Journal of Urology and Renal Diseases
Salifou ZL, et al. J Urol Ren Dis 09: 1408.
www.doi.org/10.29011/2575-7903.001408
www.gavinpublishers.com
Research Article

Burden and Outcomes of Pregnancy-Associated Acute Kidney Injury in Niger

Zelika Lankoande Salifou[2,3], Hassane Moussa Diongole[1,2*], Oumarou Garba Souleymane[2,3], Zeinabou Maiga Moussa Tondi[4,5], Seck M'baye M'baye Salissou[1,2], Hassan Mamane Laouel[1,2], Abdou Amadou[6], Laouali Chaibou[1], Fassouma Abani[1]

[1]National Hospital, Niger

[2]Andre Salifou University, Niger

[3]Centre de santé mere-enfant, Niger

[4]Abdou moumouni University, Niger

[5]Amirou Boubacar Hospital, Niger

[6]Dan Dicko Dan Koulodo / Centre de santé mere-enfant, Niger

[*]**Corresponding Author:** Hassane Moussa Diongole, Nephrology Department, National Hospital of Zinder, 656, Niger

Citation: Salifou ZL, Diongole HM, Souleymane OG, Tondi ZMM, Salissou SMM, et al. (2024) Burden and Outcomes of Pregnancy-Associated Acute Kidney Injury in Niger. J Urol Ren Dis 09: 1408. https://doi.org/10.29011/2575-7903.001408

Received Date: 11 November 2024; **Accepted Date:** 15 November 2024; **Published Date:** 18 November 2024

Abstract

Introduction: AKI remains a public health issue in developing countries, and is associated with an increased risk CKD (chronic kidney disease) and mortality.

Methodology: A descriptive cross-sectional study was conducted from January 1, 2022, to August 31, 2023, collating information among pregnant women admitted to the National Hospital, Zinder.

Results: 47 pregnant women were included in the study, out of 344 hospitalized cases of AKI. The mean age of the patients was 27 years. Only 13% (N=6) of the patients had a history of hypertension. Approximately 60% (N=28) had more than one pregnancy (multiparous), and 64% (N=30) did not receive antenatal care before presentation. Approximately one-third (N=17, 36%) of the participants had given birth at home. The average serum creatinine was >500umol/L in 81% of the patients (N=38), and 38.3% (N=18) of the patients were anuric. Spontaneous recovery of kidney function was noticed in 34,04% (N=16) of patients, and one case was lost from view (2,13%). About 29,79% (N=14) had persistent impairment of kidney function at follow-up, meeting the criteria for CKD diagnosis. 34,04% of patients died with AKI due to a lack of dialysis access. Approximately 68% (N=31) of the survivors lost their babies.

Conclusion: Pregnancy-associated AKI is an adverse consequence of high mortality (among mothers and babies) and the risk of developing CKD. Concerted efforts are needed with the support of international stakeholder organizations towards the provision of optimal antenatal care as well as AKI prevention measures at all levels of healthcare delivery in this very low resource setting.

Keywords: Pregnancy-Associated AKI; Mortality; CKD Risk; Niger

Introduction

Acute pregnancy-associated kidney injury (PrAKI) is a sudden, temporary, and reversible alteration of GFR during pregnancy or post-partum. Its incidence has dropped drastically in industrialized countries due to improvements in prenatal follow-up, screening, and management of obstetrical complications, such as preeclampsia and gestational arterial hypertension [1]. Its complications are rare in developed countries, but remain a real public health problem in developing countries, where the incidence varies from 20 to 25% [2]. This near disappearance of post-abortion PrAKI could be due to more careful monitoring of the perinatal period and authorization for abortion in developed countries. Since these measures are lacking in our context, they are responsible for significant maternal-fetal morbidity and mortality [3-5].

The main causes of PrAKI in poor countries are obstetrical events, such as septic and/or hemorrhagic clandestine abortion, complicated pre-eclamptic conditions without medical follow-up, non-medically assisted deliveries, and delayed parturient referrals [6].

