

Original Research Article

Clinical profile of pediatric acute renal failure patients requiring renal replacement therapy age less than 15 years - an ambivalent cohort study

Jayesh R. Solanki, Kishan S. Patel*

Department of Pediatrics, Medical College and SSG Hospital, Baroda, Gujarat, India

Received: 03 January 2024

Revised: 02 February 2024

Accepted: 06 February 2024

*Correspondence:

Dr. Kishan S. Patel,

E-mail: ks.patel5673@gmail.com

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ABSTRACT

Background: Acute kidney injury (AKI) is characterized by a reversible increase in the blood concentration of creatinine and nitrogenous waste products and by the inability of the kidney to regulate fluid and electrolyte homeostasis appropriately. There is minimal data on the clinical profile of pediatric AKI patients age less than 15 years who required renal replacement therapy (RRT).

Methods: A total of 301 patients (3%) were diagnosed with AKI, amongst them 66 patients who required RRT from January 2021 to December 2022 were enrolled. Their clinical, biochemical, and etiological profile were studied to find out their influence in modifying the outcome of AKI patients requiring RRT.

Results: AKI was noted in 301 patients (3%), amongst them 66 patients we had analyzed who underwent RRT. Result were analyzed in three age group (0-2 month, 2 month-8 year, 8 year-15 year). Male preponderance was seen amongst all age groups with male: female ratio being 2:1, 5:1 and 1.8:1 respectively and rural area preponderance seen in all age groups. Birth asphyxia, neonatal sepsis and septicemia were leading etiologies in different groups. Peritoneal dialysis (PD) was only RRT modality in the 0-2 month age group, while hemodialysis and PD modalities were used in rest groups. Multi-organ dysfunction syndrome was commonly seen comorbidity associated with all groups along with pyogenic meningitis, and encephalopathy. Mortality rate was observed at 47% (n=31).

Conclusions: From our study, we conclude that to expand the facility of point of care, hemodialysis facility in ICUs with a larger study or multicentric study in the pediatric age group is required.

Keywords: Acute kidney injury, Renal replacement therapy, Clinical profile, Outcome

INTRODUCTION

Acute kidney injury (AKI) is defined as the sudden impairment of renal function, which causes a decline in glomerular filtration rate (GFR), retention of urea and nitrogenous waste products, and impaired regulation of extracellular volume and serum electrolytes. Pediatric acute kidney injury results in different types of clinical manifestations from a minimal elevation in serum creatinine to anuric kidney failure, arises from multiple causes, and occurs in a variety of clinical settings.¹ As per KDIGO classification, AKI is defined as “an absolute increase in S. Cr at least 0.3 mg/dl within 48 hours or by a

50% increase in S. Cr from baseline within 7 days, or a urine output of less than 0.5 ml/kg/hour for at least 6 hours”.²

Some studies show that even a small increase in serum creatinine from the baseline after Cardiac surgery will be helpful in the early prediction of AKI.³ Also, the International Society of Nephrology (ISN) has launched the 0 by 25 campaign. The purpose of this campaign is to have zero deaths from preventable or untreated AKI in resource-limited settings (i.e., Africa, Latin America, and Asia) by 2025.⁴

Acute renal failure (ARF) patients are seen more in the ICU setting, as a part of multiple organ dysfunction syndrome (MODS), in postoperative states and after some of the interventional studies, in individuals who are already susceptible to AKI. These patients have various co-morbid conditions and are on various life-supportive modalities and their organ systems are injured further by fluid overload and electrolyte and acid-base disturbances. They require continuous waste product clearance due to ongoing illness and at the same time, they receive infusions of nutritional and inotropic agents for the sustenance of vital parameters. AKI is also an increasingly common complication of critical illness, with some research showing that as many as 1 in 3 children experience AKI per hospital admission.⁵

