

Maternal Mortality in a Tertiary Referral Maternity Hospital in Niger: A Retrospective Analysis of 175 Cases

Balkissa Issoufou Amadou^{1*}, Maina Oumara^{1,2}, Souleymane Oumarou Garba^{3,4}, Rahamatou Madeleine Garba^{1,2}, Madi Nayama^{1,2}

¹Department of Obstetrics and Gynecology, Issaka Gazoby Maternity Hospital, Niamey, Niger

²Abdou Moumouni University, Niamey, Niger

³André Salifou University, Zinder, Niger

⁴Mother and Child Health Centre, Zinder, Niger

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*Corresponding author: Balkissa Issoufou Amadou

Department of Obstetrics and Gynecology, Issaka Gazoby Maternity Hospital, Niamey, Niger

Abstract

Background: Niger remains one of the countries with the highest maternal mortality burden worldwide. Approximately one in 23 women is at risk of dying from complications related to pregnancy, childbirth, or the postpartum period. Despite the implementation of the Millennium Development Goals (MDGs), the Sustainable Development Goals (SDGs), and substantial investments in maternal health over the past 15 years, progress has remained modest. The maternal mortality ratio declined from 700 deaths per 100,000 live births in 2005 to 553 in 2015 and 509 in 2017. **Methods:** We conducted a retrospective descriptive and analytical study at Issaka Gazoby Maternity Hospital, a tertiary referral maternity hospital in Niamey, Niger. The study covered a 12-month period from 1 January to 31 December 2025 and included all maternal deaths that met the World Health Organization (WHO) definition of maternal death. **Results:** During the study period, 8,002 live births and 175 maternal deaths were recorded, corresponding to a maternal mortality ratio of 2,186.9 per 100,000 live births. Maternal mortality was significantly associated with hypertensive disorders of pregnancy, grand multiparity, and lack of formal education. Direct obstetric complications accounted for most maternal deaths, with eclampsia/severe pre-eclampsia being the leading cause. **Conclusion:** Maternal mortality in this tertiary referral hospital remains unacceptably high and is driven by the combined effects of socioeconomic, health system, cultural, and biological factors. Strengthening antenatal care, improving timely referral systems, and ensuring rapid management of obstetric emergencies are essential to reduce preventable maternal deaths in Niger and other low-resource settings.

Keywords: Maternal mortality; Obstetric emergencies; Postpartum haemorrhage; Hypertensive disorders of pregnancy; Tertiary referral hospital; Niger.

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INTRODUCTION

Maternal mortality remains a major public health challenge worldwide, particularly in sub-Saharan Africa. Approximately 260,000 maternal deaths were recorded in 2023, of which 92% occurred in low- and middle-income countries. Most of these deaths were preventable [1,2].

It is estimated that in 2023, approximately 87% (225,000) of maternal deaths worldwide occurred in sub-Saharan Africa and Southern Asia. Nearly 70% (182,000) occurred in sub-Saharan Africa, while

approximately 17% (43,000) occurred in Southern Asia [3].

Between 2000 and 2023, Eastern Europe and Southern Asia experienced the greatest reductions in maternal mortality, with declines of 75% (from 38 to 9 per 100,000 live births) and 71% (from 405 to 117 per 100,000 live births), respectively. Although sub-Saharan Africa achieved a 40% reduction over the same period, it continued to record the highest maternal mortality burden worldwide in 2023 [3].

The persistently high maternal mortality observed in many low-resource settings reflects substantial inequalities in access to quality maternal healthcare services, including skilled birth attendance, comprehensive emergency obstetric and newborn care, and timely referral systems [4]. The leading direct causes of maternal death remain postpartum haemorrhage, hypertensive disorders of pregnancy, sepsis, complications of labour and delivery, and unsafe abortion, most of which are preventable through evidence-based interventions [5].

In Niger, despite sustained efforts to improve maternal health through the implementation of free maternal and neonatal healthcare policies and other national reproductive health initiatives [6], maternal mortality remains unacceptably high, with a national maternal mortality ratio estimated at 297 deaths per 100,000 live births.

The objective of this study was to describe the epidemiological, sociodemographic, clinical, therapeutic, and etiological characteristics of maternal deaths managed at the Issaka Gazoby Maternity Hospital, a tertiary referral maternity hospital in Niger.

METHODS

Study design and setting

This retrospective descriptive and analytical study was conducted at Issaka Gazoby Maternity Hospital, a tertiary referral maternity hospital in Niamey, Niger. The study covered a 12-month period from 1 January to 31 December 2025.

Study population

The study population comprised all maternal deaths recorded during the study period.

Inclusion criteria

All maternal deaths meeting the World Health Organization (WHO) definition of maternal death were included in the study [1].

