

Acute Renal Failure in Children at the University Hospital of Brazzaville

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Abstract

Introduction: Acute renal failure (ARF) is a medical emergency that does not spare children. Its interest lies in the search for etiologies and management made difficult by the poor quality of hospital technical platform in Africa. **Objectives:** To improve the management of ARF in children, determine its prevalence, and identify the causes and factors associated with mortality. **Patients and Methods:** We reviewed the records of children from one month to 17 years hospitalized between January 2016 and December 2018 in every pediatric department at the University Hospital of Brazzaville and included those whose discharge diagnosis included the item “ARF”. Study variables were age, sex, source, (para)clinical signs, stage and type of ARF, etiology and evolutionary profile. **Results:** Included were 18952 hospitalized children out of whose 253 had ARF 1.3%. There were 145 (57.3%) boys and 108 (42.7%) girls with an average age of 71.5 months. The mean time to consultation was 8.1 days. ARF was at failure stage in 147 cases (58.1%). It was functional in 210 cases (83.0%), out of which 95.1% resulted from severe dehydration. No extra-renal treatment was performed. Lethality was 34.4%. Hypovolemic shock (56.3%), severe sepsis (18.4%) and severe malaria (14.9%) were the main causes. Young age, provenance of the child, severe dehydration, deep coma, oligoanuria, stage of failure, hyperkalemia, absence of an extra-renal purification center were factors associated with mortality ($p < 0.0002$). **Conclusion:** The high prevalence of ARF and its lethality requires public health actions including proper management of dehydration and malaria but also the creation of an extra-renal purification center.

Keywords

Acute Renal Failure, Child, Brazzaville

1. Introduction

Acute renal failure (ARF), a rapid deterioration of renal function resulting in elevated plasma creatinine and inability of the kidney to eliminate waste nitrogen metabolism and maintain the body's electrolytic balance [1], is a medical emergency. It is reversible in most cases, but may be life-threatening [1] [2]. It is one of the leading causes of morbidity and mortality in children [3] [4]. Its pediatric prevalence is 0.8 per 100,000 habitants in the United Kingdom [5], 0.39% in the United States [6], 4.5% in Canada [7], with mortality rates of 25%, 15.3%, 3.5%. In Africa, some hospital surveys are reported by Aloni in the Democratic Republic of Congo (DRC): 1.78% [8], Keita in Senegal: 0.91% [9], Ifeoma in Nigeria: 1.0% [10] and Coulibaly in Burkina Faso: 3.3% [11] with respectively 25%, 34%, 40.5%, 10.1% of deaths. The diagnosis of ARF is made by biological examinations and its management depends on the causes.

In Congo, according to Assounga [12], the pediatric frequency of the ARF at the University Hospital of Brazzaville in 2000 was 0.99% with 37% of deaths. Recently, seventeen years later, our study was carried out in the same hospital, and intended to contribute to improving the management of inpatient children with ARF and aimed to: determine epidemiological aspects of pediatric ARF, identify causes, describe the evolutionary profile and identify factors associated with mortality.

2. Methodology

It was a cross-sectional, retrospective study conducted from January 2016 to December 2018 at the University Hospital of Brazzaville, a Level III health facility. It has 22 clinical departments, including three pediatric departments (infant, older children and intensive care), which are part of the study.

Children aged from one month to 17 years, hospitalized in one of the pediatric departments, and whose discharge diagnosis included among others the item ARF were included.

Newborns and children hospitalized for chronic renal failure were not included. Inaccurate records, duplicates, and children with uncomplicated renal disease were excluded.

This sample was exhaustive. The data was collected on a pre-established survey form.

The variables studied were: socio-demographic: age, sex, place of residence and provenance of the child; the age, occupation, education and socio-economic status of the parents; Clinical: period and motive of hospitalization, symptoms presented before admission and at admission: diuresis, presence of edema, temperature, respiratory distress, state of consciousness, state of hydration and nutritional, paleness, blood pressure. Para-clinical variables: serum creatinine, blood urea, hemogram, blood ionogram, serum calcium, phosphoremia, bicarbonate, blood gas, haptoglobin, blood smear, C3 complement, coombs test, urine test strip, 24-hour proteinuria, urine cytobacteriological examination

(UCBE), electrocardiogram, renal and/or abdominal ultrasound, chest X-ray, abdominal radiography without preparation, percutaneous renal biopsy (PRB).

Other variables: stage of ARF, type of ARF, etiology of ARF, treatment, evolution.

2.1. Operational Definitions

ARF was defined as a rapid and usually reversible decrease in the glomerular filtration rate leading to uremia and fluid and electrolyte disturbances. It is characterized by a recent elevation (<3 months) of serum creatinine, which may display preserved diuresis (>500 ml/24h) or oliguria (100 - 500 ml/24h) or anuria (<100ml/24h) [13].

