

Research Article

# Epidemiological and Clinical Aspects of Arf in the Pediatrics Department of the Ignace Denn National Hospital in Conakry (Guinea)

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## Abstract

Acute renal failure (ARF) is a major public health problem, with incidence in newborns and children ranging from 4.5 to 82%, and mortality from 19 to 83%. The aim was to determine the frequency of acute renal failure in children admitted to the pediatric ward of the Hospital National Ignace Deen. Patients and Method: This was a dynamic descriptive study covering the period from April 1er to September 30 2023; children under 16 years of age with a sudden rise in creatinine above 1.6 mg/dl were included in the study. Results: The incidence of acute renal failure was 7.93%; mean age 8.04 ±3 years. The sex ratio was 2 in favor of men. Clinical signs were dominated by fever, physical asthenia, anorexia and conjunctival pallor (91.67%, 66.67%, 58.33% and 56.25% respectively); proteinuria, hematuria and bilirubinuria were found at Urine Test Strip (BU) (54.17%, 29.17% and 41.67% respectively). Stage I ARF predominated, at 52.02%; organic ARF was found in 54.10% of cases. Mortality in this series was 14.58%. Conclusion: the management of pediatric renal failure at the complication stage is currently a major problem for healthcare professionals, due to the lack of nephropediatric services or specialized centers for extra-renal purification in the various health facilities in Guinea.

## Keywords

Epidemiology, AKI, Pediatrics

## 1. Introduction

Acute renal failure (ARF) is a major public health problem, defined as a sudden deterioration in renal function resulting in elevated creatinine levels, an inability of the kidneys to excrete waste products of nitrogen metabolism and to maintain the body's hydromineral balance [1-4]; The incidence of ARF in newborns and children ranges from 4.5 to 82%, with a

mortality of 19 to 83%; it is also a burden on the healthcare system, leading to increased treatment costs associated with drugs and Extra Renal Purification (EER) [5-8]. Acute renal failure complicated by cardiovascular disease is a major cause of morbidity and mortality in pediatric intensive care units [9].

The etiologies of ARF in the pediatric setting are diverse,

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**Received:** 16 December 2024; **Accepted:** 31 December 2024; **Published:** 17 January 2025



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the circumstances of discovery variable; it is the consequence of a low glomerular filtration rate (GFR), high renal vascular resistance, low perfusion of the cortical region; high tubular sodium excretion and a hemolytic syndrome [10-12].

Acute tubular necrosis (ATN) remains the predominant etiology of ARF in pediatric intensive care; prognosis is closely linked to very young age and ARF associated with sepsis [10, 13].

The onset of acute renal failure can rapidly lead to life-threatening hydroelectrolytic disorders, with the risk of acute lung oedema due to hydrosodium overload, and cardiac rhythm disorders due to hyperkalemia [14]. Its discovery should therefore lead to the immediate introduction of symptomatic treatment to prevent these complications, and the search for a cause that may require specific treatment [13, 14].

Today, thanks to the development of resuscitation techniques and EER, including in neonates and premature infants, and to early management, the preserved mortality of ARF is no longer related to renal damage but to the severity of associated damage [15].

The aim of this study was to investigate the frequency and describe the clinical and prognostic aspects of acute renal failure in the Pediatric Department of the Ignace Deen National Hospital. Due to the lack of pediatric dialysis in the country, the importance of this study was to alert decision-makers to the mortality of this pathology in children, and to put in place preventive measures.

## 2. Methodology

This was a dynamic descriptive study covering the period from April 1<sup>er</sup> to September 30 2023; recruitment was exhaustive and included all patients admitted to the department during the study period. Children under 16 years of age with impaired renal function due to creatinine elevation above 1.6 mg/dl were included in the study; creatinine clearance was calculated using the Schwartz method. Several creatinine determinations were performed; baseline creatinine levels were determined on patient admission, and ARF was classified according to Kidney Disease Improving Global Outcomes (KDIGO) recommendations. Acute renal failure was considered on clinical grounds: absence of normocytic normochromic anemia, absence of history of renal failure, normal kidney size on ultrasound. Types of acute renal failure were divided into functional ARF in the presence of signs of extra-renal dehydration, hypovolemia with a normal BU; organic ARF in the presence of at least one BU abnormality: Pu and/or Hu, Leukocyturia in the absence of urinary tract infection. Obstructive ARF in the presence of unilateral or bilateral dilatation of the urinary tract on abdominal ultrasound. Analysis was performed in SPSS v21.

## 3. Results

The incidence of acute renal failure in this series was 7.93% (Figure 1).

The 5 to 10 age group was the most dominant, i.e. 70.8%, with an average age of  $8.04 \pm 3$  years (Table 1).

Male predominance, with a sex ratio of 2 (Figure 2)

Clinical signs were dominated by fever, physical asthenia, anorexia and conjunctival pallor, with frequencies of 91.67%, 66.67%, 58.33% and 56.25% respectively (Table 2).

