

RESEARCH ARTICLE

Analysis of Maternal Deaths in the Obstetric Intensive Care Unit at the University Hospital for Mother and Child in N'Djamena

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Abstract

Objective: To contribute to a better understanding of the causes of maternal deaths in our setting and to describe the characteristics of the women who died.

Patients and Methods: The study was conducted in the Obstetric Intensive Care Unit at the University Hospital for Mother and Child in N'Djamena. This was a prospective, descriptive study conducted over a 12-month period, from June 2025 to June 2026. The study included all women admitted to the Intensive Care Unit who died from an obstetric complication that occurred during pregnancy, during childbirth, or within 42 days postpartum. Data were entered and analyzed using Excel 2016 and EpiInfo version 7.2.5.0.

Results: The incidence of maternal mortality that we calculated in the Department of Anesthesia and Intensive Care at the University Hospital for Mother and Child was 673.2 deaths per 100,000 live births. The mean age of the patients in our series was 26.08 (+/- 6.20) years, ranging from 14 to 41 years. Regarding the mode of admission, 62.5% (n=65) of the deaths were referred from various healthcare facilities across the country. In our series, 86 of the patients who died had not attended any prenatal care visits. It should be noted that of the 104 women who died in childbirth, 28.9% (n = 38) had given birth vaginally, while 51.9% (n = 54) had undergone a cesarean section and 11.5% (n=12) had died during their pregnancies. With regard to maternal mortality by etiology, we classified the causes of death into two groups: deaths due to direct obstetric causes and deaths due to indirect obstetric causes. Direct obstetric causes were the most common, with 90 cases, accounting for 86.5% of total mortality. Hypertension and its complications ranked first in our study, accounting for 52 deaths, or 50% of all deaths. These were dominated by preeclampsia and eclampsia and were often complicated by associated organ damage (HELLP syndrome: 8 cases; acute kidney injury: 15 cases; pulmonary arterial hypertension: 8 cases; hemorrhagic stroke: 5 cases). Sepsis ranked second, with 21 deaths, accounting for 20.2%. Postpartum hemorrhage accounted for 13.5% of deaths, ranking third in terms of frequency. In our series, 56% (n=58) of the deaths occurred within 24 hours of hospitalization; some women even died within hours or even minutes of admission.

Conclusion: Maternal mortality is a family and social tragedy and a shock to the medical team. Our study confirms a predominance of conditions related to hypertension and sepsis. Deaths occur primarily among young women, often homemakers living in rural areas, highlighting the socioeconomic vulnerability of this population.

Keywords: Maternal Mortality, Resuscitation, Mother and Child University Hospital, N'Djamena, Chad.

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1. Introduction

Maternal mortality (MM) is a key indicator of a functioning health care system, social justice, and quality of life, as well as an essential indicator of development. The fight against maternal mortality is a global concern, falling under the Millennium Development Goals (MDG 5A) established by the United Nations in 2000 and later included among the Sustainable Development Goals (SDGs 2030) [1]. According to the latest estimates from the World Health Organization (WHO) published on April 7, 2025, more than 700 women die every day from preventable causes related to pregnancy and childbirth—that is, one woman every two minutes. Sub-Saharan Africa alone accounts for nearly 70% of these deaths, primarily due to limited access to quality health care, inadequate infrastructure, and sociocultural barriers [2].

In Europe, the maternal mortality rate between 2016 and 2020 ranged from 2.7 in Norway to 10.9 in Slovakia per 100,000 live births [3]. In France, for the period 2016–2018, 272 maternal deaths were recorded, with a rate of 11.8 deaths per 100,000 live births [4]. In Cameroon, this rate was 438 per 100,000 live births in 2020 [5]. In the DRC, according to the 2023–2024 DRC Demographic and Health Survey (EDS-RDC), from 2017 to 2023, the maternal mortality ratio is estimated at 746 deaths per 100,000 live births [6].