The staging of the ARF used was that of the modified RIFLE (**Table 1**) classification for pediatrics (pRIFLE) [14]. The estimated clearance of creatinine is calculated according to Schwartz's pediatric formula [15] and compared to a reference value of 100 ml/min/1.73m² in the absence of a known prior value.

Acute renal failure is called functional or pre-renal, when there is a decrease in glomerular perfusion; organic or intrinsic, a dysfunction of different renal structures (tubules, glomeruli, interstitium or vessels) and obstructive or post-renal, when there is an obstacle on the urinary tract [16].

Complete recovery of renal function: was defined by the normalization of serum creatinine and blood urea output.

Partial recovery of renal function: was defined as resumption of diuresis with improvement of renal function without normalization of serum creatinine and/or blood urea. Chronicity: was defined by the lack of normalization of renal function beyond three months.

2.2. Statistical Analysis

The data were entered and processed using SPSS version 20.0 and Microsoft Excel 2010. The qualitative and quantitative variables were expressed in percentages \pm standard deviation, respectively. The comparison of the means between variables was performed by Pearson's chi-square for qualitative variables, the Student's test for quantitative variables. The Odd Ratio (OR) calculation and their confidence interval (CI) were required. The threshold of significance was set at 0.05.

Table 1. Modified RIFLE for ARF classification in pediatrics [14].

Stage	Estimated clearance plasma creatinine	Diuresis
Risk	Reduced to >25%	<0.5 ml/kg/h since 8 h
Injury	Reduced to >50%	<0.5 ml/kg/h since 16 h
Failure	Reduced to >75% or <35/ml/min/1.73 m ²	<0.3 ml/kg/h during 24 h or anuria since 12 h
Loss	Persisting failure >4 weeks	-
End stage	Persisting failure >3 months	-

3. Results

3.1. Frequency

Of the 18,952 children hospitalized during the reporting period, 253 were hospitalized for an ARF (1.3%). This frequency was 2.5% in the pediatric intensive care unit (n = 161/6351), 1.1% in the older children department (n = 58/5263) and 0.5% in the Infant pediatrics (n = 34/7338).

Socio-demographic characteristics of the study population

These were children with a mean age of 71.5 ± 67.1 months (1 and 204 months). There were 145 boys (57.3%) and 108 girls (42.7%), sex ratio 1.3. They lived in urban areas in 238 cases (94.1%), semi-urban in three cases (1.2%) and rural in 12 cases (4.7%). They came from home with no history of prior consultation in 122 cases (48.2%), with history of prior consultation in a level II hospital in 98 cases (38.7%), with history of prior consultation in a medical office in 21 cases (8.3%) and prior consultation in a Level I Medical Center in 12 cases (4.8%)

The parents had an average age of 32.7 ± 7.9 years old (15 to 58 years old) for the mothers versus 38.9 ± 8.9 (19 to 65 years old) for the fathers. They were over 35 years old in 274 cases (63.9%), between 18 and 35 years old in 155 cases (36.1%) and under 18 years old in 3 cases (0.7%). Their level of education was secondary in 240 cases (55.6%), primary in 137 cases (31.7%), higher in 47 cases (10.9%) and in eight cases (1.8%) they had no education. They were unemployed in 158 cases (36.6%), informal sector workers in 132 cases (30.5%), civil servants in 65 cases (15%), workers in 56 cases (13%) and senior executives in 21 cases (4.9%).

The socio-economic level specified in 220 cases (87%), was low in 135 cases (61.4%), average in 64 cases (29.1%) and high in 21 cases (9.5%).

3.2. Anamnestic Data

The mean time from onset of symptoms to hospitalization was 8.1 ± 10.1 days (range 1 to 60 days).

The treatment administered before hospitalization, in 191 cases (75.5%) was made of plant decoction in four cases (2.1%) and drugs in 187 cases (97.9%). The drugs were nephrotoxic in 42 cases (22.5%), non-steroidal anti-inflammatory drugs in 31 cases and aminoside in 11 cases. These drugs were obtained over-the-counter in 92 cases (49.2%) on prescription of nurses in 59 cases (31.5%) and doctors 36 cases (19.3%).

3.3. Clinical Data

The symptoms leading to hospitalization and those found on the examination are recorded in **Table 2** and **Table 3**.

3.4. Para-Clinical Data

The mean serum creatinine level was $280.5 \mu\text{mol/l} \pm 262 \mu\text{mol/l}$ ($132.8 \mu\text{mol/l}$ to $1839.03 \mu\text{mol/l}$); the blood urea level was $1.4 \pm 0.8 \text{ g/l}$ (0.3 g/l to 4.1 g/l). In 36

Table 2. Motive of hospitalization.