Similarly, a study carried out in the anesthesia and resuscitation department of the maternity ward of Ibn-Rochd hospital in Casablanca (Morocco) between January 1, 2002, and December 31, 2008, identified 58 patients with PrAKI, with an incidence of 2.49%; the evolution was marked by eight deaths (13.8%) and four patients evolved towards chronicity (6.9%); the consequences were favorable for the other 42 (72.4%) [7].

In Mauritania, the prevalence of postpartum AKI at the Nouakchott National Hospital Center was 4.61% from June 2012 to June 2015 [8].

In Mali, a retrospective study carried out in the nephrology department of Point G University Hospital over a 24-month period between January 2020 and December 2021 identified 32 cases of PrAKI with an incidence of 1.9% and a recovery of renal function of 62.5 [9].

A retrospective study carried out in the same department from January 1, 2010, to December 31, 2012, identified 28 cases of PrAKI with a total recovery of renal function in 39% of cases [6].

The prevalence of PrAKI in the nephrology department of the CHU "Point D," in Mali, was 1.85% between January 2017 and December 2018 [10].

In November 2016, the only study carried out at the Issaka Gazoby Maternity Hospital in Niamey reported a prevalence of PrAKI of 14.95% [1].

No data are currently available on this topic in the Zinder region; hence, this study was conducted to fill this gap.

The objective of this study was to write the clinical and prognostic aspects of PrAKI at the National Hospital of Zinder (NHZ).

Method

We conducted a descriptive study with prospective data collected from the Nephrology-Dialysis Department of the Zinder National Hospital. (NHZ) over a period of 20 months from January 1, 2022, to August 31, 2023. Informed consent from conscious patients and relatives of unconscious patients was obtained while explaining the purpose of our work to them. The anonymity of the patients was respected by deleting their identity before the analysis of the data, but also by carefully keeping all the data collected in a confidential file.

A research authorization issued by HNZ through the Technical Advisory Committee was obtained.

Study population

This study included all patients admitted to the nephrology dialysis department for AKI during the study period.

Inclusion criteria

All patients with AKI during pregnancy or postpartum were included

Non-inclusion criteria

Not all patients with AKI following inadvertent ligation of the ureters during a caesarean section were included.

The following information was collected: sociodemographic, clinical, and paraclinical data of patients, etiologies, and evolution.

Anemia is defined by the World Health Organization (WHO) as a pathological condition in which the concentration of hemoglobin in the blood is reduced [11].

The hemoglobin concentration thresholds used by the WHO for the diagnosis of anemia are in men: less than 13 g/dl and less than 12 g/dl in women.

The WHO also proposes different stages of anemia depth according to the hemoglobin concentration:

• In women: mild anemia between 11 and 11.9 g/dl; moderate between 8 and 10.9 g/dl; severe if it is less than 8 g/dl.

• In men: mild anemia between 11 and 12.9 g/dl; moderate between 8 and 10.9 g/dl; severe if it is less than 8 g/dl

Results

During the study period, 344 patients with AKI were hospitalized, including 47 patients with PrAKI. The average age of women with PrAKI was 27.80 ± 7.72, range of 15 and 43 years. Almost half of the patients were aged between 25 and 35 years (44.68%) (Table 1). Almost all patients were homemakers (93.62%). Most patients

were from rural areas (72.34%) (Table 2).

Almost two thirds were multiparous (59.58%) (figure 1).

Half of the patients (51.06%) presented post-partum with AKI.

Two women (64%) had no antenatal care and 60% had vaginal deliveries.

Age range (years)	Frequency(*n*)	Percentage %
[15-25]	18	38.30
[25-35]	21	44.68
[35-45]	8	17.02
Total	47	100.00

Table 1: Distribution of patients by age.

Origin	Frequency (n)	Percentage (%)
Rural	34	72.34
Urban	13	27.66
Total	47	100.00

Table 2: Distribution of patients by place of origin.