Although Chad has made considerable efforts to improve maternal health, it is not immune to this troubling reality. According to the National Institute of Statistics, Economic, and Demographic Studies (INSEED), the maternal mortality ratio stands at 860 deaths per 100,000 live births, well above the target set by the Sustainable Development Goals (SDGs), which aim for fewer than 70 deaths per 100,000 live births by 2030 [7]. Poverty, inadequate or unevenly distributed health services, the problem of geographic accessibility to referral centers, as well as other ethnic and cultural factors may be at the root of this pressing problem. The objective of this study is to contribute to a better understanding of the causes of maternal deaths in our context and to describe the characteristics of the women who died. Patients and Methods: The study was conducted in the Obstetric Intensive Care Unit at the University Hospital for Mother and Child in N'Djamena. It was a prospective, descriptive study conducted over a 12-month period, from June 2025 to June 2026. The study included all women admitted to the Intensive Care Unit who died from an obstetric complication that occurred during pregnancy, during

childbirth, or within 42 days postpartum. The study excluded cases of accidental or incidental death and late maternal death. For each death, the following parameters were examined: Quantitative variables: age, parity, gestational age, length of stay, blood pressure, pulse, respiratory rate, and Glasgow Coma Scale score. Qualitative variables: mode of admission, place of origin, prenatal care, reason for admission, diagnosis, cause of death, and length of stay. The data were entered and analyzed using Excel 2016 and EpiInfo version 7.2.5.0. The study adhered to the ethical principles of confidentiality, anonymity, and protection of personal data. It received formal authorization. Data analysis was conducted in accordance with the principles of the Declaration of Helsinki on medical research involving human subjects.

2. Results

The incidence of neonatal death that we calculated in the Department of Anesthesia and Critical Care at the University Hospital for Mother and Child was 673.2 deaths per 100,000 live births. The mean age of the patients in our series was 26.08 ($\pm$ 6.20) years, ranging from 14 to 41 years. The most affected age group was 21 to 30 years, accounting for 55.8% ($n=58$) (Figure 1). With regard to parity, we divided the parturients into four groups: primiparas, pauciparas (two to four parities), multiparas (five to six parities), and grand multiparas (seven or more parities). In our study, the mean parity was 4.21 ($\pm$ 2.8), with values ranging from 0 to 11 parities. Primiparous and pauciparous women accounted for approximately 67% of all maternal deaths, while multiparous and grand multiparous women accounted for 33% of the deaths. Regarding the mode of admission, 62.5% ($n=65$) of the deaths were referred from various health facilities across the country. In our series, 86 of the deceased patients had not attended any prenatal care visits (CPN), and 18 had attended at least one CPN visit. It should be noted that of the 104 women who died during childbirth, 28.9% ($n=38$) had given birth vaginally, 51.9% ($n=54$) had undergone a cesarean section, and 11.5% ($n=12$) had died during their pregnancies. With regard to maternal mortality by etiology, we categorized the causes of death into two groups: deaths due to direct obstetric causes and deaths due to indirect obstetric causes. Direct obstetric causes were the most common, with 90 cases, accounting for 86.5% of total mortality. Hypertension and its complications ranked first in our study, accounting for 52 deaths, or 50% of all deaths. These

were dominated by preeclampsia and eclampsia and were often complicated by associated organ damage (HELLP syndrome: 8 cases; acute kidney injury: 15 cases; pulmonary arterial hypertension: 8 cases; hemorrhagic stroke: 5 cases). Sepsis ranked second, with 21 deaths, or 20.2% (Table I). Postpartum hemorrhage accounted for 13.5% of deaths, ranking third in terms of frequency. Indirect causes were dominated by electrolyte imbalances, particularly severe hypokalemia with motor deficits and cardiac arrhythmias (Table II). At admission, 40.8% (n=42)

of the patients who died had impaired consciousness, 25% (n=26) were in shock, and 14.4% (n=15) had oliguria or anuria (Table I).

Fifty patients (48%) required mechanical ventilation. In our series, 56% (n=58) of the deaths occurred within 24 hours of hospitalization; some patients even died within hours or even minutes of admission (Figure 2). The majority of these women were referred from another hospital, and 44% (n=46) died after spending more than 24 hours in the intensive care unit.

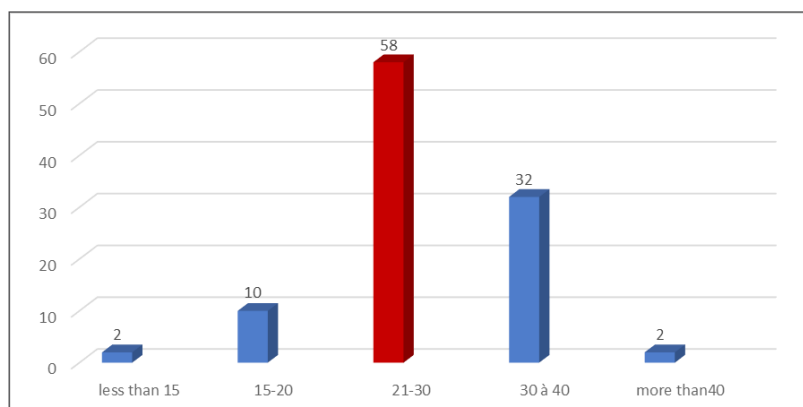


Figure 1. age group

2.1 Causes of Death

In 90 cases, the death was linked with the pregnancy

and its complications. Therefore, patients died with cause no lined with the pregnancy

