

Original Research Article

Maternal Mortality Ratio and Its Causes in the Far North Region of Cameroon

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Abstract: Objectives: To analyze the epidemiology of maternal deaths in the Far North Region of Cameroon. **Materials and Methods:** This was a retrospective cross-sectional descriptive study covering the period from January 1, 2019, to December 31, 2025. The study focused on deaths occurring among pregnant women, during childbirth, or in the postpartum period. For in-hospital data, we used death and delivery registries to calculate the maternal mortality ratio and notification forms to identify the causes of death. For regional data, we consulted the DHIS2 database. **Results:** At the Maroua Regional Hospital (MRH), we identified 217 maternal deaths, representing an estimated maternal mortality rate of 1,330 per 100,000 live births. Across the entire Far North region, there were 1,507 maternal deaths, for a rate of 275 per 100,000 live births. At the MRH, the trend showed the lowest rates between 2022 and 2023, periods when the department had the largest number of staff (at least 4 obstetrician-gynecologists and 30 midwives). Deaths at the regional hospital represented 20.11% of all in-hospital deaths in the entire Far North region. The most affected age group was 20-29 years old, at 44.7%; the unemployed accounted for 89.3%. The highest percentage of women was unschooled (63.3%). The majority (53.9%) had not received any antenatal care. Deliveries took place at home in 10.7% of cases. 74.65% of these women were referred. The direct causes of death were hypertensive disorders (24.42%), followed by septicemia, and postpartum hemorrhage (20.28% each). The leading indirect cause was severe anemia, observed in 11.52% of cases. **Conclusion:** The maternal mortality rate, although decreasing, remains high in the Far North region. The affected women are young and referred by lower-level health facilities. Hypertensive disorders are the leading direct cause of these deaths. Each death should be systematically audited to better understand the related dysfunctions and to reduce this rate in the Far North region of the country.

Keywords: Maternal Mortality, Ratio, Far North Region, Cameroon.

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INTRODUCTION

Maternal mortality is defined as the death of a woman during pregnancy or childbirth, regardless of its duration or location, from any cause determined or aggravated by the pregnancy or the care it necessitated, but neither accidental nor fortuitous [1–3]. The maternal mortality ratio is an indicator of a country's healthcare system performance; an increase in this ratio indicates a dysfunction, especially since maternal death is most

often preventable [4, 5]. Despite a marked global decline between 1990 and 2021, the maternal mortality rate remains high in Central Africa [6]. In Cameroon, the maternal mortality ratio increased from 669 to 782 deaths per 100,000 live births between 2004 and 2011. In 2018, the estimated number of deaths per 100,000 live births (LB) was 406, according to the Demographic and Health Survey (EDSC-V) [7]. While Cameroon has set the goal of reducing maternal mortality to 70 per 100,000 live births by 2030, in accordance with the Sustainable

Development Goals (SDGs), just as there are significant differences between continents and countries, the maternal mortality rate varies from one region of the country to another. In 2015, Tebeu found 287.5 in a first-category hospital in Yaoundé; in 2023, Boten found 1,176 in a second-category hospital in the Littoral region. The main causes are postpartum hemorrhage and hypertensive diseases [2-8]. Since the far north region is among those with the highest death rates in the country, we wanted to know the death rate and causes of death in this region.

Study Design and Area

We conducted a retrospective cross-sectional descriptive study in the Far North Region of Cameroon, specifically at the Maroua Regional Hospital, which has the highest number of births in the region.

Study Duration

January 1, 2019, to December 31, 2025, for the hospital-based portion and January 1, 2020, to December 31, 2025, for the regional portion.

Study Population: The target population consisted of all pregnant women in the Far North Region.

Inclusion Criteria: The records of women who died during the study period.

Exclusion Criteria: The records of women who died from causes unrelated to pregnancy.

Ethical Considerations

We obtained preliminary approval from the head of the Maroua Regional Hospital, granting us

access to maternal death records in the Gynecology-Obstetrics Department. We also obtained authorization number 0056/CERSH/NO/2024 from the Northern Regional Ethics Committee for Human Health Research. Data were collected confidentially and used solely for the purposes of our study.