Motives	n	%
Respiratory distress	78	30.8
Hypodynamia	56	22.1
Convulsions	51	20.1
Severe anemia	21	8.3
Coma	15	6
Severe dehydration	9	3.5
Hematuria	6	2.4
Abdominal pain	5	2
Renal edema	4	1.6
Renal failure*	4	1.6
Anuria	3	1.2
Burn	1	0.4
Total	253	100.0

Renal failure*: referred patients.

Table 3. Examination.

Signs	n	%
Fever	203	80.2
Dehydration	134	52.9
Severe	119	88.8
Moderate	15	11.2
Pallor	108	42.7
Coma	100	39.5
Deep	63	63
Mild	37	37
Oliguria/anuria	60	23.7
Undernutrition	59	23.3
Blood pressure	27	10.7
Normal	14	51.9
HBP	13	44.4
Hypotension	1	3.7
Edema	19	7.5
Hemoglobinuria	19	7.5
Distended bladder	6	2.4
Congestive heart failure	5	2
Hypogastric mass	1	0.4

NB: these symptoms could be isolated or associated.

cases, mean serum sodium concentration was 138.2 ± 12.8 meq/l (110.7 meq/l to 195.0 meq/l) in 127 cases, hyponatremia in 32 (25.2%), hypernatremia in 18 cases (14.2%), an average serum potassium concentration of 5.0 ± 2.4 meq/l (1.35 meq/l and 12.20 meq/l). Hypokalemia in 27 cases (21.2%), hyperkalemia in 33 cases (26%).

The serum calcemia performed in three (1.2%) cases were normal; anemia was noted in 112 cases (44.3%) with an average hemoglobin level of 8.6 ± 3.1 g/dl (2.9 g/dl to 15 g/dl).

The urine test strips in 29 cases (11.5%) showed nitrite positivity in 21 cases (72.4%), leukocyturia in 21 cases (72.4%), positive proteinuria in 13 cases (44.2%). ketonuria and positive glycosuria in four cases (13.8%).

The UCBE performed in 19 cases (7.5%), was positive in 8 cases (42.1%). The isolated organisms were *E. coli* in four cases (50%), *Klebsiella pneumoniae SPP* in three cases (25%), *enterobacterium SPP* in one case (12.5%) and *staphylococcus aureus* in one case (12.5%).

The 24-hour proteinuria performed in 15 cases (5.9%) was positive in 7 cases (46.7%).

Blood culture in six cases was positive in three cases. The isolated organisms were *Enterobacter Cloacae*, *Klebsiella*, *Pseudomonas Fluorescens* in one case each.

The renal ultrasound performed in 41 cases (16.2%), showed: a kidney of normal morphology in 28 cases (68.3%), a kidney of increased size in six cases including five cases with a normal echogenicity and a case with poor corticomedullary differentiation, posterior urethral valves in five cases, bilateral hydro-nephrosis, bladder and ureteral duplication, and an intravesical expansive process in one case each.

The chest X-ray performed in 38 cases (15.0%) noted cardiomegaly with signs of overload in four cases, pleural effusion in three cases, alveolar opacity in 13 cases, and interstitial opacity in 18 cases.

Bicarbonates, blood gases, haptoglobin, C3 complement, coombs test, ECG, PRB were not performed.

3.5. Type and Causes of ARF

The ARF was at failure stage in 147 (58.1%), injury stage in 81 cases (32%) and risk stage in 25 cases (9.9%). The ARF was functional in 210 cases (83%), parenchymal in 34 cases (13.4%) and obstructive in nine cases (3.6%).

The causes of ARF are shown in **Table 4**.

4. Treatment

The treatment was conservative and function of etiology in all cases. Hemodialysis was indicated and not performed in 63 cases.

4.1. Evolution

A full recovery was noted in 168 cases (65.6%) and one death in 87 (34.4%) (**Table 5**).

Table 4. Causes of renal failure.

