

Clinical Profile, Etiological Factors and Outcome of Acute Renal Failure in Children: A Clinical Study

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Research Article

Abstract: Acute Renal failure is a syndrome characterised by acute decline in glomerular filtration rate leading to retention of nitrogenous wastes such as urea and creatinine. 56 Acute Renal Failure patients were included in the study who attended our hospital during the study period. Out of the total 56 patients included for the study analysis, 34 patients were males and 22 were females indicating that frequency of acute renal failure was more in males as compared to females with a male: female ratio of 1.54:1. Children in the age group of 5-8 years were most commonly affected followed by children between 9-12 years, 1-4 years and less than one year in decreasing order. Oliguria was the most common presenting complaint in the patients. Vomiting, haematuria, fever were other common complaints. Intrinsic renal pathology was the commonest cause of acute renal failure in enrolled patients, followed by pre-renal and post-renal causes. Acute glomerulonephritis was the commonest etiology of intrinsic renal failure. Age less than one year, female sex, Acute Tubular Necrosis, Obstructive Uropathy, Haemolytic Uremic syndrome, presence of CNS complications and prolonged oligoanuria were associated with poor prognosis. The mortality rate was 25% in the present study.

Introduction:

Kidney is a highly vascular organ and hence is prone for ischemic injury whenever blood supply to it is decreased. It is also susceptible to nephrotoxic injury by virtue of its rich blood supply and the ability to concentrate toxins in the medullary interstitium and renal epithelial cells. Acute renal failure (ARF) is a syndrome characterised by acute decline in glomerular filtration rate leading to retention of nitrogenous wastes such as urea and creatinine. [1]

ARF is one of the common clinical syndromes encountered in clinical practice. The pathogenesis, clinical picture and treatment of ARF in adults is fairly well established. The limited amount of published data of experience with infants and children indicate that a comparable degree of understanding of this problem has not been attained for the paediatric age group. [2] ARF is one of the commonest life threatening conditions seen in childhood. Etiology of ARF varies in different parts of the world. [3] In an economically poor country like India, acute gastroenteritis still forms a

major underlying cause. Other common causes are haemolytic uraemic syndrome (HUS), Acute glomerulonephritis (AGN).

With the availability of dialysis facility and good supportive treatment there has been marked improvement in the management of ARF. [4] Dialysis therapy has changed the outlook for ARF somewhat, however, dialysis especially haemodialysis is not an easy proposition in children at centres with limited resources and inadequate expertise. [5] Most of the causes of ARF are preventable, notably ARF secondary to volume depletion, snakebite, and postoperative. So, every measure should be taken to prevent it.

The present study was undertaken to analyse the clinical features, etiology and the factors determining the prognosis in paediatric cases of ARF admitted at a tertiary care hospital in Aurangabad and representing the Marathwada region of Maharashtra.

Material and Methods:

56 paediatric patients of ARF up to the age of 12 years admitted at the hospital during the study period of 2 years were included in the study.

ARF was diagnosed by demonstrating elevation of Blood urea (> 40 mg/dl) and serum creatinine (>2 mg %) over a few days in absence of any pre-existing renal disease. [6] Rise of serum creatinine by at least 0.5 mg% per day with or without Oliguria was also one of the selection criteria. [5]

Cases of acute on chronic renal failure were excluded. Those initially considered to be ARF but subsequently proven to be suffering from long standing renal disorders were excluded.

Each patient underwent detailed clinical, haematological and biochemical evaluation. Clinical data of each patient was collected according to proforma. Detailed history was taken regarding each patient in relation to etiological factors like gastroenteritis, burns, major surgery, drugs, post streptococcal glomerulonephritis, obstructive uropathy,

bleeding tendency, etc. Detailed history regarding consumption of drugs like NSAIDs, aminoglycosides, radio contrast agents, anticancer drugs, antibiotics, ayurvedic medicines, etc was asked.

Blood urea and serum creatinine were repeated daily till they came to normal. Fractional urinary clearance indices were not utilised because almost all patients were started on diuretics and previous use of diuretics totally invalidates the use of these indices. [7]

Haemogram, urine analysis and biochemical investigations were done in all patients. In relevant cases specialised investigations like renal USG, IVP, MCU, KUB, blood culture, septic profile, C₃ level, ECG, ASO titres were done. Kidney biopsy was done whenever consent for the same could be obtained.

Management of the patient included correction of fluid and electrolyte imbalance, anaemia and control of hypertension. Dialysis (peritoneal dialysis) was done whenever indicated. Indications for dialysis used were: [8]

- Blood urea > 100 mg % and expected to remain so.
- Hyperkalemia
- Fluid overload
- Severe hypertension
- Severe acidosis
- Uremic pericarditis
- Uremic encephalopathy

Attempts were being made to find out poor prognostic factors from the following: Age, sex, oligoanuria, complications, blood urea, serum creatinine levels, cause of ARF and the treatment modality used.

Response to treatment and ultimate outcome was noted. Patients were followed up clinically and biochemically every month in OPD.