Data Collection

We conducted a non-exhaustive and non-probability sampling during the study period. The study focused on deaths occurring among pregnant women, during childbirth, or in the postpartum period. For in-hospital data, we used death and delivery registers to calculate the maternal mortality ratio, as well as notification forms and medical records to identify the causes of death. For regional data, we consulted the DHIS2 database.

Data Analysis: We used Excel 2021 and IBM SPSS 24 (Statistical Package for the Social Sciences) analysis software.

RESULTS

At Maroua Regional Hospital, we identified 217 maternal deaths, representing an estimated maternal mortality ratio of 1,330 per 100,000. Across the Far North region as a whole, there were 1,507 maternal deaths, representing a ratio of 275 per 100,000. Deaths at the Regional Hospital accounted for 20.11% (185) of all in-hospital deaths across the Far North region (920). And 74.65% of the deceased patients had been referred.

Table I: The socio-demographic characteristics of deceased women

Variables	Frequency (N=217)	Percentage %
Age		
10-19	84	38,7
20-29	97	44,7
30-39	67	30,7
> 40	9	4,0
Marital status		
Married	198	91,3
Single	15	6,7
Divorced	3	1,3
Widow	2	0,7
Level of education		
Not in school	137	63,3
Primary	58	26,7
Secondary	19	8,7
Higher education	3	1,3
Profession		
Unemployed	194	89,3
Student	13	6,0
Employed	10	4,7
Residency		
Urban	87	40,0
Rural	130	60,0

The age group most affected was 20–29-year-olds, accounting for 44.7%; the unemployed accounted

for 89.3%; and those not in education accounted for 63.3%.

Table II: Maternal mortality ratio in the Maroua Regional Hospital

Years	Maternal death	Life birth (LB)	MMR (for 100.000 LB)
2019	32	1763	1815
2020	37	2057	1798
2021	29	2251	1288
2022	27	2571	1050
2023	25	2500	1000
2024	32	2546	1257
2025	35	2626	1333
2019-2025	217	16314	1330

The intra-hospital maternal mortality rate (Maroua Regional Hospital) over seven years was 1330 per 100,000

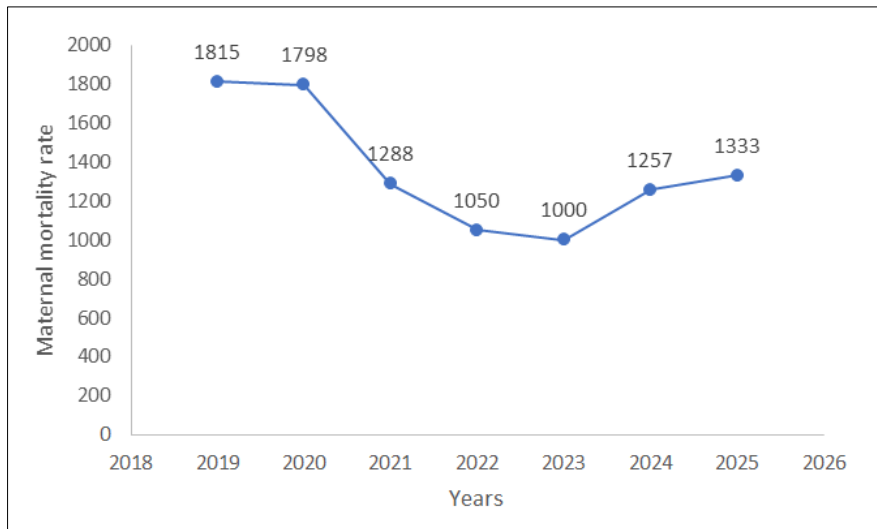


Figure 1: Trend of maternal mortality

Looking at the trend, the lowest ratios were recorded between 2022 and 2023.

