Scientific Research Publishing

Open Journal of Obstetrics and Gynecology, 2025, 15(1), 118-137
https://www.scirp.org/journal/ojog
ISSN Online: 2160-8806
ISSN Print: 2160-8792

What Emerges from the Analysis of Maternal Deaths at the Gyneco-Obstetric and Paediatric Hospital in Yaoundé?

Pascale Mpono Emenguele[1,2*], Nelssa Kuete Fouomekong[1], Junie Annick Metogo Ntsama[1,2], Vanina Ngono Akam[1,2], Christiane Nsahlai[1], Isidore Tompeen[1,3], Serge Nyada[1,2], Véronique Mboua Batoum[1], Wilfried Loïc Tatsipie[1], Xavier Junior Ayissi Ngono[1], Esther Ngo Um Meka[1,3]

[1]Department of Obstetrics and Gynecology, Faculty of Medicine and Biomedical Sciences, University of Yaoundé 1, Yaoundé, Cameroon
[2]Department of Obstetrics and Gynecology, CHRACERH, Yaoundé, Cameroon
[3]Department of Obstetrics and Gynecology, Yaoundé Gynaecological and Paediatric Hospital, Yaoundé, Cameroon
Email: *mponopassy@yahoo.fr

How to cite this paper: Emenguele, P.M., Fouomekong, N.K., Ntsama, J.A.M., Akam, V.N., Nsahlai, C., Tompeen, I., Nyada, S., Batoum, V.M., Tatsipie, W.L., Ngono, X.J.A. and Meka, E.N.U. (2025) What Emerges from the Analysis of Maternal Deaths at the Gyneco-Obstetric and Paediatric Hospital in Yaoundé? *Open Journal of Obstetrics and Gynecology*, **15**, 118-137.
https://doi.org/10.4236/ojog.2025.151012

Received: December 1, 2024
Accepted: January 24, 2025
Published: January 27, 2025

Abstract

Background: Maternal mortality remains a major public health problem worldwide. **Objectives:** Our study aims to present the results of an analysis of reviews of maternal deaths at HGOPY. **Methodology:** This was a descriptive cross-sectional study with retrospective data collection from archived records and reviewed maternal death reports. Our study lasted 8 months, from October 1, 2023 to May 31, 2024. The study covered maternal death files at the HGOPY over an 8-year period, from 1st of January 2016 to the 31st of December 2023. Data were processed and analyzed using Statitical Paquage for Social Science (SPSS) version 26.0. **Results:** We counted a total of 160 maternal deaths, of which 97 had been reviewed. We excluded 61 deceased women reviewed and retained 33. We recorded a cumulative total of 160 maternal deaths and 19,651 live births. The peak in the proportion of maternal deaths at the Yaoundé Gynaeco-Obstetric and Paediatric Hospital was in 2021, with a proportion of 0.013. No maternal deaths had been reviewed between 2016 to 2017. Most deaths (64%) occurred between 37 and 40 weeks. The majority (30.5%) were aged between 30 and 35. The data show that 80.6% of maternal deaths were due to direct obstetric causes, while 19.4% were due to indirect causes. Most deaths (69.4%) were preventable. Only 8.3% were not preventable. **Conclusion:** Concerted efforts must be made to adapt maternal death prevention and management strategies to local contexts in order to significantly reduce these alarming figures.

