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Maternal Near-Miss in Two Referral Hospitals in Yaounde in 2024: Epidemiological Patterns, Clinical Presentations, and Therapeutic Approaches

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Abstract

Introduction: Severe maternal morbidity continues to be a pressing public health issue in sub-Saharan Africa. Analysing maternal near-miss cases, defined as women who nearly succumbed to life-threatening obstetric complications but survived, provides valuable insights into the quality of maternal healthcare. This study aimed to explore the epidemiological, clinical, and therapeutic characteristics of maternal near-miss cases in two referral hospitals in Yaoundé, Cameroon, in 2024. **Methods**: A retrospective study was carried out at the two Yaounde referral hospitals from August 2023 to July 2024. Cases were identified based on the World Health Organisation (WHO) near-miss criteria. We gathered sociodemographic, clinical, and management data from medical records and analysed them using SPSS software. **Results**: Out of 3980 live births, 232 met the near-miss criteria, resulting in a Maternal Near-Miss Ratio of 58.3 per 1000 live births and a Near-Miss to Maternal Death Ratio of 4:1. Most of the women were young, single, and had completed secondary education. The majority of complications arose during the third trimester, and over 90% of patients presented with hemodynamic instability upon admission. A significant number required intensive care unit admission, antibiotic treatment, and blood

transfusions. **Conclusion**: This study highlights the burden of severe maternal complications and the need to strengthen prompt management of life-threatening conditions within Yaounde hospitals.

Keywords

Severe Maternal Morbidity, Maternal Near-Miss, Cameroon

1. Introduction

Maternal health is a key indicator of the effectiveness of a healthcare system and remains a core objective of sustainable development. Despite significant progress in recent decades, maternal morbidity and mortality continue to present major challenges, especially in low- and middle-income countries. Globally, 99% of maternal deaths occur in these regions, with sub-Saharan Africa alone accounting for about two-thirds of all cases, an estimated ratio of 542 maternal deaths per 100,000 live births [1]-[3].

However, focusing solely on maternal deaths is no longer sufficient for guiding maternal health policies effectively. The concept of "maternal near miss," as defined by the World Health Organisation, refers to women who nearly died but survived complications during pregnancy, childbirth, or within 42 days after the termination of pregnancy. This concept offers a valuable complementary approach to understanding maternal health [2] [4] [5].

Evaluating near-miss cases helps identify gaps in the continuum of care, assess the performance of obstetric interventions, and anticipate life-threatening situations. Moreover, analysing maternal near miss events informs both clinical and organisational decisions aimed at improving the quality of obstetric care [1] [5] [6].

In Cameroon, data on maternal near-miss cases are limited, even though such events provide crucial insights for developing strategies to reduce preventable maternal deaths. The Yaounde Gynaecological-Obstetric and Paediatric Hospital and Yaounde Central Hospital, two tertiary referral centres, handle numerous complex obstetric emergencies, making it an ideal setting for studying these critical events. A deeper understanding of the epidemiological, clinical, and therapeutic profiles of women who survive major obstetric complications would not only help evaluate the healthcare system's efficiency but also guide the implementation of targeted preventive strategies.

This study aims to describe the epidemiological, clinical, and therapeutic characteristics of maternal near-miss cases at these two referral hospitals, to contribute to the identification of a target intervention to prevent maternal morbidity or death.

2. Methodology

2.1 Type and Framework of the Study

This was a retrospective, descriptive study conducted at the Yaounde Gynaecologi-

cal-Obstetric and Pediatric Hospital and Yaounde Central Hospital, two tertiary medical institutions located in the Central Region of Cameroon. Both health care centres have gynaecology-obstetrics departments equipped to manage serious maternal complications, including obstetric intensive care. The study period spanned 12 months, from August 1, 2023, to July 31, 2024.

2.2. Study Population

The study population consisted of all women admitted in critical condition to the obstetrics and gynaecology department of the hospitals during the study period. This included women who were pregnant, in labour, or within the postpartum period. These women had experienced a serious, life-threatening obstetric complication but ultimately had a favourable outcome. This definition aligns with the World Health Organisation's maternal near-miss criteria.

2.3. Selection Criteria

Women admitted during pregnancy, labour, or within 42 days of delivery were included in the study. Each of these women had at least one severe life-threatening complication that met the clinical, laboratory, or critical intervention criteria defined by the WHO. Women who died during this episode of care, as well as those with incomplete medical records or insufficient information for case identification, were excluded.