Table 1. Cause of death

Cause of death	n	%
Hypertension and its complications: Preeclampsia/Eclampsia	52	50
Complicated by acute kidney injury	15	43.1
Complicated by hemorrhagic stroke	5	3.8
Complicated by PRES syndrome	3	1.9
Complicated by HELLP syndrome	9	8.6
Complicated by pulmonary arterial hypertension	8	7.6
Associated with sepsis	8	7.6
Isolated eclampsia	4	3.8
Postpartum sepsis and septic shock	21	20.2
Obstetric hemorrhage	14	13.5
Thromboembolic disease	2	1.9
Complication of anesthesia	1	0,9

Table 2. Other cause of death

Other cause	n	%
Electrolyte imbalance: Severe hypokalemia	8	7,6
Diabetes: Ketoacidosis	2	1,9
Decompensated heart disease	2	1,9
Road accident	2	1,9

Duration before in the hospital before the death

In 56% patients spent less than 24 hours before the death and 44% more than 24 hours

3. Discussion

The maternal mortality (MM) rate that we calculated for the Department of Anesthesiology and Intensive Care at the University Hospital for Mothers and Children was 673.2 deaths per 100,000 live births. It is difficult to extrapolate our results to the general population; at the national level, Chad has recorded fluctuating maternal mortality rates over the years. In 2025, the maternal mortality ratio stood at 860 deaths per 100,000 live births, well above the target set by the Sustainable Development Goals (SDGs), which aim for fewer than 70 deaths per 100,000 live births by 2030 [7]. Sustained efforts are therefore essential to further reduce maternal mortality. These could include strengthening prenatal care, raising awareness about the importance of prenatal checkups, improving access to emergency obstetric services, providing ongoing training for healthcare workers, and educating communities about warning signs during pregnancy. The high rate of maternal deaths observed in our study is consistent with the broader regional challenge of underinvestment in public health systems. Adegoke et al. demonstrated that, unless public health spending increases by at least 30%, most countries in sub-Saharan Africa will not meet the SDG target for maternal mortality [8].

In our series, an analysis of the sociodemographic characteristics of deceased women shows that maternal deaths primarily affect young women, with an average age of 26.08 (+/- 6.20) years and ages ranging from 14 to 41 years. This same finding was highlighted by a study in Niger, which noted that 27.1% of those who died were under 20 years of age [9]. The same trend was reported by a study conducted by Atade et al. in Benin in 2024, which indicated an average age of 25.4 years [10]. Similarly, a study conducted in Nigeria in 2023 by Kahansim et al. revealed an average age of 27.0 ± 8.1 years [11]. When examining the distribution of maternal mortality based on the origin of the deceased women, it is evident that 62% of these women were transferred from another maternity facility, most often due to a complication during childbirth or in the postpartum period. Several studies have concluded that transfer is a risk factor for maternal death. According to Alkassoum et al. in Niger, 80.3% of the deceased women were referred from another health facility, of whom 52.5% were transported to the maternity hospital by ambulance [9]. In a study on maternal mortality in Tunis, Kharouf et al. estimated that transferring a woman in labor increases the risk of death by a factor of 12

[12]. Similar findings were reported by Matumo in the Congo as well as Diassana M et al. in Bamako, at 78% and 82%, respectively [13,14]. Bouvier et al. concluded in their study that the risk of death for a woman who is evacuated or transferred is 8 to 15 times higher than that of a woman who is not [15]. This could therefore explain our high maternal mortality rate, given that we are a leading university teaching hospital for maternal and child health and the only one of its kind in the entire country, which means we receive patients from all regions of Chad. Delays in care at peripheral maternity facilities necessitate the posting of guidelines at these facilities. Thus, rapid screening and transfer under appropriate conditions would theoretically reduce the maternal mortality rate by half. In our series, 86 of the patients who died—or 82.7%—had not had any prenatal consultations. This finding is consistent with data from the literature. Ahbib A in Morocco, Diallo F et al. in Conakry, and Alkassoum I et al. in Niger reported rates of 83.1%, 85%, and 91.3%, respectively [9,16,17]. In our cohort, 54 of the deaths—or 51.9%—involved women who had undergone a cesarean section. In fact, according to the report from the French national survey on maternal mortality as well as a Canadian cohort study on the relationship between mode of delivery and maternal mortality, giving birth by cesarean section tripled the probability of death compared to vaginal delivery. There was no difference depending on whether the cesarean section was elective or emergency [18,19]. However, it is not possible to distinguish between the direct role of cesarean sections in these deaths and the role of the complications that indicated these cesarean sections; women who undergo cesarean sections often do so due to an emergency that is in itself life-threatening to the mother. Consequently, the importance of prenatal care (CPN) should be emphasized so that so-called prophylactic cesarean sections are planned and decided upon in advance, in order to reduce the frequency of emergency cesarean sections, which undeniably carry risks. In our study, deaths from direct causes accounted for 90 cases, or 86.5 percent. These proportions are comparable to the findings of regional and global studies. The 2008 Tunisian national survey reported a rate of deaths from direct causes of 67.2 percent [20]. In a study on the causes of mortality among more than 60,000 maternal deaths in 115 countries between 1990 and 2011, the World Health Organization estimates that, globally, 75% of maternal deaths are due to direct causes and 25% to indirect causes [21]. This predominance of direct causes reflects the fact that care for the obstetric