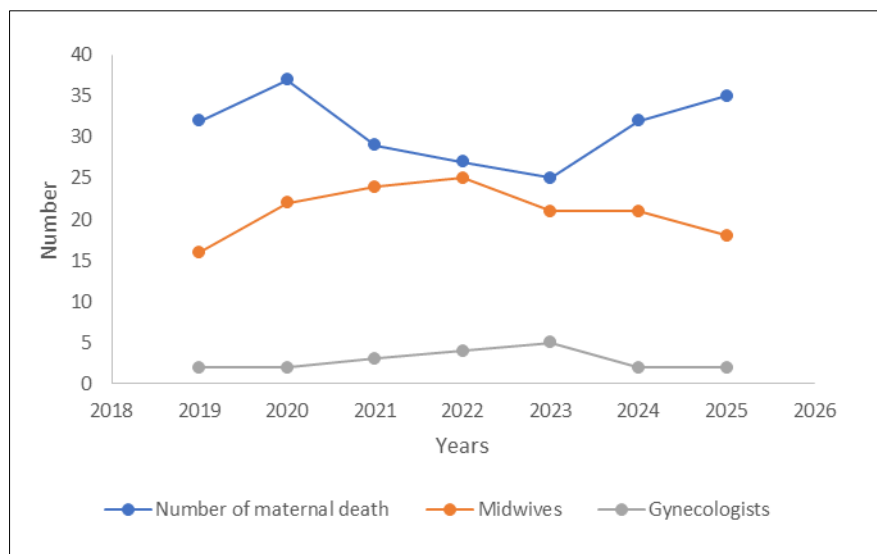


Fig. 2: Trend in the regional hospital maternal deaths according to the number of healthcare staff

The period of decline coincided with the period when there were five gynaecologists.

Table III: Maternal mortality ratio throughout the far north region

Years	Live birth delivery	Number of deaths	Regional MMR
2020	87853	291	331
2021	101887	181	178
2022	109549	395	361
2023	105538	178	169
2024	104106	267	256
2025	105881	195	184
2020-2025	614814	1507	275

Using the maternal mortality ratio derived from DHIS2 data, a rate of 275 per 100,000 live births was obtained for the entire region.

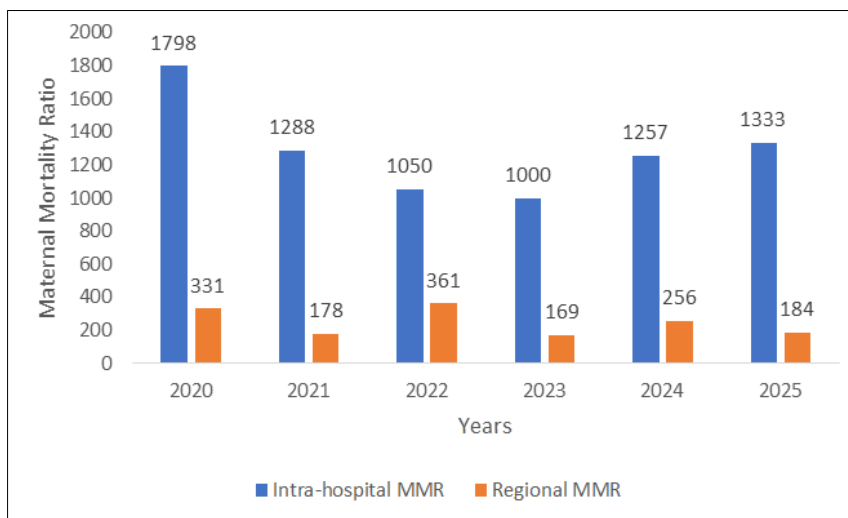


Figure 3: The maternal mortality ratio at Maroua Regional Hospital and throughout the surrounding region

Intra-hospital maternal mortality rates were significantly higher than those calculated for the region as a whole.

Table IV: Distribution of female deaths by parity

Parity	Effective (N=217)	Percentage (%)
Nulliparous	25	11,3
Primiparous (1)	46	21,3
Multiparous (2-5)	67	30,7
Great multiparous (>5)	80	36,7

Women who had given birth many times were the most affected.

Tableau V: Répartition des décès maternels selon le suivi de grossesse

Variables	Effective (N=217)	Fréquence (%)
No ANC	117	53,9
1 to 2 ANC	33	15,3
3 to 4 ANC	50	23,1
5 to 8 ANC	17	7,7

ANC: antenatal care

One hundred and seventeen (117) women who died, representing 53.9%, had not attended any antenatal care consultation.