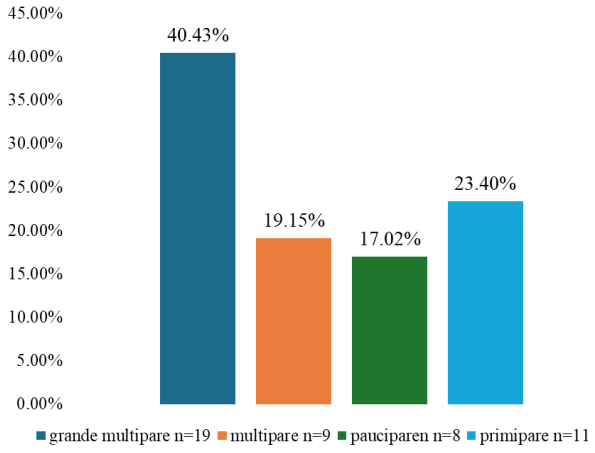

Figure 1: Distribution of patients according to their parity.

Primiparous: one birth.

Pauciparous: two to three births.

Multiparous: four to five births

Grande multiparous: six or more births.

Clinical features included hypertension, blood pressure > 140/90 mmHg in 51.06% of the patients, anuria in 38.30%, and oliguria in 31.91%. Three-quarters (74.47%) of the woemn had anemia. Fluid overload was present in 70.21% of the patients.

Serum creatinine was >500 µmol/L in 80.85% of the patients.

Severe preeclampsia/eclampsia was the most common etiology of PrAKI, present in 57.32% of the cases.

Most patients (n=33) received dialysis (70%). Indications for dialysis were not present in 13 patients (28%), and 1 patient refused dialysis.

Stillbirths occured in 68.89% of cases.

In 34% of the cases, the patients had recovered their renal function; 29.79% progressed to chronic kidney disease (CKD), and maternal mortality was 34%. Infant mortality was 68.08%, including 31 stillbirths (65.95%) and 2 abortions (2.13%).

Discussion

In our study, the prevalence of AKI was 14% among all patients with AKI. In a study on the prevalence of renal failure in peripartum women, Tondi et al. [1] found a prevalence of 14.95% in Niger. Other authors have reported lower frequencies, including Konaté [10], Fomba [9], and Miguil et al. [7], which were 1.85, 1.9, and 2.49%, respectively.

In our study, the prevalence of PrAKI was 14% among all patients presenting with AKI, which is similar to that reported by Tondi et al. [1] in Niger (14.95%). Other authors have reported lower frequencies, including Konaté [10], Fomba [9], and Miguil et al. [7], of 1.85%, 1.9%, and 2.49%, respectively.

This considerable variability could be explained by poor follow-up of pregnancy, as well as the delay in taking care of and evacuating the parturients to specialized services.

The age group most represented in our study was from 25 to 35 years (44.68% of cases). The mean age was 27.80 ± 7.72 years with extremes ranging from 15 and 43 years.

Several authors, including Tounkara [5], Godara [12], and Fomba [9], have reported similar average ages of 25.9, 26.4, and 27.31 years.

In Greece, the mean age was 32 years, with an extreme range of 22–40 years [5].

The early age of occurrence of PrAKI in our context could be explained by early marriage in Africa, particularly in Niger, where 75% of young girls are married before the age of 18 years [13].

Rural women accounted for 72.34% of our sample.

Similar results have been reported by several studies, including Bentata [14], Patel et al. [15], and Arora [16], where rural women constituted 65.1%, 70%, and 75.4% of patients, respectively.

In contrast, Abdelkader et al. [8] and Lemrabott et al. [3] reported a significantly lower proportion of women living in rural areas, representing 38.4% and 49.5% of the cases, respectively. Our results may reflect the fact that the Nigerian population lives mainly in rural areas (83.2%), according to the National Institute

of Statistics of Niger (INS) in 2021[17].

The majority of our patients were from the Diffa region (46.81%). This is explained by the fact that the NGO (MSF) ensures almost all of their care, in particular, their evacuation to Zinder.