complications most closely associated with maternal mortality (hemorrhage, preeclampsia, and puerperal infections) is still suboptimal. In industrialized countries, where the management of obstetric complications has improved significantly, trends in maternal mortality are marked by a growing increase in deaths from indirect causes relative to direct causes. In the United Kingdom, there is a higher rate of deaths from indirect causes compared to direct causes (56.4% versus 47.3%) [21]. An analysis of the causes of death in our cohort revealed that hypertension and its complications were the leading cause, accounting for 52 deaths—50% of all deaths. These were predominantly preeclampsia, eclampsia, or eclamptic crisis and were often complicated by associated organ damage (HELLP syndrome: 8 cases; acute kidney injury: 15 cases; pulmonary arterial hypertension: 8 cases; hemorrhagic stroke: 5 cases). Postpartum hemorrhage accounted for 13.5% of deaths, ranking third in frequency after sepsis. Even in countries where prenatal care is provided under good conditions, preeclampsia is not a condition on the decline: its incidence is approximately 2.5 to 3 per 100,000 in Sweden or the United Kingdom, and around 12 per 100,000 in the United States [23]. According to data from the National High Blood Pressure Education Program Working Group on High Blood Pressure in Pregnancy, preeclampsia is the second leading cause of maternal mortality in the United States, accounting for nearly 15% of deaths [24]. Atade S et al. found in their study that the direct obstetric causes of death were dominated by hemorrhage (25.8%), hypertensive disorders (22.8%), and puerperal infections (21.2%) [10]. In the literature, the two leading causes cited are complications of hypertension and hemorrhage. The low prevalence of deaths from hemorrhage in our cohort can be explained by the fact that our center has an on-site blood bank where labile blood products are always available and reserved for extreme emergencies, as well as by the fact that staff are trained in the management and prevention of postpartum hemorrhage, as well as the free availability of essential medications such as Nalador and tranexamic acid. Upon admission, 40.8% (n=42) of the deceased patients had impaired consciousness, 25% (n=26) were in shock, and 14.4% (n=15) had oligoanuria (table). Fifty patients were on mechanical ventilation, and 54 were breathing spontaneously. In our series, 56% (n=58) of the deaths occurred within 24 hours of hospitalization; some patients even died within hours or even minutes of admission. This figure suggests that the majority of patients arrive in critical

condition requiring immediate care. This trend is also observed in other African settings. For example, in north-central Nigeria, Kahansim et al. found that most (41.3%) maternal deaths occurred within 24 hours of admission [11]. In Benin, Zinvokpodo et al. found a mortality rate within the first 24 hours of 72.73% [2]. Early deaths can be attributed to: delayed diagnosis at the referring facilities, the lack of medical transport, insufficient resuscitation resources, and sociocultural factors such as delayed hospital admission.

4. Conclusion

Maternal mortality is a family and social tragedy and a shock to the medical team. In our context, despite all efforts, maternal mortality remains a major tragedy. This study shed light on the epidemiological and clinical aspects and the causes of maternal deaths in the intensive care unit of the University Hospital for Mother and Child. Our study confirms a predominance of conditions related to hypertension and sepsis. Deaths occur primarily among young women—often homemakers, married, and living in rural areas—highlighting the socioeconomic vulnerability of this population. There is therefore an urgent need to strengthen policies aimed at reducing maternal mortality. To achieve this, we must focus our efforts primarily on informing and educating the public, providing continuing education for healthcare personnel, and exploring ways to better organize healthcare systems.

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