Tableau VI: Time of death

Period	Effective (N=217)	Percentage(%)
During pregnancy	11	4,95
During delivery	9	4,40
After delivery	177	81,44
Post-abortum	20	9,22

The majority of deaths occurred in the postpartum period, accounting for 81.44%.

Tableau VII: Distribution of deaths among women according to the causes

Causes of death	Effective (N=217)	Percentage (%)
Direct obstetric causes	(n=179)	(86,64)
Preeclampsia	53	24,42
Septicemia	44	20,28
PPH	44	20,28
Abortion's complications	20	9,22
Uterine rupture	9	4,15
Thromboembolic diseases	7	3,23
Extra-uterine pregnancy	2	0,92
Indirect obstetric causes	(n=38)	(13,36)
Severe anemia	25	11,52
Severe malaria	7	3,22
Postpartum cardiopathy	2	0,92
HIV/AIDS	2	0,92
Hepatopathy in pregnancy	1	0,46
Covid	1	0,46

PPH: Postpartum hemorrhage

The direct causes were dominated by hypertensive disorders (24,42%) followed by septicemia and postpartum hemorrhage (20,28% each). The most common indirect cause was severe anaemia, observed in 11,52% of cases.

DISCUSSION

In our study, we calculated a maternal mortality ratio of 1,330 deaths per 100,000 live births at Maroua Regional Hospital between 2019 and 2025. And across the Far North Region of Cameroon, we calculated using DHIS2 data and found a ratio of 275 per 100,000. According to the 2018 EDS-V covering the period from 2012 to 2018 [9], the maternal mortality ratio in Cameroon is 406 deaths per 100,000 live births. The national ratio is expected to decrease following the imminent release of the Demographic and Health Survey (DHS-VI). Maternal mortality rates vary from country to country. In developed countries, they are very low; this is the case in the USA, where in 2023, it was 18.6 per 100,000 live births [10], across the country, with a peak among Black women at 50.3 per 100,000. It was 176 in Bangladesh [11], in 2015. It was 11.8 in France between 2016 and 2018 [12]. In Iran, it was 45.3 between 2000 and 2004, then 36.5 between 2005 and 2009, and 23.76 after 2010. [1]. In African countries, this ratio is higher: this is the case in Ethiopia, where it was 366.6 [13], in all regions of the country between 2015 and 2025. In-hospital rates are still the highest; this is the case in Cotonou, Benin: it was 2028 at the Lagune Mother and Child University Hospital (CHU-MEL) and at the University Clinic of Obstetrics and Gynecology (CUGO) of the National Center Hospital and University of Hubert Koutoukou MAGA (CNHU-HKM) [3], at CHU-MEL, 905 [13], at the Yaoundé University Hospital, 287.5 [7]. And Boten *et al.*, found 1176 at Laquintinie Hospital in Douala, Cameroon [8]. Despite the high rate, it remains

lower than that which we observed in our study. In our study, we observe a fluctuating trend in maternal deaths in the region. In 2023, the hospital-based rate decreased by approximately 1,000 per 100,000 live births, when the department had five obstetrician-gynecologists. The rate then began to rise again when the number of obstetricians returned to two, demonstrating the influence of healthcare staff on this rate. Furthermore, the rate was not significantly affected by the number of midwives. The in-hospital mortality rate represented 20.11% of all in-hospital deaths in the Far North region. Lawrence *et al.*, [14], in their systematic review, estimate that maternal deaths worldwide, despite their reduction, remain unacceptably high in low-resource countries. Peredy *et al.*, [15], in the USA also note that maternal mortality is high among the Black female population. Chen *et al.*, [4], also find that the maternal death rate has decreased considerably in China between 1990 and 2019.