	Variables	n	%
Etiologies of functional ARF N = 210 (83.0%)	True hypovolemia	121	57.6
	Severe dehydration	120	99.2
	Acute gastroenteritis	115	95.8
	Ketoacidosis	4	3.3
	Burn	1	0.8
	Gastrointestinal bleeding	1	0.8
	False-positive hypovolemia	89	42.4
	Severe malaria	57	64.0
	Severe sepsis	22	24.9
	Severe heart failure	3	3.4
	impure nephrotic syndrome	7	7.9
	Total	210	100
Etiologies of parenchymal ARF N = 34 (13.4%)	Acute tubular necrosis	15	41.1
	Toxic	10	66.7
	Ischemic	5	33.3
	Pyelonephritis	14	41.2
	Acute glomerulonephritis*** post infectious	3	8.8
	Hemolytic and Uremic Syndrome	2	5.8
	Total	34	100
Etiologies of obstructive ARF N = 9 (3.5%)	Posterior urethral valves	5	55.6
	Post-traumatic urethral stenosis	2	22.2
	Bladder tumor	1	11.1
	Idiopathic bilateral hydronephrosis	1	11.1
	Total	9	100

Table 5. Distribution of deceased children by age group and by cause.

	Age (months)	1 - 36	37 - 60	61 - 120	121 - 204	Total
Cause of death/age group	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
Hypovolemic shock/electrolyte disorder	46 (86.8)	1 (1.9)	2 (3.7)	4 (7.5)	53 (100)	
Severe sepsis	7 (46.7)	2 (13.3)	3 (20)	3 (20)	15 (100)	
Severe malaria	3 (23.1)	3 (23.1)	3 (23.1)	4 (30.7)	13 (100)	
Cardiogenic shock	1 (33.3)	-	1 (33.3)	1 (33.3)	3 (100)	
Septic shock	1 (50)	-	-	1 (50)	2 (100)	
Hypertensive encephalopathy	-	1 (100)	-	-	1 (100)	
Total	58 (66.7)	7 (8.1)	9 (10.3)	13 (14.9)	87 (100)	

Mean hospital stay was 7.8 ± 9.6 days (range 1 and 68 days) (**Table 5**).

4.2. Risk Factors for Mortality

4.2.1. Unified Analysis

Relationship between socio-demographic Characteristics and mortality: **Table 6**.

The young age of the children, the facility of reference and low socioeconomic level of the parents have been identified as risk factor for death.

Relationship between clinical data and mortality: **Table 7**.

Relationship between para-clinical data and mortality: **Table 8**.

4.2.2. Multi-Varied Analysis

Relationship between mortality and socio-demographic characteristics: **Table 9**.

Relationship between evolutionary data and mortality: **Table 10**.

Relationship between mortality and clinical characteristics are recorded in **Table 11**.

Evolutionary characteristics: **Table 12**.

The existence of a current complication of hospitalization, the non-completion of hemodialysis and short hospital stay were risk factors for death.

5. Discussion

The purpose of this study was to improve the management of children with ARF hospitalized at the Brazzaville University Hospital, and to describe epidemiological aspects, identify the causes, describe the evolutionary profile and identify the factors associated with death. This study, although hospital and mono-centric, has the advantage of being carried out in the only Pediatric Intensive Care Unit in Brazzaville. But, it presents some pitfalls; the most important is the retrospective nature of the study source of bias, lost sight of but also in the collection of

Table 6. Relationship between socio-demographic characteristics and mortality.

Variables	Death		OR	CI	Khi2	p	
	Yes n (%)	No n (%)					
Age (months)	<60	63 (72.4)	80 (48.2)	2.8	1.6 - 4.9	13.627	0.0001
	>60	24 (27.6)	86 (51.8)				
Sex	Female	42 (48.3)	66 (39.8)	1.694	0.8 - 2.3	1.4	0.193
	Male	45 (51.7)	100 (60.2)				
Provenance	Health facility	63 (72.4)	68 (41)	3.8	2.1 - 6.6	22.613	0.0001
	Home	24 (27.6)	98 (51)				
Socioeconomic status	Bas	61 (70.1)	74 (44.6)	3.7	2.1 - 5.9	22.419	0.0001
	Other	26 (29.9)	92 (54.4)				
Duration of symptoms before admission (Days)	>7	21 (24.1)	37 (22.3)	1.1	0.6 - 2	0.110	0.739
	<7	66 (75.9)	129 (77.7)				

Table 7. Relationship between clinical data and mortality.

Signs	Overall evolution		Khi 2	OR	CI	P
	Death n (%)	Favorable n (%)				
Dehydration						
Severe	41 (34.5)	78 (65.5)				0.001
Moderate	1 (6.7)	14 (93.3)	4.517	2.6	1.04 - 6.3	
Coma						
Deep	42 (66.7)	21 (33.3)				0.0001
Mild	13 (35.1)	24 (64.9)	10.635	4.1	1.7 - 9.7	
Diuresis						
Oliguria/anuria	45 (75)	15 (25)				0.0001
Preserved	42 (21.8)	151 (78.2)	57.497	10.8	5.4 - 21.2	
Nutritional status						
Undernutrition	34 (57.6)	25 (42.4)				0.0001
Eutrophic	53 (27.3)	141 (72.7)	18.218	3.6	1.9 - 6.6	
ARF stage						
Failure	64 (43.5)	83 (56.5)				0.0001
Others	23 (21.7)	83 (78.3)	13.019	2.8	1.5 - 4.9	
Type of ARF						
Functional	75 (35.7)	135 (64.3)				0.326
Others	12 (27.9)	31(72.1)	0.964	1.4	0.7 - 2.9	

Table 8. Relationship between paraclinical data and death.