Acute renal failure is divided into three types: pre-renal failure, intrinsic renal failure, and post-renal failure. Pre-renal failure occurs due to a reduction in the perfusion of the kidney resulting in a decline of renal function. Intrinsic renal failure results from diseases of the kidney while post-renal failure essentially occurs due to obstructive disorders. Children with ARF due to aminoglycoside therapy and septicemia can present with non-oliguric ARF. If anuria or oliguria alone is considered essential as the pointer for the diagnosis of ARF, clinically these children will be missed. So, a strong suspicion of the background of such situations for non-oliguric ARF is essential to make the clinician do biochemical evaluation periodically and for early detection of non-oliguric or high output ARF. The prognosis of ARF patients depends on the etiology and the availability of medical care in healthcare settings. With effective control and correction of prerenal factors, adequate and proper control of post-renal factors, and the efficient treatment of intrinsic renal failure, the overall mortality and morbidity of ARF in children can be reduced to a very minimal percentage. Indications of renal replacement therapy include - electrolyte imbalance (persistent hyperkalemia), encephalopathy, intractable fluid overload, persistent acidosis and elevated creatinine beyond a critical level. As there is minimal data on this subject at hand, the proposed study may help in understanding the clinical, biochemical, etiological profile and outcome of acute renal failure patients requiring renal replacement therapy in age less than 15 years.

METHODS

This was an ambidirectional, observational cohort study to assess the clinical profile of pediatric acute renal failure patients requiring renal replacement therapy aged less than 15 years from January 2021 to December 2022 after obtaining permission from the Institutional Ethics Committee on Human Research, conducted at Medical College and SSG Hospital, Baroda, Gujarat. Between January 2021 to March 2022, 10 hemodialysis, and 30 peritoneal dialysis of ARF patients aged less than 15 years were done. So we had expected at least 5 new hemodialysis and 20 peritoneal dialysis of ARF patients aged less than 15 years till December 2022. A total of 16 hemodialysis

and 50 Peritoneal dialysis patients' data was collected between January 2021 to December 2022 in this study. All those pediatric acute renal failure patients including neonates, infants, and children who are less than 15 years of age requiring renal replacement therapy in the form of peritoneal dialysis and hemodialysis admitted in the pediatric ward, neonatal intensive care unit and pediatric intensive care unit at our pediatric department were enrolled for study after applying inclusion and exclusion criteria.

Inclusion criteria

Neonates, infants, and children with acute renal failure age less than 15 year required RRT, admitted at the pediatric ward, NICU, PICU of a tertiary care hospital in central Gujarat with/without the following features: oliguric ARF, nonoliguric ARF, uncompensated metabolic acidosis, hyperkalemia, pulmonary edema, uremic complications (encephalopathy/myopathy/pericarditis), overdose with a dialyzable toxin (e.g., lithium), cardiac failure, and patients requiring a large amount of fluid, parenteral nutrition or blood products, but at risk of developing pulmonary edema or ARDS.

For retrospective analysis, eligible patients' data were traced from clinic and hospital records.

Exclusion criteria

Parents who had not given consent for study and patients with a major congenital malformation or genetic disease were excluded.

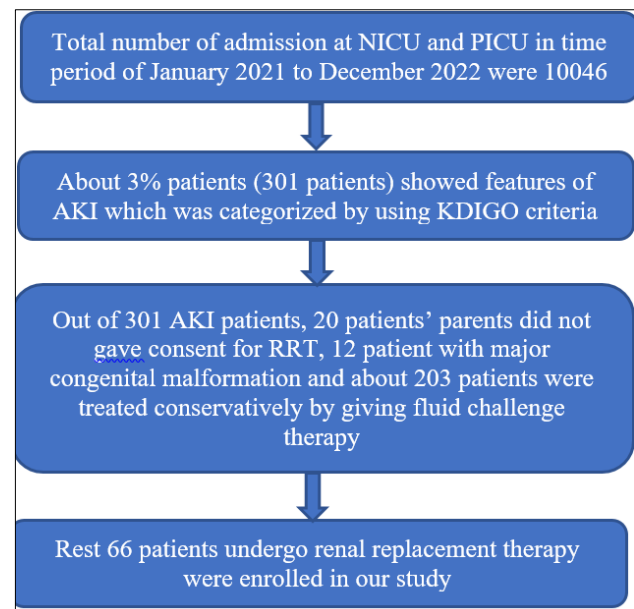


Figure 1: Methodology of our study.

The flowchart in Figure 1 shows the methodology of our study. Demographic details (e.g, age, sex, residence area, etc.), clinical data (e.g, etiology, associated comorbidities,

etc.), biochemical data (e.g, serum urea, serum creatinine, serum sodium, serum potassium, pH value and bicarbonate before initiation of RRT) were noted.

