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Research Article

Prognosis And Predictive Factors For Mortality In Acute Kidney Failure.

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Abstract

Introduction: Acute renal failure (ARF) is a life-threatening emergency with a often severe prognosis, particularly in Africa. The aim of our study was to identify prognostic and predictive factors for mortality from ARF at the National Reference University Hospital (CHU-RN) in N'Djamena.
Patients and methods: This was a descriptive study with an analytical focus, conducted over a period of nine months, from June 1, 2023, to March 1, 2024. All patients with acute renal failure admitted to the nephrology-hemodialysis department were included.
Results: Of the 249 hospitalized patients, 48 had ARF, representing a frequency of 19.27%. The majority of patients were male (male-to-female ratio of 3.38) with a mean age of 39.25 years. The main reason for admission was impaired renal function, with more than half classified as KDIGO stage 3. Emergency hemodialysis was performed in 54.17% of these patients. The outcome was marked by complete recovery of renal function in 41.7% of patients, progression to chronicity in 18.8%, and mortality in 39.6%. Factors associated with mortality were long admission time, hyperkalemia, and hyponatremia.
Conclusion: Acute renal failure is a public health problem due to its high frequency and mortality rate. Factors associated with mortality due to acute renal failure were time and metabolic disorders.

Keywords: Predictive factors, mortality, ARF, CHU-RN, Ndjamena.

INTRODUCTION

Acute kidney injury (AKI) is a significant epidemiological burden with an estimated global incidence of 13 million cases per year, 75% of which occur in resource-limited countries [1]. In South America, the incidence of ARF was 29.6%, and in Southern Europe, 31.5% [2]. In Africa, the annual incidence in Morocco was 229 cases/year, 3% of which progressed to the terminal stage [3], and in Burkina Faso, the incidence of ARF was 29.94% [4].

The global mortality rate for ARF is estimated at between 1 and 7 million per year [1]. In Africa, mortality is estimated at 12% in Mali and 36.2% in Morocco [3].

The scientific literature has identified factors associated with a poor prognosis in AKI, such as advanced age, comorbidities, and the severity of AKI on admission. Severity scores, such as the RIFLE (Risk, Injury, Failure, Loss, End-stage renal disease) score and the AKIN (Acute Kidney Injury Network) score, have also been developed to assess the extent of kidney damage and predict patient prognosis[5, 6].

Given specific socioeconomic and health constraints, it is crucial to go beyond simply applying international recommendations. Targeted research is essential to identify the local determinants of the prognosis for AKI. Understanding these factors will make it possible to rationalize resources and adapt management strategies to tangibly improve patient outcomes[7].

To this end, our study aims to determine the predictive factors for mortality in patients admitted for acute renal failure to the nephrology-hemodialysis department of the National Reference University Hospital in N'Djamena, Chad.

PATIENTS AND METHODS

This was a prospective, descriptive, analytical study conducted over a nine-month period from June 1, 2023, to March 1,

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2024. The study included all patients with ARF admitted to the nephrology-hemodialysis department who consented and met the KDIGO criteria for ARF below[8].

- An increase in plasma creatinine ≥ 26.5 µmol/L (3 mg/L) within 48 hours;
- An increase in plasma creatinine ≥ 1.5 times the baseline value over the last 7 days;
- Urine output < 0.5 mL/kg/h for 6 hours.

For each patient included, data were collected from records using a pre-established questionnaire including clinical, paraclinical, therapeutic, and evolutionary variables.

The data were analyzed using IBM SPSS Statistics version 26 (Statistical Package for Social Sciences 26) software. Qualitative variables were expressed as frequencies and percentages, and quantitative variables as means ± standard deviation. Percentages were compared using the chi-square test and means were compared using Student's t-test. The significance threshold was set at $p < 0.05$.

RESULTS

During the study period, we registered 249 patients in the nephrology-hemodialysis department of the CHU-RN. Among these patients, 48 had acute renal failure, representing a frequency of 19.27% of cases. The male-to-female ratio was 3.38. The average age of patients was 39 ± 25, ranging from 16 to 70 years. The 16-45 age group accounted for 60.41% of patients, while those over 45 accounted for 39.58%.