We found that the age group most affected by maternal deaths was 20-29 years, at 44.7%, followed by adolescent girls, at 38.7%. Contrary to the findings of Savadogo *et al.*, [16], in Burkina Faso, women aged 35 and older and those aged 19 and younger were the most affected. Aboubakar *et al.*, [13], found that the age group most affected was 15-44 years, with a mean age of 29.04 ± 7.04 years. The age group in the study by Wang *et al.*, [17], was 20-24 years, which is close to our findings. Boten *et al.*, [8], found that at Laquintinie Hospital, young age is a risk factor for maternal mortality. In our study, 91.3% were married, 63.3% had no formal education, 89.3% were unemployed, and 60% lived in rural areas. Aboubakar *et al.*, [13], also found that the majority of deceased women (64.5%) were married and that 47% had a primary education. Dangbemey *et al.*, [3], estimated that 82.7% had no income, a finding similar to ours, explaining that women with low purchasing power

were at greater risk of dying from pregnancy or childbirth.

Grand multiparous women represented 36.7% in our study, and multiparous women, 30.7%. In contrast, Aboubakar *et al.*, [13], found that primiparous and pauciparous women accounted for 59.52%. Savadogo *et al.*, [16], demonstrate that multiple deliveries constitute a risk factor for maternal death, which is the same finding as in our study, because the uterine muscle fibers become flaccid with the number of deliveries and expose women to the risk of postpartum hemorrhage in cases of uterine atony. Most deaths occurred postpartum (81.44%). This contrasts with the findings of Foumane *et al.*, [2], according to whom most deaths occurred during pregnancy. Direct causes accounted for 86.64% of maternal mortality is associated with hypertensive disorders. This is not consistent with the findings of most authors in developed countries [4, 5], and in low-resource countries [7-18], where postpartum hemorrhage was found. However, our finding is in accordance with the other authors who consider preeclampsia to be the leading cause of maternal death [2-20], while in our study, septicemia, and postpartum hemorrhage ranked second. Verspyck *et al.*, [5], show that deaths from postpartum hemorrhage have been significantly reduced, from 2.2 to 0.87 per 100,000, and that postpartum hemorrhage accounts for 53% of preventable deaths. Diassana *et al.*, [19], in Mali found that not only was hemorrhage not the leading cause of maternal death, but that delays in the administration of care contributed to 44% of maternal deaths. Rigouzzo *et al.*, [14], estimate that only 13% of maternal deaths were due to direct causes, whereas our findings indicate that direct causes accounted for 86.64%. Alemwork Abie *et al.*, [21], found that 30.6% of women admitted to the intensive care unit for hypertension and hemorrhage died. Obesity has also been identified as a factor associated with maternal deaths [12-22]. Marie Noëlle *et al.*, [23], estimate that the maternal death rate in France due to psychiatric causes is approximately 2.1/100,000. In our study, we found a low proportion of deaths related to uterine rupture (4.15%), while Belinga *et al.*, [24], estimate that rupture results in a 9.58% mortality rate and that the associated factor is coagulopathy. During the COVID-19 period at HRM, we recorded only one case (0.46%) of maternal death related to this condition. Sharma *et al.*, [25], found that COVID-related mortality rates ranged from 0.1% to 12.9%, and among the predictive factors for this maternal mortality were the presence of symptoms, comorbidities, and low income.

CONCLUSION

The high maternal mortality ratio at the MRH contributes significantly to deaths in the Far North Region of Cameroon. The large number of gynecologists would help reduce the rate. The affected women are young, mostly uneducated, and without income, and are most often referred by surrounding health centers.

Multiparous women are predominantly affected, and death often occurs during the postpartum period. The direct causes are dominated by preeclampsia, followed by septicemia and postpartum hemorrhage. Severe anemia is the leading indirect cause. Each death should be systematically audited to better understand the underlying dysfunctions and to implement mechanisms to reduce this mortality rate in the Far North Region of the country.

Recommendations

- To the Ministry of Public Health: assign obstetrician-gynecologists to the Far North region.
- To the Far North Regional Delegation: establish a maternity network to improve referral care.
- To the head of the regional hospital: ensure ongoing training for staff on the three leading causes of maternal death: hypertensive disorders, septicemia and sepsis.

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Availability of Data and Materials: available at any time needed.

Conflict of Interest: No conflict of interest declared.

Author's Contributions

CO and RI conceived the topic and led the discussion. NN: collected the data. IA and MAS: conducted the literature review. SS and DSC: data analysis, KTB and PMT: manuscript review.

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