Peritoneal dialysis was done using a stiff PD catheter, PD infusion set and IPD fluid. Hemodialysis was done in eligible patients using the Fresenius Medical Care 4008 S OCM hemodialysis machine in the PICU. Double-lumen catheter line appropriate for age were used for the hemodialysis process and inserted in the central neck vein. (e.g., internal jugular vein on either side). Pediatric dialyzer and pediatric tubing with specific priming volume used in hemodialysis. We have analyzed the data by dividing the enrollments into three groups as per age because the implementation of peritoneal dialysis is seen more with neonatal and infantile age groups, whereas hemodialysis as an RRT is implemented for older age group children.

Neonate: 0 - 2 month of age, children: 2 month-8 year of age, and children: 8 years to 15 years of age.

Statistical analysis: Various data collected were edited in password-protected excel sheet. Proportions and mean with a standard deviation of various parameters of ARF were derived by using Chi-square tests to find out statistical significance. P value less than 0.05 were considered for statistical significance. All statistical calculations were done using computer software IBM statistical package for the social sciences (SPSS) version 21.0 (IBM-SPSS Science Inc., Chicago, IL).

RESULTS

This study was an ambidirectional observational study conducted at our department of pediatrics of tertiary care hospital of central Gujarat from January 2021 – December 2022 to observe the clinicoetiological profile of acute renal failure patients requiring RRT age less than 15 years. Over all 66 patients were included in this study. The result was analyzed in three age group- 0-2 month (neonatal), 2 month-8 year, and 8 year-15 years age group.

0–2-month age group

In this age group, 24 patients received peritoneal dialysis as RRT out of which 13 (54.16%) patients' data was collected retrospectively and 11 (45.84%) patients' prospectively. Amongst this age group, 18 (66.67%) were male, while 6 (33.33%) were female. As per geographical distribution, 11 (46%) patients were received from Urban areas, while 13 (54%) patients were from rural areas. Rural area patients also include from border areas of Maharashtra, Madhya Pradesh, and Rajasthan. Birth asphyxia (33%) followed by neonatal sepsis (29%), severe dehydration (20.8%), meningitis (8.4%), IEM (4.1%), MIS-N (4.1%) were the main etiological factors found in this age group. 9 patients (37.6%) required 25-48 cycles, followed by 6 patients (25%) required 49-72 cycles, 5 patients (20.8%) required 73-96 cycles and 4 patients

(16.6%) required 0-24 cycles. Mean PD cycles were found 53.2 ± 24.7 with (IQR 36-68) cycles. 13 patients (81.3%) had a history of oliganuria of less than 48 hours and 3 patients (18.7%) had oliganuria between 49-96 hours found in our study. MODS (25%), septic shock (19%), pyogenic meningitis (19%), hyperkalemia (12.7%), VAP (6.25%), convulsions (6.25%), DIC (6.25%), encephalopathy (6.25%) were associated comorbidities seen in our study group. Out of 24 patients, 13 (54.20%) patients were discharged successfully, while 11 (45.8%) patients expired during treatment (Table 2).

Table 1: Stages of AKI by KDIGO*.

Serum creatinine	Urine output
Stage 1	
Increase in sCr 1.5–1.9 times from baseline OR ≥ 0.3 mg/dl absolute increase in sCr	Urine output < 0.5 ml/kg/hour for 6–12 hours
Stage 2	
sCr ≥ 2.0 –2.9 times baseline	Urine output < 0.5 ml/kg/hour for ≥ 12 hours
Stage 3	
sCr ≥ 3.0 times from baseline OR increase in sCr to ≥ 4.0 mg/dl acute increase OR Initiation of renal replacement therapy OR In patients < 18 years, decrease in eGFR to < 35 ml/min per 1.73 m^2	Urine output < 0.3 ml/kg/hour for ≥ 24 hours or anuria for ≥ 12 hours

*Kidney disease improving goal outcomes, sCr-serum creatinine, eGFR- estimated glomerular filtration rate

2 month-8-year age group

In this age group, a total of 25 patients were enrolled, retrospective and prospective being 12 (48%) and 13 (52%) patients respectively. Majority patients, 21 (84%) patients were male, while only 4 (16%) patients were female. M: F ratio being 5.2:1. Geographically, 16 (64%) patients belonged to rural area, while 9 (36%) patients belonged to urban area in our study showing rural preponderance.