Observations and Results:

Age and Sex distribution:

Table 1

Age (years)	Male	Female	Total
<1	5	6	11
1 to 3	7	4	11
3 to 7	13	6	19
7 to 12	9	6	15
Total	34	22	56

Clinical Features:

Table 2

Clinical Feature	Number of cases	% of cases
Oliguria	40	71.4
Peripheral oedema	33	58.9
Hypertension	26	46.42
Vomiting	24	42.85
Fever	18	32.14
Gross haematuria	18	32.14
Anuria	16	28.6
Encephalopathy	14	25
Loose motion	12	21.43
Dehydration	10	17.85
Seizures	8	14.28
Petechiae / rash	7	12.5
Ascites	7	12.5
Breathlessness	6	10.71
Headache	5	8.92
Icterus	4	7.14
Gastrointestinal haemorrhage	3	5.35
Respiratory infection	3	5.35
Pain in abdomen	3	5.35
Sore throat	2	3.57
Decreased activity	2	3.57

Etiology of ARF:

Table 3

Causes	Number of cases	% of cases	
1. Pre renal	13	23.2	
2. Renal:	AGN	20	35.7
	ATN	10	17.86
	HUS	3	5.36
	Others	4	7.14
3. Post renal	Posterior urethral valve	1	1.8
	Bilateral ureteric calculi	3	5.36
	Meatal stenosis	2	3.57

Prognostic factors:

- **Age:** High mortality rate of 60% (6 out of 10) was found in children less than one year of age.
- **Sex:** Mortality rate was higher in females (31.81%) as compared to males (20.62%).
- **Etiology:** Mortality rate was highest in acute tubular necrosis (50%) and lowest in Acute Glomerulonephritis (10%). Mortality rates were 27% in renal causes, 15.38% in pre-renal causes and 50% in post-renal causes.
- **Complications:** Mortality was higher in patients with CNS complications (36.36%) as compared to patients without CNS complications (17.65%).
- **Duration of Oliguria:** Mortality increased with duration of Oliguria. It increased from 10% in patients with <24 hours duration of Oliguria to 50% in patients with >7 days of Oliguria.

Management and Outcome:

Table 4

Mode of treatment	Number of patients	Survival	Death
Peritoneal Dialysis	32	23	9 (28.12%)
Conservative Management	24	19	5 (20.83%)

Out of total of 56 patients of ARF, 14 expired i.e. 25% mortality.

Those patients who survived (42 cases) were followed up in OPD.

Out of these 42 patients, 2 went into Chronic Renal Failure and required repeated dialysis and remaining 40 had complete recovery.

Discussion:

Age and Sex distribution:

As it is clear from following table 5, age distribution of ARF varies from study to study, because incidence and etiology of ARF varies with age and the geographic area. [9]

Table 5

Age in years	Srivastava [10]	Shah et al [4]	Present study
<1	24.8%	13%	17.86%
1 to 4	53.6%	28%	23.2%
5 to 8	12%	29%	33.9%
9 to 12	9.6%	30%	26.8%

Present study showed highest prevalence in 5-8 years age group. This can be explained by the fact acute glomerulonephritis was the commonest cause of ARF in the present study which is common in children of above age group. [10]

Srivastava et al [10] reported highest incidence of ARF in 1-4 years age group and the commonest etiology was Haemolytic uremic syndrome (HUS), which is common in that age group.

Shah et al [4] reported highest incidence of ARF in 9-12 years age group.

Male preponderance of 1.54:1 was found in present study.

Similarly, Srivastava et al [10] and Shah et al [4] reported male preponderance.

Clinical Presentation:

Oligoanuria was the commonest presenting feature in the present study.

Kandoth et al [5], Arora et al [3] and Acharya et al [9] have also reported Oligoanuria as the commonest presenting feature.

Peripheral oedema was present in 33 patients (58.9%), similarly Acharya et al [9] have reported presence of peripheral oedema in 48.8% of patients.

Etiology:

Acute glomerulonephritis (35.7%) was the commonest etiology in present study. Similarly Kandoth et al [5] have reported acute glomerulonephritis (AGN) as the

commonest etiology in their study. On the contrary, Srivastava et al [10] have reported HUS to be the commonest cause of ARF, while Acharya et al [9] had reported Acute Tubular Necrosis to be the commonest cause. Etiology of ARF is different in different parts of the world and also within different parts of the country and also shows changes with time. [9] Acute glomerulonephritis was an important cause of ARF in our study, while in England and other advanced countries, the incidence of post streptococcal AGN has considerably declined, possibly due to widespread use of penicillin for respiratory tract infections. [11] This disorder however remains common in developing countries where the incidence of pyoderma and streptococcal sore throat is high. [3]

Complications:

Presence of CNS complications in patients of ARF was associated with much high mortality in present study. Similarly, Kandoth et al [5] and Arora et al [3] have reported that presence of CNS complications herald a bad prognosis in ARF.

Duration of Oliguria:

Mortality increased with increase in duration of Oliguria in the present study. Similarly, Shah et al [4] and Kandoth et al [5] reported increased Mortality with increase in duration of Oliguria.

Outcome:

The mortality rate in present study was 25%.

The mortality rates shown by various studies are shown in table 6.

Table 6

Author	Number of patients	Percentage
Shah et al [4]	66	62
Kandoth et al [5]	48	41.7
Arora et al [3]	52	34.6
Acharya et al [9]	41	73.1
Present study	56	25

The low mortality in present study may be due to the fact that AGN was the commonest cause and it has relatively better prognosis. [5]

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