The reason for hospitalization was impaired renal function with increased serum creatinine in 72% of cases. The average time to admission was 15 days, with extremes of 5 and 23 days. Comorbidities were represented by hypertension in 16.3% of cases, followed by diabetes in 10.4% and heart disease in 6.3% of cases. Skin and mucosal pallor was the most common clinical sign in 45.8% of cases, followed by anuria in 37.5%. (See **Table I**)

Table I. Clinical Characteristics of patients

Clinical Characteristics	n	%
Reason for admission		
Increased serum creatinine	35	72,91
Anuria	12	25
Asthenia	9	18,75
Impaired consciousness	6	12,5
Anorexia	7	14,58
High blood pressure	5	10,41
Edema syndrome	4	8,33
Lower back pain	2	4,16
Admission period (days)		
<7	6	58,3
7 à 15	14	29,1
>15	28	12,5
Comorbidities		
Hypertension	8	16,7
Diabetes	5	10,4
Heart disease	3	6,3
Sickle cell anemia	1	2,1
Gout	1	2,1
No chronic conditions	32	66,7
Diuresis		
Preserved	19	39,5
Anuria	18	37,5
Oliguria	11	23
Clinical signs		
Pallor	22	45,8
Anuria	18	37,5
Acute pulmonary edema	14	29,2
Jaundice	11	22,9
Fever	8	16,6
Hepatomegaly	4	8,3

Jugular vein distension	4	8,3
Polypnea	4	8,3
Abdominal bloating	3	6,3
Gallop rhythm	3	6,3
Hives	3	6,3

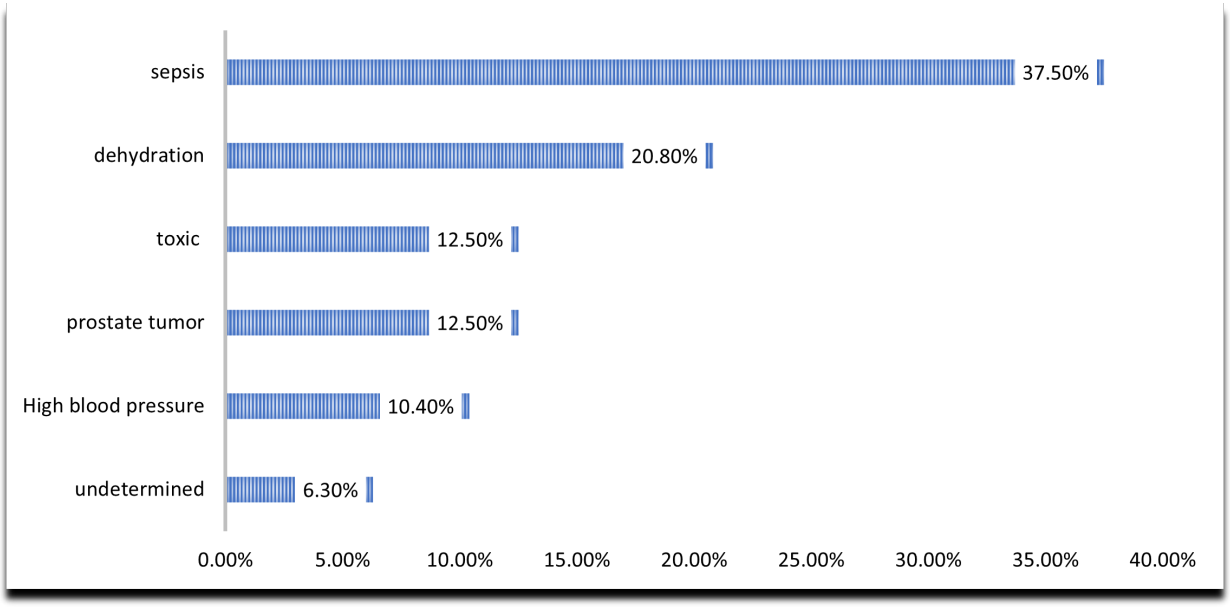
The biological characteristics are summarized in **Table II**. Acute renal failure was classified as KDGO stage III in 54.1%, stage II in 27.1%, and stage I in 18.7%. Blood counts revealed anemia in 75% of cases and thrombocytopenia in 8.33%. A biological inflammatory syndrome was found in 68.75% of cases. Abdominal ultrasound showed normal kidney size in 88.25% and dilation of the excretory tract in 12.5%.