In this group, septicemia (20%), acute viral encephalitis (16%), diphtheria (8%), DKA (8%), obstructive uropathy (8%), pneumonia (8%), severe dehydration (8%), pyelonephritis (4%), post-inflammatory ileus (4%), nephrotic syndrome (4%), tetanus (4%), uremia (4%) were etiological factor seen in patients with AKI required RRT.

Out of 25, 17 (68%) patients had a history of oliganuria present before initiation of RRT. Amongst this history of anuria since two days was found in 13 (76.5%) patients, followed by 3 (17.6%) patients with oliganuria since 3 day-4 day and 1 (5.9%) patient with 5 day-6 day of oliganuria before starting RRT found in our study (Table 3).

Table 2: Demographic, etiological, clinical profile and outcome of 0–2-month age group.

Profile	No. of patients (n=24)	Percentage
Gender		
Male	16	66.70
Female	8	33.30
Area (n=24)		
Urban	11	46
Rural	13	54
Etiology (n=24)		
Birth asphyxia	8	33.40
IEM [#]	1	4.10
Meningitis	2	8.40
MIS-N ^{\$}	1	4.10
Neonatal sepsis	7	29.20
Severe dehydration	5	20.80
CAKUT [%]	0	00.00
Drug induced AKI	0	00.00
Prematurity	0	00.00
Days of oliganuria (n=16)		
1-2	13	81.30
3-4	3	18.70
5-6	0	0
7-8	0	0
PD cycles (n=24)		
0-24	4	16.60
25-48	9	37.60
49-72	6	25
73-96	5	20.80
PD complications (n=14)		
Malfunction of catheter	12	86.00
Access site infection	2	14.00
Peritonitis	0	0.00
Leakage from catheter	0	0.00
Associated comorbidities (n=16)		
MODS [^]	4	25.00
Pyogenic meningitis	3	19
Septic shock	3	19
Hyperkalemia	2	12.50
VAP ^{&}	1	6.25
Convulsions	1	6.25
DIC [~]	1	6.25
Encephalopathy	1	6.25
Outcome (n=24)		
Survived	13	54.20
Non survived	11	45.80

Inborn errors of metabolism, \$ multisystem inflammatory syndrome of newborn, % congenital anomalies of kidney and urinary tract, ^ multiorgan dysfunction syndrome, & ventilation associated pneumonia, ~disseminated intravascular coagulation

Out of 22 patients who underwent PD in this age group, 9 patients (41%) required PD cycles between 73-96 cycles, followed by 6 patients (27%) required 25-48 cycles, 4

patients (18%) required 49-72 cycles and 2 patients (9%) required 0-24 cycles and 1 (5%) patient require >96 cycles. MODS (23%), VAP (23%), septic shock (18%), encephalopathy (12%), convulsions (6%), DIC (6%), pyogenic meningitis (6%), ARDS (6%) were associated comorbidities seen in 2 month - 8-year age group. Out of 25 patients, 12(48%) patients survived and 13(52%) patients expired in our study. Among 12 surviving patients, 7 (28%) patients were successfully discharged, 2 (8%) patients referred to higher center for further management and 3 (12%) patients took discharge against medical advice (DAMA) as they don't want to continue treatment due to personal issue (Table 3).