Exclusion criteria

Records with incomplete or unusable data and maternal deaths resulting from accidental or incidental causes were excluded.

Data collection

Data were extracted from obstetric medical records, operative reports, and referral/transfer forms using a standardized data collection form specifically developed for this study.

The variables collected included:

- Sociodemographic characteristics: age, marital status, educational level, occupation, husband's occupation, and place of residence;

- Obstetric characteristics: gravidity, parity, history of caesarean section, antenatal care attendance, gestational age, and referral status;
- Clinical characteristics: reason for admission, clinical condition at admission, laboratory findings, and associated obstetric complications;
- Therapeutic characteristics: medical treatment, blood transfusion, surgical management, route of delivery, indication for surgery, length of hospital stay, and timing of maternal death.

Outcome measures

The primary outcome was the maternal mortality ratio (MMR), calculated as the number of maternal deaths per 100,000 live births during the study period.

Secondary outcomes included the sociodemographic profile, obstetric characteristics, clinical presentation, management, causes of maternal death, and fetal outcomes.

Statistical analysis

Data were entered and analysed using Epi Info version 7.2.6.0. Microsoft Excel was used to generate tables and figures.

Descriptive statistics were used to summarize the study variables. Continuous variables are presented as means $\pm$ standard deviations (SD) or medians with ranges, as appropriate, whereas categorical variables are expressed as frequencies and percentages.

Bivariate analyses were performed using the Chi-square test (or Fisher's exact test when appropriate). Statistical significance was defined as a two-sided *p*-value <0.05 . Results are presented with 95% confidence intervals (95% CI) whenever applicable.

Ethical considerations

The study protocol was approved by the Ethics Committee of Abdou Moumouni University, Niamey, Niger (N°: 000954/2AUA/FSS/SS). The study was conducted in accordance with the principles of the Declaration of Helsinki. Patient confidentiality and anonymity were strictly maintained throughout data collection, analysis, and reporting. No personal identifiers were included in the study database or in the manuscript.

RESULTS

Maternal mortality ratio

During the study period, 8,002 live births and 175 maternal deaths were recorded at Issaka Gazoby Maternity Hospital, resulting in a maternal mortality ratio (MMR) of 2,186.9 per 100,000 live births.

When the annual trend was analysed over the four-year period (2022-2025), the MMR showed a gradual decline from 7,068.4 per 100,000 live births in

2022 to 2,187.0 per 100,000 live births in 2025 (Table 1).

Table 1: Annual maternal mortality ratio at Issaka Gazoby Maternity Hospital (2022–2025)

Year	Maternal deaths	Total live births	Maternal mortality ratio (/100.000 live births)
2022	183	2589	7,068.4
2023	162	5250	3,085.7
2024	196	7909	2,478.2
2025	175	8002	2,187.0
Total	716	23750	14,819.2

Sociodemographic characteristics

The mean age of the women was 29.1 ± 7.4 years (range: 15-45 years). Women aged 20-25 years were the most represented group (30.9%), followed by those aged 31-35 years (22.9%) (Table 2).

Most women had no formal education (69.1%), were unemployed/housewives (86.3%), and were

married (97.5%). The majority of their husbands were farmers (42.3%).

The mean gravidity was 4.36 ± 2.78 (range: 1-11 pregnancies), and grand multigravidae (≥ 6 pregnancies) represented 33.9% of the study population. The mean parity was 3.63 ± 2.50 (range: 0-10 births), with multiparous women accounting for 25.1% of all maternal deaths.

Table 2: Sociodemographic characteristics of the study population

Age (years)	Number of cases	Percentage (%)
≤ 15	2	1,14
16 – 19	12	8
20 – 25	54	30,85
26 – 30	33	18,86
31 – 35	40	22,86
36 – 40	21	12
≥ 41	11	6,29
Total	175	100

Obstetric characteristics

Twenty-two women (12.6%) had a previous caesarean section.

Regarding antenatal care, 120 women (68.6%) had received no antenatal care, whereas only five women (2.9%) attended at least five antenatal care visits during pregnancy.

Clinical characteristics

At hospital admission, gestational age ranged between 28 and 36+6 weeks in 65 women (37.1%).

Most women (80.0%) were referred from peripheral healthcare facilities, and ambulances were the most common means of transportation (73.7%). Hypertensive disorders of pregnancy were the leading reason for admission (20.0%). Twenty women were declared dead during transfer to the hospital.

Overall, 83.2% of women presented in poor general condition on admission. Clinical examination frequently revealed mucocutaneous pallor (62.6%) and hypovolaemic shock (74.8%).

The mean haemoglobin concentration was 7.7 g/dL (range: 1.5–12.0 g/dL). Laboratory investigations showed leukocytosis in 51.0%, thrombocytopenia in 44.5%, and hypoglycaemia in 94.8% of women. Renal impairment was identified in 18 patients (11.6%), while hypokalaemia and hyponatraemia were found in 1.3% and 4.5% of cases, respectively.