Proteinuria, Hematuria and leukocyturia on dipstick were 54.17%, 29.17% and 27% respectively (Table 3).

Biological assessment: all patients had creatinine levels above 1.6 mg/dl, anemia was present in 72.92% (Table 4).

Stage I ARF according to KDIGO 2012 was the most represented 52.08% followed by stage II 31.25% (Table 5).

Organic ARF was the most common form, accounting for 54.17% (Figure 3)

Progression was marked by an 85.42% recovery rate of normal renal function with a mortality rate of 14.58% (Figure 4).

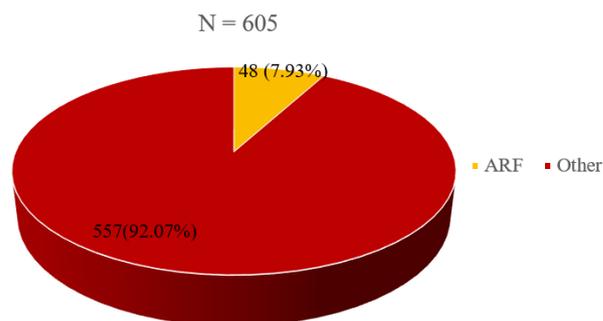


Figure 1. Frequency of pediatric ARF.

Table 1. Distribution of children with ARF in the Pediatrics Department of the Hôpital National Ignace Deen, Conakry, by age group.

Age range	Workforce	Percentage
<5 years	4	8,33
5-10 years	35	72,92
>10 years	9	18,75
<b>Total</b>	<b>48</b>	<b>100</b>

Average age  $8 \pm 3$  years Extremes 4 to 15 years

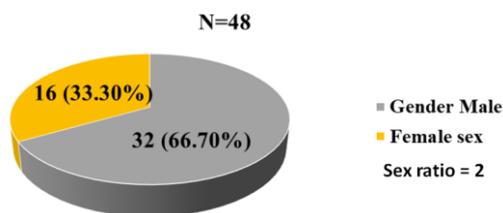


Figure 2. Gender distribution of children with ARF in the pediatric ward of the Hôpital National Ignace Deen, Conakry.

Table 2. Distribution of children with ARF in the Pediatrics Department of the Hôpital National Ignace Deen, Conakry, according to clinical signs.

Clinical signs	Workforce	Percentage
Fever	44	91,67
Physical asthenia	32	66,67
Reasons for consultation		
Anorexia	28	58,33
Headaches	24	50
Vomiting	22	45,83
Diarrhea	8	16,67
Permanent dyspnea	21	43,75
Anuria	5	10,42
Physical signs		
Edema	3	6,25
Pale Conjunctiva	27	56,25
Persistent skin folds	16	33,33

Table 3. Distribution of children with ARF in the pediatric ward of the Hôpital National Ignace Deen, Conakry, by BU result.

Urine dipstick (UD)	Workforce	Percentage
Proteinuria	26	54,17
Hematuria	14	29,17
Leukocyturia	12	25,00
Glucosuria	6	12,50
Bilirubinuria	20	41,67
Urine density > 1020	15	31,25

Table 4. Distribution of children with ARF in the pediatric ward of the Hôpital National Ignace Deen, Conakry, according to biological status.

Biological parameters	Workforce	Percentage
Creatinine > 1.6 mg/dl	48	100

Biological parameters	Workforce	Percentage
Urea > 52 mg/dl	36	75
Hb <8 g/dl	35	72,92
Reticulocytes > 25 G/L	48	100
Hyponatremia 125 to 135 mmol/l	15	31,25
Calcemia 8.6 to 10.3 mg/dl	45	93,75

Table 5. Distribution of children with AKI in the pediatric ward of the Ignace Deen National Hospital in Conakry according to the stage of acute renal failure according to KDIGO 2012.

Stage of acute renal failure	Workforce	Percentage
Stage 1	25	52,08
Stage 2	15	31,25
Stage 3	8	16,67
Total	48	100

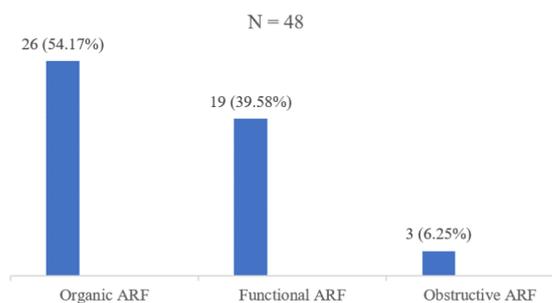


Figure 3. Distribution of children with ARF in the pediatric ward of Conakry's Ignace Deen National Hospital, by type of ARF.