Biological parameters	Frequency (%)	Mean	Student test			
			Average difference	t	Bilateral significance	CI
Urea						
Death	15 (41.7)	1.5	0.18	0.6	0.525	-5.7; 9.7
Living	21 (58.3)	1.3				
Creatinine						
Death	87 (34.4)	32.9	1.9	0.5	0.614	-5.6; 9.6
Living	166 (65.6)	31				

data. Thus, the results of this study can be extrapolated to the entire child population of Brazzaville. It worth to be done specially since there is only pediatric intensive care unit in Brazzaville. But, there are some pitfalls, the first of which is related to the mono-centric character and the second due to the retrospective nature of this study, sources of bias in lost-to-follow-up.

The prevalence of pediatric ARF varies from one country to the other depending

Table 9. Relationship between mortality and sociodemographic characteristics.

	Khi2	OR	IC	p	ORa	CI	P
Age < 60 months	13.627	2.8	1.6 - 4.9	0.0001	2.2	1.7 - 2.9	0.000
Health facility	22.613	3.8	2.1 - 6.6	0.0001			
Low socio-economic level	22.419	3.7	2.1 - 5.9	0.0001			

Table 10. Relationship between evolution and mortality.

	Overall evolution		Khi 2	OR	CI	P
	Deaths n (%)	Favorable n (%)				
Complications						
Yes	64 (63.4)	37 (36.6)	33.113	5.5	2.9 - 10.1	0.0001
No	23 (15.1)	129 (84.9)				
Indication of dialysis						
Yes	47 (54.0)	16 (9.6)	60.133	11	5.7 - 21.4	0.0001
No	40 (46.0)	150 (90.4)				
Hospital stay						
<7	74 (45.4)	89 (54.6)	25.109	5.2	2.6 - 10.3	0.0001
>7	15 (16.7)	75 (83.3)				

Table 11. Relationship between death and clinical findings.

	Khi 2	OR	CI	p	ORa	CI	p
Deep coma	10.635	4.1	1.7-9.7	0.0001			
Severe dehydration	4.517	2.6	1.04-6.3	0.001			
Undernutrition	18.218	3.6	1.9-6.6	0.0001	2.3	1.9 - 2.6	0.0001
Oliguria/anuria	57.497	10.8	5.4-21.2	0.0001			
Failure stage ARF	13.019	2.8	1.5-4.9	0.0001			

Table 12. Relationship between mortality and therapeutic and evolutionary characteristics.

	Khi2	OR	CI	p	ORa	IC	p
Complications	33.113	5.5	2.9 - 10.1	0.0001			
Absence dialysis	60.133	11	5.7 - 21.4	0.0001	3.1	2.5 - 3.8	0.0001
Hospital stay <7 days	25.109	5.2	2.6 - 10.3	0.0001			

on methodological differences and the level of health facility. The available data are essentially those of multicenter surveys. Its prevalence is 1.3% in this study as in that of Assounga [12] in the same hospital. Similar prevalence is reported by Keita in Senegal and Ifeoma in Nigeria [9] [10] respectively 0.91% and 1.0%. Higher prevalence is noted in the work done in the DRC, Algeria, Nigeria, Bur-

kina Faso and Brazil [8] [11] [17] [18] [19] with respective rates of 1.78%, 3.07%, 3.13%, 3.3%, and 8%. In contrast, those in China and the United States report low prevalence of 0.32% and 0.39 [6] [20]. These disparities can be explained, among other things, by the delay in consultation and, in particular, the management of ARF etiologies in developing countries.

The age of onset varies from one study to another and is a function of the target population. It is on average 71.5 ± 67 months in our study as described in the works of Gheissari, Ifeoma, Batouche and Bunchman [10] [18] [21] [22]. In Senegal, Burkina Faso, Pakistan and the United States the average age varies between 80.4 and 129.6 months [6] [9] [11] [23]. Younger children from 12.79 to 67.2 months are the most reported in the works of Riyuzoa, Abdullah, Oubella, Moghtaderi, Shalaby, Moussa Ntondi, Cao and Damte Shimelis [24]-[30].

The male predominance noted in the literature [8] [11] [22] [25] [31] is found in this study without any significant difference.