Keywords

Maternal Mortality, Proportion, Review, Cause, Etiology

1. Introduction

Background

Maternal mortality remains a major public health problem worldwide. In 2020, almost 800 women a day died from preventable causes related to pregnancy and childbirth; almost 95% of maternal deaths occurred in low- and middle-income countries [1]. This reflects not only the state of healthcare systems, but also social and economic inequalities within populations. In Cameroon, despite the various strategies adopted in the fight against maternal mortality, namely: the introduction of the health voucher [2], the development of norms and standards in reproductive health [3], nationwide training in essential and emergency obstetric and neonatal care, the purchase of deliveries from matrons ... The maternal mortality ratio was 406 deaths per 100,000 live births in 2018 according to the Demographic and Health Survey (DHS) [4]. This ratio seems far from achieving Sustainable Development Goal 3.1, which is to bring the global maternal mortality ratio below 70 per 100,000 live births by 2030 [5]. Surveillance of Maternal and Child Deaths is another strategy adopted by Cameroon's Ministry of Public Health. Since the creation of the SDMR committee and the introduction of maternal death review at the Yaoundé Gyneco-Obstetric and Paediatric Hospital (HGOPY) in 2009, no formal evaluation of results has been carried out. This lack of up-to-date data on maternal deaths limits our understanding of the real impact of these initiatives. Our study therefore aims to present the results of an analysis of reviews of maternal deaths at HGOPY.

2. Material and Methods

2.1. Study Design

This was a descriptive cross-sectional study with retrospective data collection from archived records and reviewed maternal death reports.

2.2. Study Period

Our study lasted 8 months, from October 1, 2023 to May 31, 2024. The study covered maternal death files at the HGOPY over an 8-year period, from 1st of January 2016 to the 31st of December 2023.

2.3. Study Setting

Our study was carried out in the Gynaecology/Obstetrics Department of the Yaoundé Gynaecological-Obstetric and Paediatric Hospital, a first-class reference hospital in Cameroon's healthcare pyramid. It performs an average of 3000

deliveries a year, and organizes at least one review of maternal deaths every three months. This health facility is located at the Ngousso neighbourhood of Yaoundé, capital city of Cameroon.

2.4. Study Population

- Source population: All records of women of childbearing age whose pregnancies were managed at the HGOPY during the study period.
- Target population: All records of women who died at the HGOPY during pregnancy or within 42 days of pregnancy termination and whose records were reviewed.
- Inclusion criteria:
- All women's files.
- Died during pregnancy, childbirth or within 42 days of termination of pregnancy.
- Died with records reviewed.
- Deaths for which a review report was available.
- Non-inclusion criteria:
- Records of women who died outside pregnancy and 42 days following termination of pregnancy.

2.5. Study Procedure

After obtaining ethical clearance and research authorization from the HGOPY administration, we began collecting study data. We began by consulting the delivery and maternal death registers at the maternity hospital to identify maternal deaths during our study period at the HGOPY We then retrieved maternal death records from the archives. We then collected the review reports from the HGOPY Maternal Death Surveillance Committee. We collected data from all records of women who died during pregnancy, delivery or during the 42 days following termination of pregnancy, whose records were reviewed and the minutes of these reviews were available. Information was collected using a pre-established questionnaire (appendix 1), with 40 questions divided into 8 sections, covering:

- Section I: patient identification (09 questions);
- Section II: pre-admission pathway (05 questions);
- Section III: admission (02 questions);
- Section IV: diagnosis (05 questions);
- Section V: quality of care (09 questions);
- Section VI: cause of maternal death by team (03 questions);
- Section VII: cause of maternal death according to review (05 questions);
- Section VIII: death audited (02 questions).

Questionnaire was tested on three maternal deaths and validated before administration to our sample.

2.6. Statistics

The information gathered during the survey was used to create our database,

which was encrypted and encoded using Census and Survey Processing System (CS Pro) software version 7.6.1. These data were then processed and analyzed using Statitical Paquage for Social Science (SPSS) version 26.0. Results were presented in tables and figures using Microsoft Excel and Word 2016.

Categorical variables were expressed as headcount and frequency, and quantitative variables as mean (±standard deviation) or median (interquartile range) according to distribution. The variables of interest were:

- Socio-demographic characteristics: age of parturient, occupation, marital status, region of origin, religion, level of education, place of residence, referring facility, transport conditions, reason for referral.
- Clinical and obstetrical variables: gestational age, year of death, month of death, gestational formula, gestational age, clinical diagnosis.
- Etiologies: direct cause, indirect cause, delay, avoidability.
- Management variables: Management performed, concept of delivery, mode of delivery, time of death, management provider, quality of management and time of death.