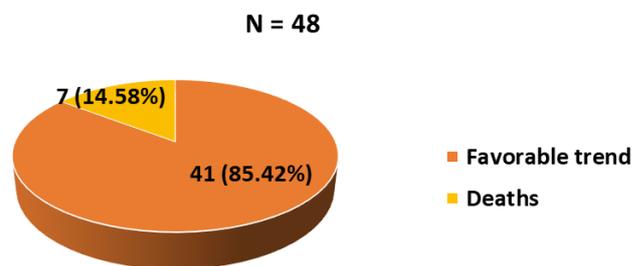


Figure 4. Distribution of children with ARF in the pediatric ward of the Hospital National Ignace Deen, Conakry, according to course.

#### 4. Discussion

The actual frequency of pediatric ARF is not well known, due to the paucity of studies; in this study, more than 7 out of 10 patients (7/10) presented with acute renal failure.

Akoly et al in Togo in 2019, Xu et Coll in China in 2018 and Ma ġa et Coll in 2018 in Chad had found respective frequencies of 4%; 13% and 5.81% [16-18]

The 5-10 age group accounted for nearly 3 out of 4 patients, with an average age of  $8 \pm 3$  years.

Akoly et al in 2019 in Togo found a mean age of 8.17 years [16]. Moussa Tondi et al found a mean age of  $2.5 \pm 0.75$  years, with a predominance of the [0 - 5 years] age group (43%) [19].

Male predominance has not been reported as a phenomenon in the literature; Ma ġa et al in 2018 in Chad found a sex ratio of 1.63 [18].

Clinical signs were marked by fever in 7 out of 8 patients; physical asthenia in 2 out of 3 patients; and anuria in 1 out of 10 patients.

The manifestation of AKI in children is not specific to this pathology, and clinical signs depend on the etiology responsible. The literature review reports that fever remains the primary reason for consultation during severe malaria associated with acute renal failure [19]. According to KEITA et al in Senegal in 2016, clinical signs were dominated by anemia 68%, vomiting 58%, fever 28%, anuria 22% [20].

Proteinuria dominated the urine dipstick markers for kidney damage in more than half the patients; nearly 3 out of 10 patients had hematuria, and 1 out of 4 had germ-free leukocyturia after a germ-free urine cytobacteriological examination.

Post-infectious glomerular damage in children has been extensively described in the literature [9].

All patients had elevated creatinine levels in excess of 1.6 mg/dl, and 3 out of 4 patients had uremia levels in excess of 100 mg/dl. More than 2 out of 3 patients had anemia with hemoglobin below 8 g/dl.

More than half the patients were in stage I and 1 in 6 in stage III (severe stage according to the KDIGO 2012 severity criteria). Stage III represents the phase of uremic complications requiring EER management. The lack in the country of an EER technique adapted to children increases the risk of death in the absence of recovery of renal function. Luyindula et al found in their study that dialysis was indicated for 57.1% [21].

More than half the patients had experienced acute organic renal failure according to the criteria defined in this study, and functional AKI was found in almost 40% of patients.

The etiologies of renal damage in children are many and varied; organic damage is the most widely described in the literature [13]; BATOUCHE et al. found in their study that acute tubular necrosis was ischemic (17%), toxic (25%) and septic (30%); glomerular damage (19%) and vascular damage (7%) were the main etiologies of acute renal failure in children [9].

Progression was favorable in 4 out of 5 patients, with a mortality rate of 14.58%. In their study, Moussa Tondi et al found a favorable outcome with total recovery of renal func-

tion in 74%; progression to chronicity was found in 4% and mortality in 11% [19].

Conclusion: Acute organic renal failure remains the most common form of ARF in children. The advanced stage of acute renal failure continues to have a poor vital prognosis for children in Guinea, due to the lack of extra-renal purification techniques and appropriate resuscitation. Prevention through malaria control and reduction of Otto Rhino Laryngology and skin infections will reduce the frequency of acute renal failure in children.

#### Recommendations:

A request to develop the means and techniques for caring for children suffering from renal failure by setting up a nephropediatrics unit, a peritoneal dialysis unit or hemodialysis.

Prevention through the fight against infectious diseases such as malaria, early treatment of Otto Rhino Laryngology and skin infections, and congenital malformations of the urinary tract. Develop investigative resources for the early diagnosis of renal pathologies in children.

## Abbreviations

ARF	Acute Renal Failure
AKI	Acute Kidney Injury
ATN	Acute Tubular Necrosis
GFR	Glomerular Filtration Rate
ATCD	Past History
BU	Urine Test Strip
KDIGO	Kidney Disease Improving Global Outcomes
EER	Extra Renal Purification
Coll	Collaborators
g/dl	Gramme per Decilitre
mg/dl	Milligram per Deciliter
mmol/l	Millimole per Liter
$\mu\text{mol/l}$	Micromole per Liter

## Acknowledgments

With this article, we would like to thank our dear master, professor Mohamed Lamine Kaba, for his efforts to improve the scientific quality of this work and his contribution to the supervision and correction of this manuscript.

## Declaration of Informed Consent

All authors appearing in this article equally share and agree to the publication of this article in your journal.

## Conflicts of Interest

The authors declare no conflicts of interest. This manuscript is to be used for the benefit of science, not for sale.

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