The reasons for consultation and the revealing symptoms are also variable from one study to another, depending on the etiology and the existence of complications relating to delay in consultation [29]. The predominant symptoms are: respiratory distress, hypodynamic, convulsions, fever, oligoanuria [11] [29] [32]-[37]. The definitive diagnosis is provided by creatinine, which has been significantly contributive to this study.

Diagnosis is made at the stage of renal failure (58.1%) as in Halle works 86.2% [38], Oubella 81% [26], Jakanattane 35.9% [35], Duzova 43.0% [34], Tresa 76.7% [23], Riyuzo 94.8% [24] and Batouche [18]. In China and Saudi Arabia, the risk stage predominates [20] [28].

In terms of etiologies, the predominance of severe dehydration in the occurrence of functional ARF of the child is a known fact [9] [12] [23] [40]. It was hypovolemic in 83% of cases in this study. Other causes are: severe malaria, the first cause of functional ARF in black Africa [1] [11] [29], second cause in our study and severe sepsis, whose genesis in the occurrence of functional ARF is well known [21] [25] [26] [28] [33] [35] [38] [39] [40].

The evolution of ARF in children is generally favorable [9] [12] [26] [33] [35] [36] [41] [42]. But it can be laced with complications including hyperkalemia, acute pulmonary edema and metabolic acidosis [35] [37]. Its prognosis is depending to the etiology, the speed of management and the level of the health facility and the accessibility to extra-renal purification. The lethality of 34.4%, found in this study is similar to that of Assounga [12]. Lethality varying between 32% and 56.2% are reported in Côte d'Ivoire, Nigeria, Senegal, Saudi Arabia, Morocco, Turkey, Baghdad, Brazil, Nigeria, Thailand, India, in Kuwait, Togo, Cameroon and Lithuania [9] [17] [27] [26] [34] [25] [19] [10] [33] [35] [36] [38] [40] [41] [42] [43]. Lesser lethality is reported in developed and developing countries with extra-renal purification centers [11] [18] [20] [21] [23] [29] [31] [39] [42] [44] [45] [46].

The risk factors for death reported in Morocco, Bangladesh, India, Lithuania

and Iran [26] [31] [36] [39] [46] are age below five years, provenance of the child, the existence of deep coma, severe dehydration, undernutrition, oligoanuria, ARF at failure stage, lack of dialysis and hospital stay of less than seven days.

Conclusion

The ARF of the child is frequent at the University Hospital of Brazzaville. It predominates in children under 36 months and low socioeconomic status. Severe dehydration is the main etiology. High lethality reflects its severity. Young age, provenance of the child, severe dehydration, deep coma, oligoanuria, stage of renal failure and absence of an extra-renal purification center are some of the factors associated with death of inpatient children with ARF.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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Annex: Survey Sheet

I. Identity

Last name and first

name :.....

Age: months 1 - 11 months / _ / 12 - 60 months / _ / 61 - 120 months / _ / 121 - 204 months / _ /

Sex: M / _ / F / _ /

Adress (of the child):

• BZV: Yes / _ / No / _ /

○ Makelekele / _ / Bacongo / _ / Poto-poto / _ / Moungali / _ / Ouenze / _ / Talangai / _ / MFilou / _ / madibou / _ / Djiri / _ /

• Other: Yes / _ / No / _ / If yes, specify:

Provenance: Home / _ / Base hospital / _ / Integrated Health center / _ /

Doctor's office / _ /

Any department of the University Hospital of Brazzaville / _ /

Specify:

Year: 2016 / _ / 2017 / _ / 2018 / _ /

Month of hospitalization: /...../

Hospitalization Service: SIP / _ / PGE / _ / PN / _ /

Reason for referral or hospitalization:

II. History of the Disease

Duration of symptoms before admission: <7 days / _ /; 7 and 14 Days / _ / ≥ 15 Days / _ /

Duration of symptoms before the first consultation in any health center:

Interval: <7 days / _ /; 7 and 14 Days / _ / ≥15 Days / _ /

Symptoms:

III. Antecedents

Personal:

Uropathy Yes / _ / No / _ / Urolithiasis Yes / _ / No / _ / HTA Yes / _ / No / _ /

Diabetes Yes / _ / No / _ / Hemoglobinopathies Yes / _ / No / _ / HIV: Yes / _ / No / _ /

Hematopathy: Yes / _ / No / _ / Nephrotic syndrome: Yes / _ / No / _ / GNA: Yes / _ / No / _ /

Cardiopathy: Yes / _ / No / _ / Long-term treatment: Yes / _ / No / _ /

If yes: Folic acid / _ / TAR / _ / Digoxin / _ / Captopril / _ / Iron / _ / corticosteroid / _ /