3. Results

3.1. Sample Size

We counted a total of 160 maternal deaths, of which 97 had been reviewed. We excluded 61 deceased women, respectively 33 with unavailable review reports and 28 with unavailable or incomplete records as described in Figure 1:

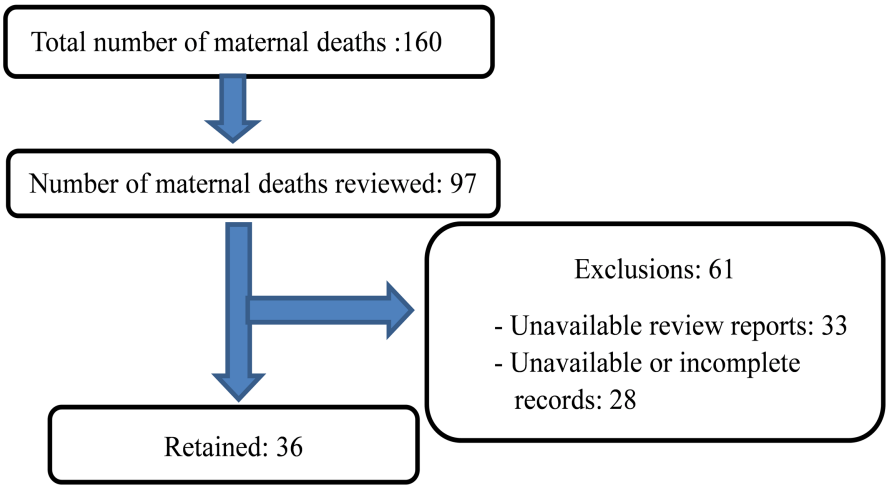

Figure 1. Sample size recruitment diagram.

3.2. Proportion of Maternal Deaths by Year

Over the observation period, we recorded a cumulative total of 160 maternal deaths and 19,651 live births. The peak in the proportion of maternal deaths at the Yaoundé Gynaeco-Obstetric and Paediatric Hospital was in 2021, with a proportion of 0.013 (Table 1).

Table 1. Proportion of maternal mortality as a function of the number of live births per year at the Yaoundé Gynaeco-Obstetric and Paediatric Hospital from 2016 to 2023.

Year	Number of live births	Number of maternal deaths	Proportion of maternal mortality
2016	3062	17	0.0055
2017	2642	12	0.0045
2018	2781	24	0.0086
2019	2774	19	0.0068
2020	2169	15	0.0069
2021	2236	29	0.013
2022	2107	25	0.012
2023	1880	19	0.010

3.3. Proportion of Maternal Deaths Reviewed

3.3.1. Presentation of Maternal Deaths and Maternal Deaths Reviewed by Year

In our series, no maternal deaths had been reviewed between 2016 to 2017. By 2021, all deaths had been reviewed (**Figure 2**).

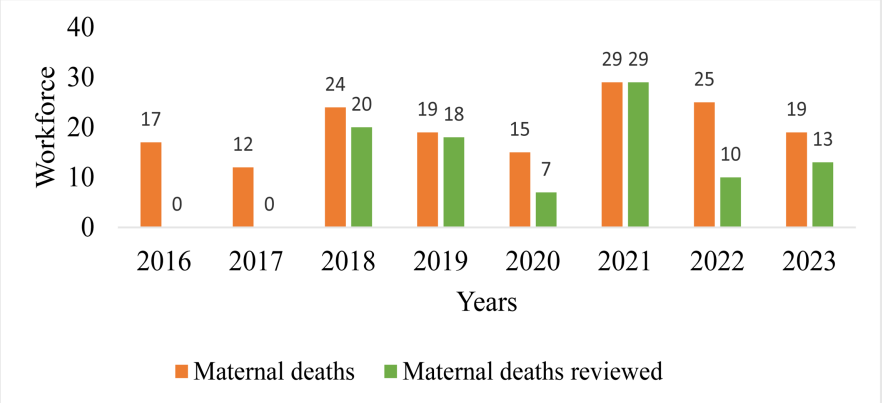

Figure 2. Presentation of maternal deaths and maternal deaths reviewed by year at HGOPY.