8-year -15-year age group

Total 17 patients were enrolled under this age group, retrospective and prospective being 10 (58.8%) and 7 (41.2%) patients respectively. Out of which, 11 (64.7%) patients were male, while 6 (35.3%) patients were female, M: F ratio being 1.8:1. Out of 11 male patients, 4 (36%) patients underwent peritoneal dialysis and 7 (64%) patients underwent hemodialysis (HD), while all 6 female patients underwent hemodialysis. In 8 year-15-year age group out of the total 17 patients, 6 (35%) patients belong to the urban area and 11 (65%) patients belong to the rural area. In this age group, septicemia (24%), DKA (17%) and obstructive uropathy (17%) were most common form of etiology followed by lupus nephritis (12%), acute encephalitis (6%), AGN (6%), acute on CKD (6%), liver abscess (6%), tumor lysis syndrome (6%). Only 4 patients underwent PD. Out of which, 3 patients underwent 0-24 cycles, while one patient underwent more than 25-48 cycles of peritoneal dialysis. Median PD cycles in 8 year-15-year age group were 20, with (IQR 16-23). Out of 13 patients who received HD, 1-2 cycles were done in 5 patients, 3 cycles were done in 2 patients, and more than 5 cycles of HD were seen in 6 patients. Median HD cycle in this age group was 3 with (IQR 1-6.25). Out of 17 patients, 13(76.4%) patients had history of oliganuria. History of oligoanuria within 2 days was found in 6 (46.2%) patients and oliganuria since 5-8 days was present in 6 (46.2%) patients, while the history of oliguria between 3-4 days was seen in only one patient (7.6%). Septic shock (29%), MODS (22%), encephalopathy (14%), ARDS (7%), DIC (7%), hypokalemia (7%), pulmonary edema (7%) and thrombocytopenia (7%) were major comorbidities seen in 8 year-15-year age group. Hypotension (56%) was the most common intra HD complication seen in 5 patients followed by pulmonary hemorrhage (22%), DIC (11%), and hyperglycemia (11%) in our study. No cases were reported with complications of dialysis dysequilibrium syndrome and no catheter-related infections were found. Out of 17 patients of the 8–15-year age group, 10 (58.8%) patients survived and 7 (41.2%) patients expired. 10 patients who survived after RRT, 5 (50%) patients were successfully discharged, 2 (20%) patients referred to higher center for further management and 1 (10%) patient took discharged against medical advice (Table 4).

Table 3: Demographic, etiological, clinical profile and outcome of 2 month-8-year age group.

Gender	PD (n=22)	HD (n=3)	Total no. of patients (n=25)	Percentage
Male	19	2	21	84
Female	3	1	4	16
Area	n=22	n=3	n=25	
Urban	8	1	9	36
Rural	14	2	16	64
Etiology	n=22	n=3	n=25	
Septicemia	5	0	5	20
Acute viral encephalitis	4	0	4	16
DKA [@]	1	1	2	8
Diphtheria	2	0	2	8
Obstructive uropathy	2	0	2	8
Pneumonia	2	0	2	8
Severe dehydration	2	0	2	8
Meningitis	1	0	1	4
Post inflammatory ileus	1	0	1	4
Pyelonephritis	1	0	1	4
Tetanus	1	0	1	4
Nephrotic syndrome	0	1	1	4
Uremia	0	1	1	4
Days of oliganuria	n=14	n=3	n=17	
0-2	12	1	13	76.00
3-4	2	1	3	18.00
5-6	0	1	1	6.00
Associated comorbidities	n=14	n=3	n=17	
MODS [#]	4	0	4	23.00
VAP ^{\$}	4	0	4	23.00
Septic shock	2	1	3	18.00
Encephalopathy	1	1	2	12.00
Convulsion	1	0	1	6.00
DIC [%]	1	0	1	6.00
Pyogenic meningitis	1	0	1	6.00
ARDS [^]	0	1	1	6.00
Outcome	n=22	n=3	n=25	
Survived	10	2	12	48
Discharge	6	1	7	
Refer	2	0	2	
DAMA ^{&}	2	1	3	
Non-survived	12	1	13	52

@DKA-Diabetic Ketoacidosis, # Multiorgan dysfunction syndrome, \$ Ventilation associated pneumonia, % Disseminated intravascular coagulation, ^ acute respiratory distress syndrome, & Discharged against medical advice

Table 4: Demographic, etiological, clinical profile and outcome of 8 year-15-year age group.

Gender	PD (n=4)	HD (n=13)	No. of patients (n=17)	Percentile
Male	4	7	11	64.70
Female	0	6	6	35.30
Area	n=4	n=13	n=17	
Urban	2	4	6	35.30
Rural	2	9	11	64.70
Etiology	n=4	n=13	n=17	
Septicemia	2	2	4	24.00
DKA [@]	0	3	3	17.00
Obstructive uropathy	1	2	3	17.00

Continued.