Therapeutic management

Analgesics, antibiotics, intravenous fluid resuscitation, and blood transfusion were administered in 90.9%, 79.6%, 49.2%, and 49.2% of patients, respectively.

Most maternal deaths occurred during the postpartum period (62.9%), whereas 19.4% occurred during labour.

Among women who delivered, 59 (53.6%) had a vaginal birth and 33 (30.0%) underwent caesarean section.

Placental abruption was the leading indication for caesarean delivery (25.9%), followed by eclampsia/status eclampticus and severe pre-eclampsia (22.2%).

All laparotomies were performed for uterine rupture, including one case complicated by pelviperitonitis associated with intrauterine fetal death.

Most women died within 1-6 hours after hospital admission (26.9%), while 17.7% died between 24 and 48 hours after admission.

Causes of maternal death

- Among direct obstetric causes, eclampsia/severe pre-eclampsia was the leading cause of maternal death, accounting for 31 cases (17.7%).
- Among haemorrhagic causes, uterine rupture was the most frequent, accounting for 22 cases (32.8%).
- Regarding indirect causes, anaemia during pregnancy accounted for eight maternal deaths (47.1%).
- Among infectious causes, postpartum infection was responsible for 28 deaths (77.8%).

DISCUSSION

This study assessed the epidemiological profile, clinical characteristics, management, and causes of maternal deaths at Issaka Gazoby Maternity Hospital, the largest tertiary referral maternity hospital in Niger. The maternal mortality ratio (MMR) was 2,186.9 per 100,000 live births, highlighting the persistently high burden of maternal mortality in this referral facility.

Comparable maternal mortality ratios have been reported in several African countries as well as in previous studies conducted in Niger (Tables 3 and 4) [7-22]. However, the particularly high MMR observed in our study is likely explained by the referral nature of our institution, which serves as the highest-level referral centre for obstetric emergencies. Most women were transferred from peripheral health facilities, frequently in critical condition after experiencing delays in seeking, reaching, or receiving appropriate care, as described in the "three delays" model.

The majority of women who died were young, with a mean age of 29.1 years. Similar findings have been reported in other studies conducted in sub-Saharan Africa [7,8]. This observation reflects the high fertility rate and the predominance of pregnancies among young women in the region.

Approximately 69.1% of women had no formal education, consistent with findings reported by Abdoul Habou *et al.*, in Tahoua (94%) [16], Madi Nayama *et al.*, in Niamey (69.47%) [15], Berthé *et al.*, in Mali (80%) [23], and Sissoko *et al.*, (52.5%) [24]. Low educational attainment is widely recognized as a determinant of poor maternal health outcomes because it is associated with reduced health literacy, delayed healthcare-seeking behaviour, inadequate antenatal care utilization, and limited autonomy in healthcare decision-making.

Table 3: Maternal mortality ration rappedort in sub-saharan Africa

Authors	Country, year	Maternal mortality ratio (for 100.000)
Padonou SGR et coll.[7]	Bénin, 2026	2,039.0
Zinvokpodo K.M et coll.[8]	Togo, 2025	99.15
Douaguibé B. et coll.[9]	Togo, 2023	722.30
Atade S.R. <i>et al.</i> , [10]	Bénin, 2021	1,173
Sossoukpé N et coll.[11]	Bénin, 2025	182.40
Biaye B <i>et al.</i> , [12]	Sénégal, 2022	595.24
Thiam O. <i>et al.</i> , [13]	Sénégal, 2024	199.0
Ntoimo F <i>et al.</i> , [14]	Nigeria, 2018	2,085.0

Table 4: Maternal mortality ration rappedort in Niger's regions in previous studies

Authors	Region, year	Maternal mortality ratio (for 100.000)
Madi Nayama A. [15]	Niamey, 2025	2,125.28
Abdoul Habou E.A.I [16]	Tahoua, 2025	2,611.94
Wassila [17]	Niamey, 2022	2,364.0
Salfa C. [18]	Agadez, 2021	1,902.90
Zaroumeye D. [19]	Tillabery, 2025	2,778.82
Moussa S. [20]	Dosso, 2025	2,267.80
Tamo K A [21]	Maradi, 2022	2,645.72
Alkassoum I [22]	Maradi, 2018	2,512.0
Present study	Niamey, 2026	2,186.95

Multiparous women accounted for the largest proportion of maternal deaths in the present study. Similar findings have been reported in Senegal by Biaye *et al.*, [12] and Thiam *et al.*, [13], as well as in Niger by Madi Nayama *et al.*, [15]. In contrast, studies conducted

by Berthé *et al.*, [23] and Atade *et al.*, [10] identified nulliparous women as the most affected group. These discrepancies may reflect differences in fertility patterns, referral practices, and study populations across settings.