3.3.2. Review Rate of Maternal Deaths by Year

Of a total of 160 maternal deaths recorded over the entire study period, 97 (60.6%) were reviewed, the distribution of which by year of observation is shown in the figure above (**Figure 3**).

3.3.3. Maternal Deaths Reviewed with Available Reports

A comparison was made between the number of maternal deaths, maternal deaths reviewed, maternal deaths reviewed and reports available. The year 2021 was the year in which there were as many maternal deaths (29 cases) as maternal deaths reviewed (29 cases) and fewer reports available (9 cases) (**Figure 4**).

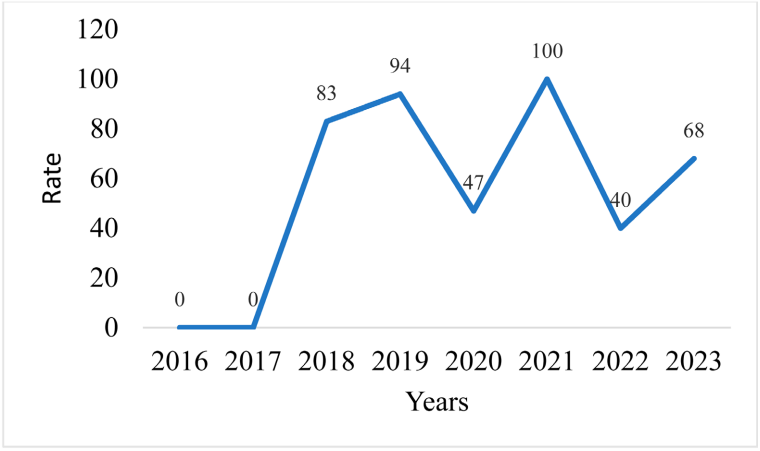

Figure 3. Review rate of maternal deaths by year from 2016 to 2023 at HGOPY.

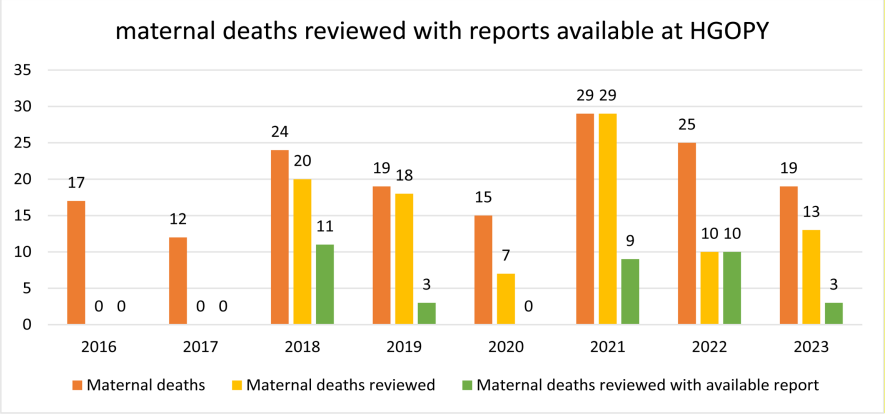

Figure 4. Maternal deaths reviewed with reports available at HGOPY.

3.4. Etiologies of Maternal Deaths Reviewed

3.4.1. Socio-Demographic Data for Maternal Deaths Reviewed

In our series, we found 36 cases of maternal death with review reports and records available (N = 36). The mean age at death was 29.67 ± 6.78 years, with a minimum of 16 years and a maximum of 44 years. The majority (30.5%) were aged between 30 and 35. Almost half of the deceased mothers (47.2%) were single, and half (50%) had at least secondary education (Table 2).