Gender	PD (n=4)	HD (n=13)	No. of patients (n=17)	Percentile
Lupus nephritis	0	2	2	12.00
Acute viral encephalitis	1	0	1	6.00
AGN [#]	0	1	1	6.00
Acute on CKD ^{\$}	0	1	1	6.00
Liver abscess	0	1	1	6.00
Tumor lysis syndrome	0	1	1	6.00
Complications	n=3	n=11	n=14	
Septic shock	1	3	4	29.00
MODS [%]	1	2	3	22.00
Encephalopathy	0	2	2	14.00
ARDS [^]	0	1	1	7.00
DIC ^{&}	1	0	1	7.00
Hypokalemia	0	1	1	7.00
Pulmonary edema	0	1	1	7.00
Thrombocytopenia	0	1	1	7.00
Outcome	n=4	n=13	n=17	
Survived	1	9	10	58.8
Discharge	1	4	5	
Refer	0	4	4	
DAMA [*]	0	1	1	
Non-survived	3	4	7	41.2

@Diabetic ketoacidosis, # acute glomerulonephritis, \$ chronic kidney disease, % multiorgan dysfunction syndrome, ^ acute respiratory distress syndrome, & disseminated intravascular coagulation, * discharged against medical advice

Table 5: Biochemical profile of different age group AKI patients required RRT.

Biochemical parameters	Survived		Non-survived	
	Mean	SD [@]	Mean	SD
Biochemical profile of RRT[#] survivors and non-survivors in 0-2 month age group				
Urea (mg/dl)	131.23	65.0784	106.81	77.2513
Creatinine (mg/dl)	3.42	2.0554	3.55	1.5211
Sodium (mEq/l)	143.769	14.4404	141.364	21.2757
Potassium (mEq/l)	5.6077	1.3967	5.6636	1.478
pH	7.0831	0.1398	7.0509	0.1407
HCO ₃ (mEq/l)	7.8846	4.6467	10.4091	4.8794
Biochemical profile of RRT patients between survivors and non-survivors in 2 month-8 year age group				
Urea (mg/dl)	135.5	52.57	67.5	41.2
Creatinine (mg/dl)	4.3064	1.6167	2.11	0.7522
Sodium (mEq/l)	138.78	10.7502	147	9.4772
Potassium (mEq/l)	5.35	1.8658	4.0667	0.8228
pH	7.1071	0.1081	7.0317	0.189
HCO ₃ (mEq/l)	8.6529	4.072	8.15	5.1894
Biochemical profile of RRT patients between survivors and non-survivors in 8 year to 15 years				
Urea (mg/dl)	112.1	54.25	124.14	62.91
Creatinine (mg/dl)	6.83	2.35	5.35	3.7
Sodium (mEq/l)	139.6	6.6	141	5.3852
Potassium (mEq/l)	4.52	1.449	4.72	1.34
pH	7.07	0.2	7.016	0.19
HCO ₃ (mEq/l)	7.93	5.62	11.07	4.28

renal replacement therapy, @ Standard deviation

DISCUSSION

Acute renal failure is one of the important diseases in the causation of mortality and morbidity. Various conditions

leading to ARF by themselves can lead to various other non-renal complications thereby contributing to mortality and morbidity. The incidence of AKI in our study was 3% but other studies by Shrivastava et al, and Mishra et al observed approximately 1% of AKI incidence.^{6,7} Table 1

shows AKI stages according to KDIGO criteria. In the present study, different parameters like demography, clinicoetiological, biochemical parameters and outcome were analyzed in three age groups (0–2-month age, 2 month–8-year age group and 8 year–15-year age group).

In our study there was a male preponderance seen in the 0–2-month age group, 2 month–8-year age group and 8 year–15-year age group, described respectively in Tables 2–4 (male: female ratio 2:1, 5:1 and 1.8:1 seen respectively in all three groups). Mishra et al, Javaid et al, Shin et al, Asinobi et al, and Arora et al also reported a similar male dominance but M: F ratio being 2.2:1, 2.1:1, 1.7:1, 1.21:1, 3:1 respectively.^{8–12} This discrepancy might be due to regional and social differences in the above studies. Similarly, rural preponderance was seen in all three age groups. Our hospital is a major tertiary-level care referral health center located in central Gujarat. Our hospital is catering patients from rural areas of South Gujarat, and border areas of Madhya Pradesh, Maharashtra, and Rajasthan.