2.4. Near-Miss Cases

Maternal near-miss cases were identified according to the criteria established by the WHO in 2011 [7], cited below:

2.5. Life-Threatening Conditions

• Cardiovascular dysfunction: shock; cardiac arrest (absence of pulse or heartbeat and loss of consciousness); use of continuous vasoactive drugs; cardiopulmonary resuscitation; severe hypoperfusion (lactate > 5 mmol/L or > 45 mg/dL); severe acidosis (pH < 7.1).

• Respiratory dysfunction: acute cyanosis; gasping; severe tachypnoea (respiratory rate > 40 breaths per minute); severe bradypnoea (respiratory rate < 6 breaths per minute); intubation and ventilation not related to anaesthesia; severe hypoxaemia (oxygen saturation < 90% for ≥ 60 minutes or PaO_2/FiO_2 < 200). PaO_2/FiO_2: ratio of arterial oxygen partial pressure to fractional inspired oxygen.

• Renal dysfunction: oliguria non-responsive to fluids or diuretics; dialysis for acute renal failure; severe acute azotaemia (creatinine ≥ 300 μmol/mL or ≥ 3.5 mg/dL).

• Coagulation or haematological dysfunction: failure to form clots; massive transfusion of blood or red cells (≥5 units of blood); severe acute thrombocytopenia (<50,000 platelets/mL).

• Hepatic dysfunction: jaundice in the presence of pre-eclampsia; severe acute

hyperbilirubinaemia (bilirubin > 100 µmol/L or > 6.0 mg/dL).

• Neurological dysfunction: prolonged unconsciousness (lasting ≥ 12 hours) or coma (including metabolic coma); stroke; uncontrollable fits or status epilepticus; total paralysis.

• Uterine dysfunction: uterine haemorrhage or infection leading to hysterectomy.

Severe maternal complications: • Severe postpartum haemorrhage • Severe pre-eclampsia • Eclampsia • Sepsis or severe systemic infection • Ruptured uterus • Severe complications of abortion.

Critical interventions or intensive care unit use: • Admission to intensive care unit •Interventional radiology • Laparotomy (includes hysterectomy; excludes caesarean section) • Use of blood products [7]. These criteria are based on three main categories: clinical, biological, and intervention criteria.

2.6. Data Collection

Data were extracted from medical records, hospitalization registers, and departmental activity reports. A data collection grid was employed to gather sociodemographic, clinical, and therapeutic information. Variables collected included age, marital status, educational level, obstetric history, primary diagnosis, nature of complication, medical and surgical interventions, and maternal outcomes.

2.7. Data Analysis

Data were entered and analysed using IBM SPSS Statistics version 26 software. Quantitative variables were described using means and standard deviations or medians, depending on their distribution. Qualitative variables were expressed as frequencies and percentages.

2.8. Ethical Considerations

The study received approval from the Institutional Ethics Committee of the Faculty of Medicine and Biomedical Sciences at the University of Yaoundé I. Before beginning recruitment, we obtained the agreement of the various hospital directors. To ensure data confidentiality, records were anonymised, and access to personal information was limited to the research team.

3. Results

Of the 290 files selected for this study, 232 cases of severe maternal morbidity (SMM) were identified.

3.1. Maternal Near-Miss Ratio (MNMR)

The Maternal Near-Miss Ratio (MNMR) was higher in the HCY group, at 68 per 1000 live births, compared to the HGOPY group, which had a ratio of 49.5 per 1000 live births (see Table 1). Resulting in a Maternal Near-Miss Ratio of 58.3 per 1000 live births and a Near-Miss to Maternal Death Ratio of 4:1.

Table 1. Severe maternal morbidity rate in two reference hospitals in Yaoundé.

Variables	HCY[a]	HGOPY[b]	Total
Number of cases of narrow escapes	128	104	232
Number of live births	1880	2100	3980
Maternal mortality rate (100,000 live births)	1702	1238	1457

a = Yaoundé Central Hospital; b = Yaoundé Gyneco-Obstetric and Pediatric Hospital.

3.2. Epidemiological Data

Socio-Demographic Characteristics of the Study Population: The average age of patients experiencing an obstetric near miss was 27.85 years, with a median age of 29 years. The ages ranged from 16 to 39 years. Most near-miss cases involved women aged 30 to 40 years (50.86%), with a majority being single (69.40%), having completed secondary education (59.48%), often working as housewives (46.12%), and predominantly identifying as Christian (78.02%) (See **Table 2**).

Table 2. Sociodemographic characteristics of the near miss (N = 232).