Prior medication before hospitalization:

Treatment given before hospitalization Yes / _ / No / _ /

If Yes: Medical / _ / Traditional / _ /

If medical treatment:

Duration of treatment: <7 days / _ / ; 7 and 14 Days / _ / ≥ 15 Days / _ /

ATB: aminoglycoside / C3G / metronidazole / quinolone / Amoxi + ac clav / /

Amoxicillin / _ / macrolide / _ / cotrimoxazole / _ /

Antipalust: A + L / _ / quinine / _ / arthemether / _ / artesunate / _ /

NSAID / _ / corticosteroid / _ / diazepam / _ / diarrhea / /

Specify the delay between taking the medication and hospitalization:

Interval: <7days / _ / ; 7 and 14Days / _ / ≥ 15Days / _ /

Family history:

Sibling: size Any other disease history

Parents:

• Mother:

○ Age:

○ Level of education: out of school / _ / primary / _ / secondary / _ / higher / _ /

○ Job:

○ Socio-economic level: low / _ / medium / _ / high / _ / not specified / _ /

○ Pathological ATCD: HTA / _ / diabetes / _ / renal patho / _ / DSS / _ / HIV / _ /

• Father:

○ Age:

○ Level of education: out of school / _ / primary / _ / secondary / _ / higher / _ /

○ Job:

○ Socio-economic level: low / _ / medium / _ / high / _ / not specified / _ /

○ Pathological ATCD: HTA / _ / diabetes / _ / renal patho / _ / DSS / _ / HIV / _ /

IV. Clinical Aspects**1. Overall Examination**

Consciousness: normal / _ / coma / _ / ; if yes: mild / _ / moderate / _ / deep / _ /

Pale Yes / _ / No / _ / if yes, specify:

Dehydration Yes / _ / No / _ / if yes, specify:

Jaundice Yes / _ / No / _ /

Edema: Yes / _ / No / _ / If yes: Lower limbs / _ / Face / _ / Generalized / _ /

Diuresis ml / h, Anuria / _ / Oligoanuria / _ / Normal / _ / Not specified / _ /

BP mmHg Normal / _ / HTA / _ / Hypotension / _ / Not specified / _ /

T° °C Normal / _ / hyperthermia / _ / hypothermia / _ / Not specified / _ /

Nutritional status: Eutrophy / _ / Emaciation / _ / Severe E. / _ / Overweight / _ /

Not specified / _ /

2. Physical Examination

Dyspnoea Yes / _ / No / _ / If yes: Mild / _ / Moderate / _ / Severe / _ / kuss mall / _ /

Ascitic edematous syndrome Yes / _ / No / _ /

Ascites Yes / _ / No / _ /

Lumbar mass Yes / _ / No / _ / if yes: specify the location

Acute Urine Retention (RAU) Yes / _ / No / _ /

Heart failure Yes / _ / No / _ /
 if yes: Global heart failure (HF)/ _ / Left-sided HF / _ / Right-sided HF / _ /
 Other signs:

3. Para-Clinical Examinations

3.1. Biology

Creatinine: Yes / _ / No / _ /

Results: 1) 2) 3) 4) 5) 6)

Range: [10-20] / _ / [21-30] / _ / [31-40] / _ / [41-50] / _ / [51-60] / _ /
 [61-70] / _ / [71-80] / _ /

[81-90] / _ / [91-100] / _ / ≥101 / _ /

Urea: Yes / _ / No / _ / Results: ≤1 / _ / 1-1.99 / _ / 2-2.99 / _ / 3-3.99 / _ / ≥
 4 / _ /

Uric acid: Yes / _ / No / _ / Results:

Blood Ionogram: Yes / _ / No / _ /

Sodium mEq/l normal / _ / hyper natremia / _ / hypo-
 natremia / _ /

Potassium mEq/l normal / _ / hyperkalemia / _ / hypo ka-
 liemia / _ /

Chlorine mEq/l normal / _ / hyperchloremia / _ / hypo
 chloremia / _ /

Calcium: Yes / _ / No / _ /

Results: mEq/L. Normal / _ / hypercemia / _ / hypo calcemia / _ /

Phosphoremia: Yes / _ / No / _ / Normal / _ / high / _ / lower / _ /

Bicarbonate: Yes / _ / No / _ / Normal / _ / high / _ / lower / _ /

Hemogram: Yes / _ / No / _ /

Hb: (g/dl) Normal / _ / A. mild / _ / A. moderate / _ / A. severe / _ /

WBC Normal / _ / leukocytosis / _ / leukopenia / _ /

Platelets Normal / _ / thrombocytosis / _ / thrombocytopenia / _ /

MCV Normal / _ / high / _ / lower / _ /

MCH Normal / _ / high / _ / lower / _ /

Blood glucose Yes / _ / No / _ /

Results: g / l Normal / _ / hypoglycemia / _ / hyperglycemia / _ /

Urine strips Yes / _ / No / _ /

Results:

Leukocyte: Yes / _ / No / _ /, Nitrite: Yes / _ / No / _ /,

Proteinuria: absent / _ / 1+ / _ / 2+ / _ / 3+ / _ / 4+ / _ /

Cetonurie: Yes / _ / No / _ / Glucosuria: Yes / _ / No / _ /

UCBE: Yes / _ / No / _ / Leukocyte: Yes / _ / No / _ /, Nitrite: Yes / _ / No / _ /,
 germ

Proteinuria of 24 hours: Yes / _ / No / _ / Results: negative / _ / massive / _ /
 moderate / _ /

Thick smear: Yes / _ / No / _ /, if yes: positive / _ / negative / _ /

CRP: Yes / _ / No / _ /, if yes: Normal / _ / high / _ / moderate / _ /
 ESR: Yes / _ / No / _ /, if yes: Normal / _ / high / _ / moderate / _ /
 HIV serology: Yes / _ / No / _ /, if yes: positive / _ / negative / _ /
 Hemoculture: Yes / _ / No / _ /, germ:
 Coproculture: Yes / _ / No / _ /, germ:

3.2. Imaging

Abdominal X-ray: yes / _ / no / _ /

Results:

Renal ultrasound yes / _ / no / _ / Results:

Abdominal ultrasound yes / _ / no / _ / Results:

Intravenous Urography: Yes / _ / no / _ / Results:

Retrograde urethrocytography yes / _ / no / _ /

Results:

Computed tomography: yes / _ / no / _ /

Results:

Chest x-ray: yes / _ / no / _ /

If yes: alveolar images / _ / interstitial images / _ / alveolar-interstitial images / _ /

Pleural effusion / _ / Left cardiomyopathy / _ /

4. Discharge Diagnosis.....

5. IRA classification: stage of risk / _ / stage of injury / _ / stage of failure / _ /

6. Type of acute renal failure: functional / _ / parenchymatous / _ / obstructive / _ /

V. Assumed Causes of ARF

Functional ARF: dehydration / _ / anemia / _ / hemorrhage / _ /

Burn / _ /

Impure nephrotic syn-

drom / _ / sepsis / _ / heart failure / _ /

Parenchymatous ARF: acute glomerulonephritis / _ / Impure nephrotic
 syndrom / _ / Haemolytic uraemic syndrome / _ / ATN / _ / Acute Interstitial
 Nephritis / _ / Urinary tract infection / _ /

Obstructive ARF: PUV / _ / Ureteral stenosis / _ / Bladder tumor / _ /

Hydronéphrose / _ / Lithiasis / _ /

VI. Treatment Received

- Vascular filling: yes / _ / no / _ / if yes: ISS / _ / IGS / _ / LR / _ / gelofusine / _ /
- Transfusion: yes / _ / no / _ / if yes: PRBC / _ / platelet / _ / FFP / _ /
- Hyperkalemia treatment: yes / _ / no / _ /
- if yes: kayexalate / _ / sodium bicarbonate / _ / salbutamol / _ / insulin / _ /
- Treatment of acidosis: yes / _ / no / _ / if yes: dialysis / _ / bicarbonate / _ /
- Treatment of hyponatremia: yes / _ / no / _ /
- if yes, intravenous sodium supplementation / _ / sodium supplementation
 per os / _ /
- Treatment of hypocalcemia: yes / _ / no / _ / if yes, calcium supplementation

IV / _ /

- Obstacle lift: yes / _ / no / _ / if yes: vesical cystostomy / _ /
- vasoactive amine: yes / _ / no / _ / intubation / VA: yes / _ / no / _ /
- Lasilix: yes / _ / no / _ / IEC: yes / _ / no / _ /
- Corticoid: yes / _ / no / _ / Immunosuppressive: yes / _ / no / _ /
- Extra-renal treatment: yes / _ / no / _ /
- Other to be specified:

VII. Evolution

- Overall evolution: Death: / _ / Favorable: / _ /
 - If favorable evolution: Output: / _ / Transfer / _ /
 - If transfer, specify service:
 - Renal function at discharge: normal: / _ / ↓ partial / _ / not specified / _ /
 - Complication: yes / _ / no / _ /
 - If yes, specify:
 - Cause of death:
- Duration of hospitalization: 3 days / _ / 3 and 7 days / _ / > 7 days / _ /