Table II. Biological data

Biological data	**n**	**%**
Creatinine level (mg/L)		
13 à 60	8	16,66
60 à 120	4	8,33
120 à 250	13	27,08
> 250	23	47,91
Potassium level (mmol/L)		
<3	6	12,5
3-5,5	20	41,7
>5,5	22	45,8
Sodium (mmol/L)		
<135	20	41,7
135-145	25	52,1
>145	3	6,3
Urea (g/L)		
0,35 - 1	8	16,6
1 - 2	12	25
2 - 3	12	25
> 3	16	33

Acute renal failure was organic in 52% of cases, functional in 35% of cases, and obstructive in 13% of cases. The etiological circumstances were dominated by sepsis in 37.5% of cases, followed by dehydration in 20.8% of cases (see **Figure 1**).

Figure 1. Etiology of ARF



Patient management was based on antibiotic therapy (56.25%), rehydration (68.75%), correction of ion imbalances (62.5%), vasoactive drugs (54.25%), transfusion (35.41%), antihypertensive drugs (31.25%), diuretics (27.08%), and extrarenal purification (54.16%). Renal replacement therapy was indicated for severe uremia (58.3%), anuria (37.5%), acute pulmonary edema (27.08%), hyperkalemia (25%), and metabolic acidosis (22.91%). Twelve out of 26 cases (46.15%) received one to four dialysis sessions; 14 out of 26 cases (53.84%) received more than four dialysis sessions.

The outcome was marked by recovery of renal function in 42% of cases, 19% of cases progressed to chronic renal failure, and mortality was 39% of cases.

The time to admission, KDGO stage of ARF, OAP, hyperkalemia, and hyponatremia were factors associated with death with statistical significance ($p<0.005$). (See **Table III).**

Table III. Factors associated with mortality.

Factors	Death	Value of P
Consultation period >14 days	84,2%	0,0131
KDIGO Stage 3	100%	0,0001
Acute Pulmonary Edema	47,4%	0,025
Urea g/L >3	78,9%	0,0001
Hyperkalemia > 6.6	42,1%	0,0267
Hyponatremia	68,4%	0,0023

DISCUSSION

The frequency of acute renal failure in our study was 19.27%. This prevalence is lower than those observed by Ibrahim et al.[9] in Chad (25.2%), Diallo et al.[10] in Senegal (29.5%), and Mahoungou et al.[11] in Congo Brazzaville (37.9%). The fact that these studies were conducted exclusively in intensive care units could explain this discrepancy.

A male predominance was found with a sex ratio (M/F) of 3.38. This result is consistent with other studies, notably those by Ahoui et al. [12] in Benin and Lanzy et al. [13] in Congo Brazzaville, which reported sex ratios (M/F) of 2.2 and 4.7, respectively.

The average age of our patients was 39.25 years. This relatively young age is similar to that observed by other African authors [14, 15]. In contrast, in developed countries, the average age of patients appears to be higher [16, 17].

Elevated serum creatinine levels were the most common reason for admission in 72.91% of cases. Samaké et al [14] in Mali and Konan et al [18] reported that elevated serum creatinine levels were the reason for hospitalization in 48.3% and 38% of cases, respectively.

We observed an average consultation delay of 15 days, which is significantly higher than the 7.6-day delay reported by Khalil et al. [19] in Morocco. This prolonged delay is probably due to several factors, including initial recourse to traditional practitioners (phytotherapy) and economic difficulties.