Parameters	Near miss n (%)
Age (years)	
[15 - 19]	37 (15.94)
[20 - 29]	77 (33.20)
[30 - 40]	118 (50.86)
Marital status	
Bachelor	161 (69.40)
Bride	71 (30.60)
Level of study	
Primary	76 (32.76)
Secondary	138 (59.48)
Superior	18 (07.76)
Occupation	
Housewife	107 (46.12)
Shopkeeper	69 (29.74)
Student	50 (21.55)
Pupil	09 (03.88)
Religion	
Muslim	51 (21.98)
Christian	181 (78.02)

3.3. Clinical Features

Among patients experiencing obstetric near misses, complications primarily affected primiparous (first-time mothers) and multiparous (two to four previous births) women, constituting 41.81% and 43.97%, respectively. Most cases occurred in the third trimester of pregnancy (77.15%), and a significant majority received care in a referral context (90.08%). Approximately half of these women (48.28%) had not completed the recommended number of antenatal consultations, which may have contributed to the onset of serious complications. Most admissions took place during pregnancy (37.07%) or labour (39.22%), underscoring the critical nature of these periods for preventing near misses (see Table 3).

Table 3. Distribution of near miss according to their obstetric history.

Parameters	Near misss n (%) (N = 232)
Parity	
P1 = primiparous	97 (41.81)
P2-4 = multiparous	102 (43.97)
P ≥ 5 = grand multiparous	33 (14.22)
AG(SA)	
1T	28 (12.06)
2T	25 (10.77)
3T	179 (77.15)
Number of Consultations Prenatal care (CPN)	
Minus 04	112 (48.28)
Plus 04	120 (51.72)
Admission mode	
Referred	209 (90.08)
No-referred	23 (09.92)
Obstetric timing at entry	
Post-abortion	28 (12.07)
Pregnancy	86 (37.07)
Work	91 (39.22)
Postpartum	27 (11.65)

3.4. Clinical Signs on Admission

The majority of near-miss patients displayed hemodynamic instability (90.52%) and signs of shock (68.10%) upon admission, indicating a critical clinical condition. Al-

tered consciousness was noted in 45.26% of patients, and nearly a third (30.60%) exhibited signs of peritoneal irritation. Additionally, 18.10% experienced convulsions on admission, which may be associated with eclampsia or severe metabolic disorders. Fever was present in a relatively smaller number of cases (25.00%), suggesting that infection was not the predominant factor affecting most patients. Notably, hourly diuresis was only assessed in 35.78% of patients (see Table 4).

Table 4. Distribution of near miss according to clinical signs on admission.

Parameters	Near misses n (%) (N=232)
Altered consciousness	
Yes	105 (45.26)
No	127 (54.74)
Hemodynamic status	
Stable	22 (09.48)
Unstable	210 (90.52)
Signs of shock	
Yes	158 (68.10)
No	74 (31.90)
Seizures on admission	
Yes	42 (18.10)
No	190 (81.90)
Sign of peritoneal irritation	
Yes	71 (30.6)
No	161 (69.40)
Fever	
Yes	58 (25.00)
No	174 (75.00)
Hourly diuresis	
Evaluated	83 (35.78)
Not rated	149 (64.22)

3.5. Diagnosis

Hypertensive disorders (preeclampsia with signs of severity, Hemolysis Elevated Liver Enzymes Low Platelets-HELLP syndrome, and eclampsia) were the leading cause (39.22%) of severe maternal morbidity. These life-threatening conditions are part of WHO near-miss criteria. In addition, first-trimester haemorrhage were

the second most common pathologies observed (19.82%), reflecting the impact of early pregnancy complications, including abortion-related complications (uterine perforation, intestinal lesions) and ectopic pregnancies. Obstetric haemorrhage came in third (18.10%), divided into postpartum haemorrhage, abruptio placentae, placenta previa, and uterine rupture (See Table 5). These are severe conditions that have the potential to progress to life-threatening situations if not appropriately managed and are part of part of WHO near-miss criteria.

Table 5. Distribution according to diagnosis of the Near-miss (N = 232).

Parameters	Near-miss n (%)
HBP and complications	91 (39.22)
1T haemorrhages	46 (19.82)
Obstetric haemorrhage	42 (18.10)

3.6. Biological Tests

In patients who survived serious obstetric complications, biological tests revealed several abnormalities, although they were not completed in all cases. A urine dipstick (UD) test for proteinuria, which is important for diagnosing hypertensive disorders during pregnancy, was performed in only 64.22% of cases.

Anaemia was the most common laboratory abnormality, found in 67.68% of patients. This likely reflects both the frequency of acute blood loss and the often precarious nutritional status of those in high-risk pregnancies. Thrombocytopenia occurred in 25% of cases, possibly related to conditions such as eclampsia or HELLP syndrome. Additionally, leukocytosis was observed in 26.29% of patients, potentially indicating an inflammatory or infectious response.