Table 2. Table type styles (Table caption is indispensable).

Variables	Number (N = 36)	Frequency (%)
Age range (years)		
[15 - 20]	2	5.6
[20 - 25]	7	19.4
[25 - 30]	6	16.7
[30 - 35]	11	30.5

Continued

[35 - 40]	**9**	**25**
≥40	1	2.8
Civil status		
Single	17	47.2
Married	13	36.1
Concubinage	5	13.9
Not documented	1	2.8
Education level		
Primary	6	16.7
Secondary	18	50
Higher level	5	13.9
Not documented	7	19.4

3.4.2. Clinical Data: Obstetrical Parameters

Mean gestational age was 28.4 ± 12.4 weeks' amenorrhea, with a minimum of 8 SA + 01 days and a maximum of 40 SA + 05 days.

Most deaths (64%) occurred between 37 and 40 weeks.

Gestational status varied considerably. A total of 41.7% of women had been pregnant five or more times, while 36.1% had been pregnant three to four times, and 22.2% two times or less.

In terms of parity, most women (55.5%) had completed 2 or 4 full-term deliveries. The median parity was 2 deliveries [1 - 4] with a minimum of 0 and a maximum of 6. The data show that 94% of women had not experienced an abortion and 9% a premature delivery (Table 3).

Table 3. Distribution of maternal deaths by gestational age and pregnancy formula.

Variables	Number (N = 36)	Frequency (%)
Gestational age (weeks)		
[8 - 14[	1	3
[14 - 22[	2	5.5
[22 - 28[	0	0
[28 - 34[	1	3
[34 - 37[	2	5,5
[37 - 40[	23	64
≥ 40	7	19

Continued

Pregnancies		
≤2	8	22.2
3 - 4	13	36.1
≥5	15	41.7
Parity		
0	4	11.1
1	7	19.4
2 - 4	20	55.5
≥5	5	14
Premature birth (n = 33)		
No	30	91
Yes	3	9
Abortions		
No	34	94
Yes	2	6

3.4.3. Pathway to Admission

Of 36 cases, 72.2% were referred by other institutions, while 27.8% were not. Of those referred, 61.5% came from a health center, 26.9% from a district hospital and 11.5% from a referral hospital. The majority (57.7%) arrived by cab, 15.4% by ambulance, with the remainder using personal vehicles or other means (Table 4).

Table 4. Factors related to patient referral and arrival.

Variables	Number (N = 36)	Frequency (%)
Reference		
Yes	26	72.2
No	10	27.8
Referral structure (n = 26)		
CDS	16	61.5
HD	7	26.9
Reference hospital	3	11.5
Means of transport (n = 26)		
Cab	15	57.7
Ambulance	4	15.4

Continued

Personal vehicle	4	15.4
Motorcycle	3	11.5

3.4.4. Reason for Referral

Reasons for referral resulted from fetal and maternal conditions. Fetal complications were observed in 5.5% of cases, all of which were intrauterine fetal deaths (IUFD). Early pregnancy complications included ectopic pregnancy (2.8%), incomplete abortion (2.8%) and severe post-abortal anemia (2.8%). Late pregnancy complications were mainly pre-eclampsia (16.7%) and eclampsia (13.9%). Labor and postpartum complications included postpartum hemorrhage (13.9%), scar uterus problems (5.5%), active labor (2.8%) and uterine rupture (2.8%). Medical complications were dominated by pulmonary pathologies (8.3%) and DIC (8.3%) (Table 5).

Table 5. Distribution of maternal deaths reviewed by reason for referral.