Etiological classification of AKI patients required RRT shown in Tables 2–4. In the 0–2-month age group, birth asphyxia (33.4%) was the most common etiological factor followed by neonatal sepsis (29.2%) and severe dehydration (20.8%), meningitis (8.40%), MIS-N (4.1%), IEM (4.1%) as mentioned in Table 2. One study by Katariya et al observed birth asphyxia 18 (34.9%) as being a common cause of AKI in the neonatal age group followed by sepsis 12 (23.1%) and shock 15 (28.5%) in total 52 patients. This study is comparable with our study.¹³ Severe dehydration secondary to top feeding/faulty feeding is 3rd common cause in our study because we receive so many referrals from surrounding rural areas with false feeding practices, which outstands our study from other studies. In 2 month–8 year age group, Septicemia (20%) is most commonly seen etiological factor followed by acute viral encephalitis (16%), diphtheria (8%), DKA (8%), obstructive uropathy (8%), pneumonia (8%), dehydration and other miscellaneous causes mentioned in Table 3, while in the study by Javaid et al showed acute gastroenteritis (31.7%) followed by sepsis (25%), PSGN (11.7%), HUS (5%) as an etiological factor for AKI.⁹ In 8 year–15 year age group, septicemia (24%) was the most common form of etiology followed by DKA (17%), obstructive uropathy (17%), lupus nephritis (12%), acute encephalitis (6%), AGN (6%), acute on CKD (6%), liver abscess (6%) and tumor lysis syndrome (6%) as mentioned in Table 4, while in the study by Asinobi et al show sepsis (22.1%) as a major causative etiology followed by glomerulonephritis (17.6%), malaria (17.6%), unknown intravascular hemolysis (16.2%), G6PD deficiency (7.4%), hemoglobinopathy (5.9%), AIHA (1.4%) and HUS (1.4%).¹¹ One study by Shin et al shows HUS (26.1%) followed by glomerulonephritis (17.4%) as an etiological factor.¹⁰ While in the presented study, no cases of HUS were there.

In the 0–2-month age group, 16 (66.67%) patients had a history of oliganuria with different time intervals, while in the 2 month–8-year age group, 17 (68.00%) patients had oliganuria history and in 8 year–15-year age group, 13 (76.5%) patients had a history of oliganuria. In the 0–2-month age group, 14 patients had PD-related complications, in which 12 patients had malfunctions of the catheter and 2 patients had access site infection. In 8 year–15-year age group as most patients underwent hemodialysis, 9 (69.2%) patients developed HD-related complications. Out of which 5 patients had hypotension, 2 patients had pulmonary hemorrhage and 1 patient each had hyperglycemia and DIC (Table 5). In the study by Shin et al Catheter-related complications (21.7%) were the most common HD-related complications followed by dialysis disequilibrium syndrome (20%).¹⁰

Commonly associated comorbidity in all age groups was multi organ dysfunction syndrome (MODS) followed by septic shock, encephalopathy, pyogenic meningitis, hyperkalemia, ventilator-associated pneumonia, ARDS, DIC, pulmonary edema, while in 8 year–15 year age group septic shock was most common associated comorbidity seen in our study. The study by Krishnamurthy et al showed encephalopathy, and pneumonia, as associated comorbidities.¹⁴ Table 5 shows different biochemical profile among survivors and non-survivors in all age groups.

The survival rate in the exclusive PD group (0–2-month age group) was 54.20%. In 2 month–8-year age group, 12 patients (48%) survived. Majority of deaths were due to MODS and septicemia. In 8 year–15-year age group, 10 patients (58.8%) survived out of which 5 patients were discharged successfully, 4 patients were referred to a higher center for post-renal cause and end-stage renal disease (ESRD) may require renal transplantation and 1 patient took DAMA.

Limitations

Because of COVID pandemic, we observed a decreased patient load at our institution, we found difficulty in collecting prospective data. This is a pioneer study as a point of hemodialysis in the PICU set up in our state. So, there is a limitation in consumable supply (e.g., non-availability of small-sized bloodlines and dialyzers for infants and lower age groups) hence number of patients undergoing hemodialysis is reduced. We have only one HD machine available in our PICU. So larger size data is not available and we have taken retrospective data from the dialysis unit. HD is still in the evolution stage even in developed countries, so HD data of 0–2 month of age is not available.

CONCLUSION

From our study, we conclude that to expand the facility of point of care, hemodialysis facility in ICUs with a larger

study or multicentric study in the pediatric age group is required.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Solanki JR, Patel KS. Clinical profile of pediatric acute renal failure patients requiring renal replacement therapy age less than 15 years - an ambivalent cohort study. *Int J Contemp Pediatr* 2024;11:288-95.