acute on chronic renal failure 82%.

Discussion

Because of the lack of a uniform definition of ARF until recently, most studies of the past are relatively heterogeneous and the incidence of ARF has varied from 10 to 40% among hospitalized children. The causes of ARF have changed in the last decade. Studies in the 1970s and 1980s demonstrated that intrinsic renal diseases including HUS and glomerulonephritis were the most common causes of ARF in children. Most studies from the developed world presently report ARF from surgical, transplant and intensive care units.[3] Information on pediatric ARF is relatively scant from our country. Hence, this study was conducted aimed at identifying changes in the etiology of pediatric AKI in the recent years as well as its short-term outcome. In the previous studies also, ARF had a maximal incidence in children under five years of age.[3,11] Increased occurrence of diarrhea and septicemia in young patients could be the major reason for this age distribution.

In a recent study from North India, sepsis was the cause of ARF in 33% patients.[12] This could be due to poor hygiene and lack of sanitation, still prevalent in a large proportion of the population. The incidence of HUS has decreased as compared with previous decades. Availability of better antibiotics and an overall decrease in the incidence of dysentery in the population could be responsible for this change. Most cases of HUS were associated with dysentery, and E. coli was the most common causative agent. Utility of sonography in ARF is primarily limited to the identification of obstruction, urolithiasis and differentiation from chronic kidney disease.[13]

The reasons for greater use of PD were its easy availability, requirement of lesser expertise and also a younger age group of patients. The higher incidence of peritonitis among these patients could be due to use of stiff catheters and prolonged duration of acute dialysis. Patients who underwent hemodialysis were older and also required dialysis for prolonged periods. While continuous RRTs are being increasingly used in intensive care patients in the western world, its usage in the pediatric population in our country is extremely low due to non-availability at most centers.[13,14]

The eventual recovery and the long-term outcome of patients with ARF chiefly depends on the underlying condition. While the prognosis in ATN, acute interstitial nephritis and glomerulonephritis, is satisfactory, patients with multi-organ failure and cortical necrosis fare poorly.[15,16] A major limitation of our study is the lack of information regarding the occurrence of ARF from the pediatric surgical and cardiothoracic units. It is possible that with the rising number of pediatric surgeries, the incidence of ARF has increased in these settings as well.

Conclusion

The study concluded that ATN consequent to septicemia was the most common cause

of ARF in this study. RRT was required in patients and PD was the mainstay of RRT in our patients.

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