Variables	Number (N = 36)	Frequency (%)
Fetal complications (n = 2)		
IUFD	2	5.5
1st trimester maternal complications (n = 3)		
Extrauterine pregnancy	1	2.8
Incomplete abortion	1	2.8
Severe postabortion anemia	1	2.8
3rd trimester maternal complications (n = 12)		
Severe preeclampsia	6	16.7
Eclampsia	5	13.9
Placenta praevia/HRP	1	2.8
Labor and postpartum (n = 9)		
Postpartum hemorrhage	5	13.9
Scarred uterus	2	5.5
Active labour	1	2.8
Uterine rupture	1	2.8
Medical complications (n = 10)		
Pulmonary (embolism, COVID19)	3	8.3
DIC	3	8.3
Malaria in pregnancy	2	5.5
PID	1	2.8
Encephalopathy	1	2.8

3.4.5. On Admission

- Staff who cared for the patient on admission

The doctor currently specializing in obstetrics and gynecology was the primary caregiver for the majority of patients on admission (77.8%) (Table 6).

Table 6. Staff who cared for the patient on admission.

Primary care staff	Number (N = 36)	Frequencies (%)
Doctor in training	28	77.8
Obstetrician	4	11.1
General practitioner	3	8.3
Medical student	1	2.8

The most common signs on admission were per vaginal bleeding (28%), elevated blood pressure (17%), pelvic pain (17%) and altered consciousness (14%), as described above (Figure 5).

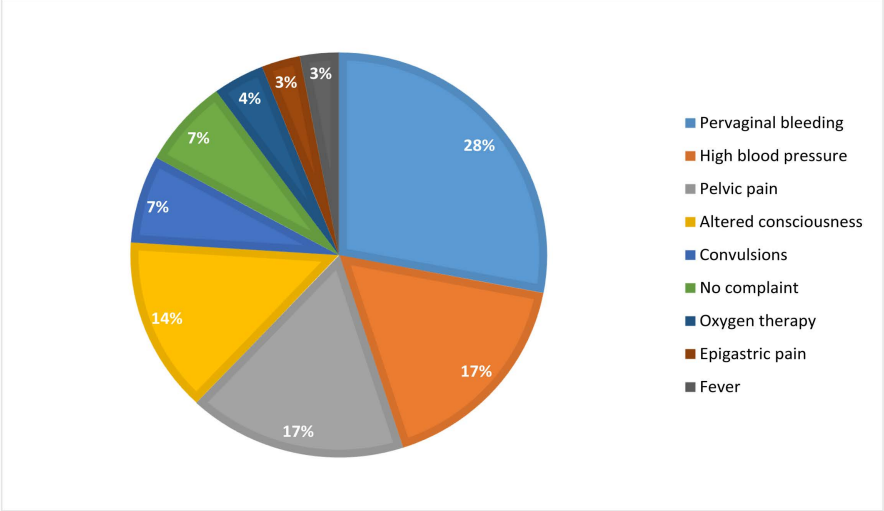

Figure 5. Reason for admission.

3.4.6. Quality of Conditioning and Follow-Up

Most cases (86%) were correctly conditioned, with complications present in 63.9% of cases on admission. Complications were inadequately managed in 13% of cases. Almost all cases (97.2%) had clear daily written follow-up (Table 7).

3.4.7. Quality of Care

The majority of maternal deaths occurred after delivery (72.2%), and fewer during pregnancy (16.7%) and after abortion (5.5%). Regarding delivery, the high route was the most common (51.5%) and the low route 48.5%. The AMTSL protocol was followed in 27.3% of cases, but not documented in most (63.6%). As for newborns, 42.4% were live births, while intrapartum and neonatal deaths accounted for 27.2% and 18.2% respectively (Table 8).

Table 7. Quality of conditioning and patient follow-up at HGOPY.

Variable	Number (N = 36)	Frequencies (%)
Conditioning		
Suitable	31	86
Inadequate	5	14
Complication on admission		
Yes	23	63.9
No	13	36.1
Complication management (n = 23)		
Suitable	20	87
Inadequate	3	13
Clear, daily written follow-up		
Yes	35	97.2
No	1	2.8

Table 8. Distribution of maternal and neonatal outcomes by time of occurrence.