High blood pressure is the main comorbidity, affecting 16.6% of cases. Ibrahim et al. in Chad [9] and Gilbert [20] in Zimbabwe reported 28.8% and 33.6% of cases, respectively. These results show us that high blood pressure is the most common comorbidity in acute renal failure in our context.

The clinical signs in our study were conjunctival pallor, anuria, and pulmonary edema. These results are similar to those of Samaké et al. [14] in Mali in 2021, who found conjunctival pallor in 40.1% of cases, followed by anuria in 29.9% of cases. However, Konan et al [18] in Côte d'Ivoire found conjunctival pallor to be the main clinical sign in 52.4% of cases, followed by OAP in 22.2% of cases.

According to the KDIGO classification of AKI, we observed that stage 3 was the most common. This result is similar to those reported by Ibrahim et al [9] in Chad and Abderaman et al [21] in Chad, with 53.9% and 32% of cases, respectively. Stage 3 KDIGO constitutes a life-threatening emergency, often requiring dialysis. This classification remains an essential tool for guiding treatment decisions and improving the prognosis of patients with ARF.

Organic acute renal failure was the most common, accounting for 52% of cases, followed by functional failure in 35% of cases and obstructive renal failure in 13% of cases. Similar studies have been reported by Konan et al [18] in Côte d'Ivoire, Diallo et al [10] in Senegal in 2017, and Samake et al [14] in Mali.

The etiology of acute renal failure was dominated by sepsis, followed by dehydration and vascular nephropathy in our study. Sari-Hamidou et al [22] in Algeria, Mahoungou et al [23] in Congo Brazzaville, and Ibrahim et al [9] in Chad made the same observations.

In terms of treatment, vascular filling, antibiotic therapy, and hemodialysis replacement therapy formed the basis of treatment. Missamou et al [24] in Congo in 2019 found that 54% of patients had received conservative treatment, 27% had received triple therapy, and 37% had received replacement therapy by hemodialysis.

Renal replacement therapy was indicated for severe uremia, anuria, and acute pulmonary edema. These results are similar to those of Konan et al [18] in Côte d'Ivoire, who found that the main indications for hemodialysis were severe uremia

in 73.7% of cases, followed by anuria in 36.8% of cases. Samaké et al [14] in Mali found that the main indications were severe uremia in 25% of cases, OAP in 22.2% of cases, and hyperkalemia in 16.6% of cases.

Renal function recovery was 42%, 19% of cases progressed to CRF, and mortality was 39%. Similar studies were reported by Ilboudo et al [15] in Burkina Faso, who found that the outcome was marked by recovery in 40% of cases, chronicity in 20% of cases, and mortality in 40% of cases. Abdraman et al [21] in Chad reported 41.6% renal recovery and 44.4% mortality. This high mortality rate could be explained by delayed consultation, often due to a long therapeutic journey in which patients resort to self-medication or traditional medicine before presenting at a healthcare facility. Despite this high mortality rate, the long-term renal prognosis for survivors is relatively good, as the majority of these ARFs were reversible. In the literature data, several risk factors for mortality were identified by multivariate analysis, namely advanced age, male gender, pre-existing comorbidities, advanced stage of AKI, sepsis, and oliguria[25]. In our series, the risk factors associated with death were a delay in consultation >14 days (p=0.0131), KDIGO stage 3 (p=0.0001), uremia >3g/L (p=0.0001), hyperkalemia >6.6 (p=0.0267), hyponatremia (p=0.023), and diuretic-refractory OAP (p=0.025). These results highlight the urgent need to raise public awareness in order to reduce delays in consultation and to implement optimized management protocols adapted to our context in order to reduce this avoidable mortality.

CONCLUSION

Acute renal failure is a major public health problem due to its frequency and high mortality rate. Our study identified several risk factors for death, knowledge of which could optimize therapeutic management and consequently reduce mortality.

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