Regarding liver function, transaminase tests (AST and ALT) were conducted in only 41.38% of patients. Among those tested, 12.93% had levels two to three times higher than normal, suggesting severe liver damage. A similar trend was noted for kidney function assessments, which were absent in more than half of the cases, representing a significant limitation in patient follow-up (See Table 6).

Table 6. Distribution according to biological assays of the Near-miss (N = 232).

Parameters	Near-miss n (%)
Urine test (proteinuria)	
Done	149 (64.22)
Not done	83 (35.78)
Anemia	
Yes	157 (67.68)
No	75 (32.32)

Continued

Thrombocytopenia	
Yes	58 (25.00)
No	174 (75.00)
Hyperleukocytosis	
Yes	61 (26.29)
No	171 (73.71)
Transaminases: ASAT - ALAT	
Normal	66 (28.45)
More than 2 - 3 N	30 (12.93)
Not prescribed	136 (58.62)
Kidney function: Urea – Creatinine	
Normal	52 (22.42)
More than 2 - 3 N	44 (18.96)
Not prescribed	136 (58.62)

3.7. Therapeutic Data

Means of Support: Most patients (94.83%) were admitted to the intensive care unit, reflecting the severity of their conditions. Antibiotics were administered in 90.52% of cases, indicating frequent suspicion or preventive management of infections. Blood transfusions were required for 69.40% of patients, highlighting the high prevalence of haemorrhage or acute anaemia. Conversely, only 40.52% of cases received antihypertensive treatment, suggesting either a lower incidence of hypertensive complications among near misses or delays in initiating treatment (see Table 7).

Table 7. Distribution of near misses according to means of support.

Parameters	Near-miss n (%) (N=232)
Admission to the Intensive Care Unit	
Yes	220 (94.83)
No	12 (05.17)
Antihypertensives	
Yes	94 (40.52)
No	138 (59.48)
Antibiotics	
Yes	210 (90.52)
No	22 (09.48)

Continued

Blood transfusion	
Yes	161 (69.40)
No	71 (30.60)

4. Discussion

4.1. Epidemiological Data

The Maternal Near-Miss Ratio (MNMR) was 58.3 per 1000 live births with a Near-Miss to Maternal Death Ratio of 4:1. These figures are higher than the WHO-recommended threshold of 15 per 1000 for referral facilities [7], confirming the substantial obstetric burden in resource-limited settings like Cameroon. This finding aligns with previous research by Mbachu *et al.* in 2017 [8] and Tura *et al.* in 2018 [9], which also reported elevated MNMR in similar contexts. In addition, a ratio of near miss to maternal death of 4:1 meaning that for every maternal death, four women nearly die, suggests not only a high frequency of severe complications but also a failure of the obstetric care system. This high number of near-misses implies that many women are reaching life-threatening conditions. This may reflect delays in recognizing complications, late arrival to healthcare facilities, inadequate emergency preparedness, or gaps in the quality and timeliness of care. In essence, survival in these cases may depend more on chance than on a consistently effective care system [10] [11].

From a socio-demographic perspective, the women who experienced near-miss were predominantly young (median age: 29 years), single, and without stable paid employment. These characteristics highlight social vulnerabilities related to inadequate access to maternal care [12]. Almost half of the women had not completed the four recommended prenatal consultations. A study by Say *et al.* in 2014 indicated that insufficient prenatal monitoring is a significant predictor of serious obstetric complications [13]. Moreover, over 90% of cases were referred, demonstrating both the existence of an active referral system and the concentration of critical cases in tertiary hospitals, often at later stages of care.

4.2. Clinical Data

The clinical profile of patients upon admission mirrored the severity of their conditions, with 90.52% presenting in a hemodynamically unstable state and 68.10% showing signs of shock. These statistics reflect a tendency for patients to arrive late in the care pathway, frequently after multi-organ failure has begun. These observations align with the WHO's clinical criteria for "maternal near miss," which include signs of shock, altered consciousness, and convulsions [14].

The presence of neurological signs, such as altered consciousness in 45.26% of cases and convulsions in 18.10% indicates a significant number of neurological complications, including potential eclampsia or encephalopathy due to cerebral hypoperfusion. Additionally, signs of peritoneal irritation (30.6%) often point to

obstetric surgical pathologies like uterine rupture or post-abortion peritonitis. These results corroborate findings reported by Oladapo *et al.* in 2005, emphasising that circulatory, neurological, and abdominal failures are the most common in near-miss cases [15]. It is important to note that diuresis was documented in only 35.78% of patients; it is a critical parameter for monitoring renal function and indicating a gap in the initial monitoring of renal function. This finding highlights a persistent weakness in clinical monitoring, a concern already noted in several studies across Africa regarding the quality of obstetric care [16].