Variable	Number (N = 36)	Frequencies (%)
Time of maternal death		
During pregnancy	6	16.7
During childbirth	2	5.6
Post-partum	26	72.2
Post-abortum	2	5.5
Mode of delivery (n = 33)		
Vaginal delivery	16	48.5
Caesarean section	17	51.5
GATPA (n = 33)		
Done	9	27.3
Not done	3	9.1
Not documented	21	63.6
Condition of new-born at delivery (n = 33)		
Live birth	14	42.4
Intrapartum death	9	27.2
Neonatal death	6	18.2
Not specified	4	12.1

3.4.8. Cause of Maternal Death

1) Direct causes

- According to the medical team, review and avoidability of maternal deaths

The data show that 80.6% of maternal deaths were due to direct obstetric causes, while 19.4% were due to indirect causes. Most deaths (69.4%) were preventable. Only 8.3% were not preventable. For 22.2% of cases, avoidability was not established (Table 9).

Table 9. Causes of maternal deaths by medical team, review and avoidability of maternal deaths at HGOPY from 2016 to 2023.

Variables	Number (N = 36)	Frequencies (%)
Cause according to medical team		
Direct obstetrical	29	80.6
Indirect obstetrical	7	19.4
According to review		
Direct obstetrical	29	80.6
Indirect obstetrical	7	19.4
Avoidability		
Avoidable	25	69.4
Not avoidable	3	8.3
Not established	8	22.2

- According to the medical team and the review

The direct causes of maternal death identified by the medical team and the review were compared. Haemorrhage is the main cause in both assessments, albeit at different frequencies (55.2% vs. 48.3%). Hypertensive diseases in pregnancy are more frequently identified in the review (41.3% vs. 31%). Infections are less frequent in the review (10.3% vs. 6.9%) (Figure 6).

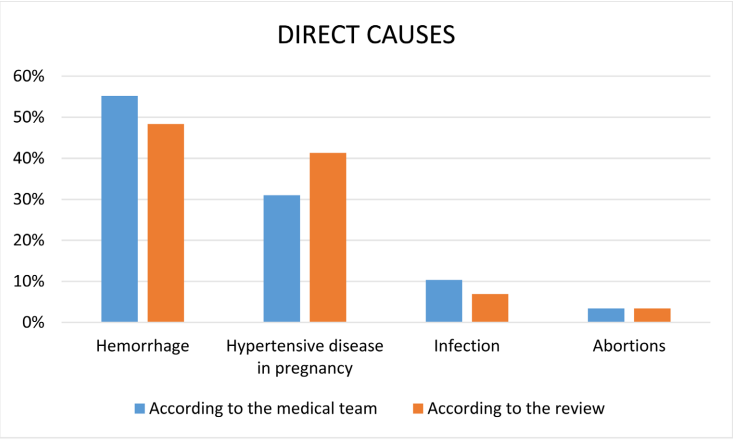

Figure 6. Direct causes of maternal death according to the medical team and the review.

2) Indirect causes

Reactions to HIV/AIDS (14.3%), pneumonia (42.8%) and transfusions (14.3%) were identified by both the medical team and the review. Malaria was identified only by the medical team (14.3% vs. 0%), while anemia was more frequently identified by the review (28.6% vs. 14.3%) (Figure 7).