Most patients were multiparous (60%), pauciparous (17.02%), and primiparous (23.40%). Abdelkader et al. [8] identified 52.94% as multiparous, 22.56% as pauciparous, and 24.50% as primiparous.

The same observation was made by Prakash 2010 [18] and Konaté et al. [10], with a predominance of multiparous in 62.6% and 67% of cases, respectively. However, unlike Tondi et al. [1], Gopalakrishnan et al. [19] reported a predominance of primiparous.

The prevalence of multiparous women in our study could be explained on the one hand by the fact that multiparity is a risk factor for the occurrence of hemorrhagic complications during pregnancy or postpartum, and on the other by a high fertility rate which was 6.2 children per average woman in Niger in 2021[20]. In our series, 64% of the patients did not receive antenatal care.

Khellaf, et al. [21], El Adnani, et al. [22], Msehli, et al. [23], alos observed high rates of absence of antenatal care, with respective rates of 59%, 72.25%, 80.8%.

Our finding could be explained on the one hand by the fact that the majority of our patients lived in rural areas and, on the other hand, because of poverty, ignorance, and inaccessibility to health centers.

In our series, AKI occurred postpartum in 51.06% of cases, 36.14% of cases in the third trimester, and 12.77% of cases in the second trimester. Similarly, Koita [24] reported that 67.9% of PrAKI cases occurred postpartum. Parwen et al. [25] reported that the third trimester and postpartum period represented 63% of cases, 21% during the second trimester, and 16% during the first trimester of pregnancy. According to Konaté [10] and Coulibaly et al. [26], the third trimester of pregnancy was predominant in 87% and 78% of cases, respectively.

These data could reflect the high frequency of postpartum toxemia and postpartum hemorrhages.

For 59.57% of our patients, delivery was performed via the vaginal route and 40.3% via caesarean section. Similar results have been reported by Konaté [10] and Eswarapa et al. [27], with 53.3% and 61% of cases of vaginal delivery and 36.7% and 34% by caesarean section, respectively. Miguil et al. [7] reported 54% cases of caesarean section and 46% of cases of vaginal delivery. Similarly, in the series of Khellaf et al. [21] and Kane et al. [28], caesarean section was the main mode of delivery with respective rates of 78% and 90%.

Our data could be due to a low rate of pregnancy follow-up, high rate of home births, and predominance of postpartum complications.

We registered 32% of the living children and 68% of the still-born children.

Our results could be explained by the high rate of women not attending antenatal care and home births as well as the complications that can lead to fetal death. Similarly, Hachim et al. [4] reported 63.65% of stillbirth. In Konaté's study [10], in utero death accounted for 57% of cases.

However, Kane et al. in Mali [28] and Fakhouri et al. [29] reported rates of 31% and 39% of fetal deaths in utero in 69% of live newborns, respectively.

Anemia was found in 74.47% of patients. The same observation was made by Abdelkader et al. [8], with 63.72% of cases.

Makushidi et al. [30] and Koita [24] reported conjunctival pallor in 81.5% and 89.3% of the cases, respectively.

Most of our patients (70%) had hydrosodium overload. This rate is close to those reported by Mahammad et al. [31], Abdoulkader et al. [8], and Lemraboot et al. [3] (73.1%, 68.62%, and 61%, respectively).

Anuria was identified in 38.30% of cases. Our observation was comparable to that of Patel et al. [15] with 38.3% of cases, and Konaté, Godara et al. [12] found a rate of 26.7% and 21% of cases of anuria, respectively.

The team of Oujidi [32], Gopalakrishnan [19], Mishra [33], and Mahfoodh et al. [34] in Tunisia reported significantly lower results in 13%, 11%, 5,8%, and 8% cases of anuria, respectively.

Arterial hypertension was found in 51.06% of the cases. This result was consistent with that of Hassan II of Fez, who observed hypertension in 55.6% of the cases. Konaté [10], Coulibaly [26], and Tondi [1] reported higher rates, that is, 70%, 75%, and 86.66%, of cases of arterial hypertension.