Regarding medical history, five women had sickle cell disease, five had chronic hypertension, and nineteen had a previous caesarean section. Comparable distributions of pre-existing maternal conditions have been reported elsewhere in West Africa [7,12,24]. These comorbidities are recognized risk factors for severe maternal complications and warrant close antenatal surveillance.

Antenatal care coverage was particularly poor in this study. Only five women attended at least five antenatal care visits, whereas more than two-thirds received no antenatal care throughout pregnancy. Similar findings have been reported in Niger [15,16,18], Mali [23,24], and other African countries [13,26]. Poor antenatal care attendance may be explained by low educational attainment, poverty, geographical barriers, insecurity, and limited access to quality maternal healthcare services. Strengthening antenatal care remains a priority for improving early detection and management of high-risk pregnancies.

Most women were referred from peripheral health facilities, and ambulances represented the main mode of transportation. Nevertheless, the high proportion of referrals reflects weaknesses in the organization of the referral system and the limited availability of comprehensive emergency obstetric and newborn care services outside tertiary hospitals. Similar observations have been reported in Mali [23], Burkina Faso [27], Senegal [12], and Gabon [26]. Delays in referral and transportation remain major contributors to preventable maternal deaths in low-resource settings.

Most maternal deaths occurred during the postpartum period and were mainly attributable to direct obstetric causes, particularly eclampsia/severe pre-eclampsia. These findings are consistent with reports from Burkina Faso [27], Senegal [12,13], Benin [10], and previous studies from Niger [15,16]. Although postpartum haemorrhage remains the leading cause of maternal death globally, hypertensive disorders of pregnancy accounted for the highest proportion of maternal deaths in our institution, suggesting local epidemiological differences and highlighting the need to strengthen prevention, early diagnosis, and timely management of hypertensive disorders during pregnancy.

Study strengths and limitations

The findings of this study should be interpreted in light of certain limitations. First, its retrospective design relied on routinely collected hospital records, which may have been affected by missing or incomplete information. Second, the study was conducted in a single tertiary referral hospital managing the most severe obstetric emergencies; therefore, the findings may not be generalizable to primary or secondary healthcare facilities. Finally, no multivariable analysis was

performed to identify independent factors associated with maternal mortality.

Despite these limitations, this study provides valuable contemporary data from one of the largest referral maternity hospitals in Niger. It contributes to the limited evidence available on maternal mortality in the country and may support policymakers in strengthening referral systems, improving the quality of emergency obstetric care, and implementing evidence-based strategies aimed at reducing preventable maternal deaths.

CONCLUSION

This study highlights the persistently high burden of maternal mortality at a tertiary referral maternity hospital in Niger. Women who died were predominantly young, had little or no formal education, were married, unemployed, and multiparous, reflecting persistent socioeconomic vulnerabilities and limited access to timely and adequate maternal healthcare.

Most maternal deaths occurred during the postpartum period and within the first 24 hours after hospital admission, emphasizing the critical importance of early recognition, prompt referral, and high-quality emergency obstetric care. Direct obstetric complications, particularly hypertensive disorders of pregnancy (pre-eclampsia/eclampsia), followed by obstetric haemorrhage, accounted for the majority of maternal deaths.

These findings underscore the urgent need to strengthen antenatal care, improve the referral and transport system, ensure the timely availability of comprehensive emergency obstetric and newborn care, and reinforce postpartum surveillance. Implementing evidence-based interventions targeting preventable causes of maternal death is essential to accelerate progress toward reducing maternal mortality in Niger and other low-resource settings.

Declarations

Ethics Approval and Consent to Participate: The study protocol was approved by the Ethics Committee of Abdou Moumouni University, Niamey, Niger (N°: 000954/2AUA/FSS/SS). The study was conducted in accordance with the principles of the Declaration of Helsinki. Owing to the retrospective nature of the study and the use of anonymized routinely collected hospital data, the requirement for informed consent was waived by the Ethics Committee.

Consent for Publication: Not applicable.

Availability of Data and Materials: The datasets generated or analysed during the current study are available from the corresponding author upon reasonable request.

Competing Interests: The authors declare that they have no competing interests.

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Authors' Contributions

Balkissa Issoufou Amadou: Conceptualization, data collection, data analysis, manuscript drafting.

Maina Oumara: Study design, supervision, critical revision of the manuscript.

Souleymane Oumarou Garba: Data interpretation, manuscript revision.

Rahamatou Madeleine Garba: Data collection and manuscript revision.

Madi Nayama: Study supervision, critical revision of the manuscript, and final approval of the version to be published.

All authors read and approved the final manuscript.

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