According to WHO near-miss criteria, the most frequent diagnoses identified in this study, hypertensive disorders and hemorrhagic complications, can be classified as life-threatening maternal conditions due to their association with organ dysfunction, such as cardiovascular dysfunction (e.g., shock), neurological dysfunction (e.g., eclampsia) and the need for critical interventions [7].

Biological data highlight significant clinical severity in near misses, as well as incomplete follow-up. Anaemia, present in 67.7% of patients, reflects not only acute blood loss related to obstetric haemorrhage, but also a nutritional status that is often fragile in the low-middle-income countries context [17]. This situation is similar to that described by Lancaster *et al.* (2020) in Mozambique, where 54% of patients suffering from postpartum haemorrhage presented with severe anaemia, doubling the risk of death [18].

Thrombocytopenia, found in 25% of patients, is higher than the average prevalence in sub-Saharan Africa (≈10%) [19]. This anomaly, often associated with severe eclampsia or HELLP syndrome, is confirmed by elevated transaminases in 12.9% of patients tested, suggesting severe multiorgan involvement [20].

More than a quarter of patients (26.3%) presented with hyperleukocytosis, which could indicate an inflammatory response related to severe infection or hemorrhagic shock. Although this marker is included in the biological criteria for maternal near-miss, it has been little studied in African settings [21].

Liver and kidney function tests were only possible in 41% of patients, which seriously limits the early detection of organ failure. These gaps observed in biological monitoring are common in African hospital audits, where logistical, material and organisational constraints are often the cause [22].

4.3. Therapeutic Data

The treatment data indicate aggressive and intensive management, with 94.83% of patients admitted to intensive care. This statistic reflects a proper recognition of the severity of the cases. The use of antibiotics in 90.52% of cases underscores the significant role that infections, whether confirmed or suspected, play in patient management. Nearly 70% of patients required blood transfusions, which supports the understanding that obstetric haemorrhages are a leading cause of severe maternal morbidity in sub-Saharan Africa [23] [24].

In contrast, only 40.52% of patients received antihypertensive treatment, a relatively low percentage considering the high prevalence of preeclampsia and ec-

lampsia in this region. This gap suggests a missed opportunity in the prevention of disease progression and life-threatening complications related to preeclampsia. It highlights the need for earlier detection and systematic treatment of hypertensive disorders in pregnancy [25]. Magee *et al.* (2016) emphasise the necessity of early antihypertensive treatment to mitigate the progression to severe forms of hypertensive complications [25].

Despite the availability of intensive care, certain limitations in patient management persist, particularly regarding clinical monitoring. Diuresis was not assessed in 64% of cases. This gap highlights deficiencies in human or material resources necessary for continuous monitoring.

Although the study focused exclusively on maternal near-miss cases, excluding maternal deaths prevented a direct comparison between women who survived severe complications and those who did not. Such a comparative analysis could provide crucial insights into factors associated with survival versus mortality, thereby enriching understanding of preventable deaths and strengthening future quality improvement strategies [4] [6] [22].

This study does have limitations, particularly due to its retrospective nature, which may introduce biases related to the quality and completeness of the data recorded in medical records. The exclusion of incomplete records and the application of WHO criteria, which can be challenging to implement in resource-constrained settings, may have led to an underestimation of the actual number of cases.

5. Conclusion

This study aimed to describe the epidemiological, clinical, and therapeutic characteristics of women who survived severe obstetric complications in Yaoundé. The results indicate that maternal near-miss cases primarily involve young and vulnerable women, who often experience delays in receiving care, gaps in clinical monitoring, and limited access to essential diagnostics. Improving routine practices such as tracking diuresis and ensuring access to laboratory tests could help detect complications earlier and prevent deterioration. Targeted improvements in clinical monitoring, access to diagnostics, and adherence to treatment protocols are urgently needed to enhance maternal outcomes and reduce preventable complications. These findings highlight the burden of severe maternal complications and the need to strengthen prompt management of life-threatening conditions within Yaounde hospitals. Additionally, analysing near-miss cases should be incorporated into quality-of-care audits to guide strategies for reducing preventable maternal mortality. Thus, the near-miss approach emerges as a vital tool for improving maternal healthcare quality in resource-limited settings.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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