The serum creatinine level was greater than 500 µmol/L in 80.85% of the cases. This result is close to that of Fomba and Konaté [9,10], with rates of 53.1% and 40.6%, respectively. Koita [24] reported a creatinine level > 800 mg/dL in 60.7% of cases.

This rate represents only patients with symptomatic functional impairment. Thus, to obtain an overall view of the prevalence of obstetric renal failure, systematic measurement of creatinine should be performed in all peripartum women.

Half of the patients had a hemoglobin level between 7-10 g/dl (51.06%). Hyperleukocytosis and thrombocytopenia were found in 72.34% and 34.04% of cases, respectively. For Fomba [9], the hemoglobin level between 7 and 10 g was 37.1% with hyperleukocytosis (71.9%) and thrombocytopenia (50%). Konaté [10] reported hyperleukocytosis in 80% of patients and thrombocytopenia in 63% of patients. However, for Koita [24] anemia below 8 g was found in 75% of cases, thrombocytopenia in 50%, and hyperleukocytosis in 89.3% of cases.

Eclampsia was the most common etiology in 44.55% of cases, followed by Retroplacental Hematoma (RPH) in 25.53%, HPP in

12.77%, PES in 12.77%, sepsis in 4.26% of cases which were cases of septic abortions. Our observations are consistent with those of Koita [24], who reported 53.6% of cases of PES /Eclampsia, PPH in 21%, HRP in 17.5%, and sepsis in 3.6% of cases. Similarly Makusidi [83] had recorded 24% PES, 26% eclampsia, 18% HPP, and 18% sepsis.

For Alaoui, et al. [35], Tondi, et al. [1], Miguil, et al. [7] PES/ Eclampsia represented respectively 60%, 68.75%, 67.2%. In view of these results, all pregnant women should benefit from regular and better quality monitoring of pregnancy to diagnose any abnormality early and then refer them to a specialized environment for adequate care.

Most of our patients had been dialyzed, that is, 70% of the cases. Hachim, et al. [3] and Mahfoudh [34] recorded a similar rate of 72.7% and 75%, respectively, of cases of parturients on dialysis.

However, Oujidi, et al. [32] Patel, [15] and Eswarappa [27] reported lower rates of 22.7%, 38.3%, and 39% of hemodialysis cases, respectively. However, Oujidi, et al. [32], Patel [15], and Eswarappa [27] found lower rates of 22.7%, 38.3%, and 39% in hemodialysis cases, respectively. This result could be explained by the delay in the management of certain patients linked to a delay in consultation, making it necessary to resort to dialysis for severe cases upon admission; recovery of renal function was noted in 16 patients (34%). Fourteen patients (29.79%) progressed to chronic disease. The maternal case fatality rate was 34% of the cases in our series.

In contrast, in the series of Tondi in Niger in 2016, 68.75% of women with PrAK recovered kidney function, 15.62% had developed CKD, and 9.40% died. In the Konaté study in Mali in 2020, the total recovery rate of kidney function was 47%, and CKD was observed in 40% of the patients. Maternal death occurred in 13% of the patients.

The mortality rate is high in our country and is even higher in Africa. But on the other hand, this rate tends to decline in developed countries due to the evolution of medicine, the development of pre-hospital medicine and the existence of the sophisticated technical platform. The mortality rate depends on several factors, including and not limited to the clinical condition of the patient at admission, socioeconomic and sociodemographic factors, the technical platform, and the workload of the nursing staff.

Conclusion

PrAKI is a common pathology in the Zinder region. The majority of our patients were multiparous and women in households with untracked pregnancies. Half of the cases were located in the Diffa region. The main etiology was vascularenal syndrome. The maternal mortality and morbidity rates remained high. Improving the prognosis of patients, first of all, involves improving the modifiable factors influencing the latter such as the follow-up of pregnancies, multiparity, the time of admission, accessibility to alternative treatments (hemodialysis).

Conflicts of interest

The authors declare no conflict of interest.

Contributions of the authors

All the authors have contributed to the realization of this work.

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