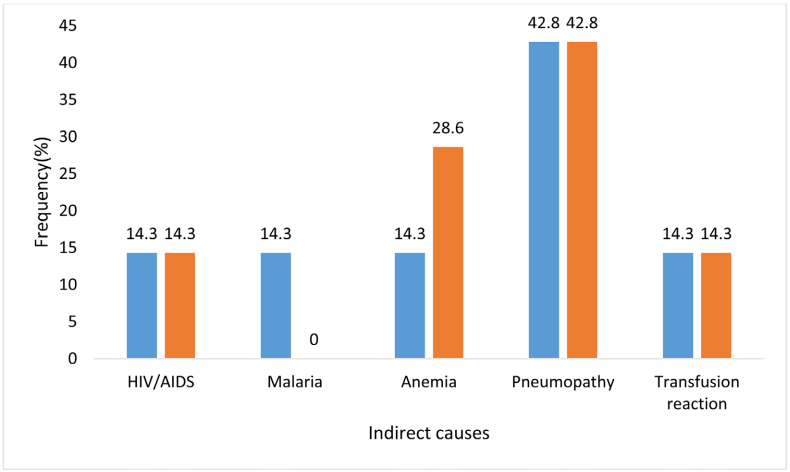

Figure 7. Indirect causes of maternal death according to medical team and review.

3.4.9. Causes of Maternal Death According to Delay in HGOPY

The figure reveals three key problems in maternal mortality: delay in receiving care (64%), delay in decision-making (22%) and delay in access to health services (14%) (Figure 8).

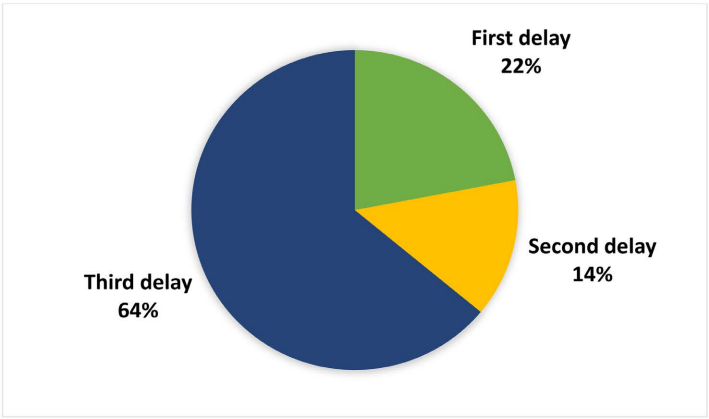

Figure 8. Causes of maternal death by delay to HGOPY.

4. Discussion

Over an 8-year period, from 2016 to 2023, the Yaoundé Gyneco-Obstetric and Paediatric Hospital (YGOPH) recorded 160 cases of maternal death, with a peak in the proportion of maternal deaths recorded in 2021. It should be noted that corona virus disease entered Cameroon in 2020. It was an unknown pathology that scared the population and the medical profession for a long time. Patients

were reluctant to go to health facilities for prenatal consultations and even childbirth, for fear of being contaminated. This could explain their late arrival at the maternity ward of the Yaoundé Gyneco-Obstetric and Paediatric Hospital in 2021. The first maternal death reviews at the YGOPH took place in 2018; however, in 2016 and 2017, cases of maternal death had already been notified. This late start to maternal death reviews may be due to the fact that they were not yet part of the mandatory package of activities for health facilities. It was on December 04, 2017 that the Ministry of Public Health signed the regulatory framework for the Maternal and Perinatal Death Surveillance and Response (MPDSR) specifying the general provisions, the organization and operation of the MPDSR and the miscellaneous and final provisions. Although the maternal death review rate in 2021 is 100%, the overall maternal death review rate is 60.6%. This lower result than that of N'DAOU, who found 67% [7], can be justified by the fact that the review of maternal deaths began 2 years after the start of reporting (i.e. 17 maternal deaths in 2016 and 12 maternal deaths in 2017). With regard to maternal death review reports, the results show a low rate, or even an absence, of availability of said reports. It should be remembered that during a review committee, several deaths are reviewed and a single report is written. But the summary of each case reviewed must be available. As the Yaoundé Gyneco-Obstetric and Paediatric Hospital is a health facility attended by students from several medical faculties, they are sometimes assigned certain tasks, such as writing review reports, but fail to carry them out. The 30 - 35 age group was the most represented at 30.5%. This percentage is higher than that of THIAM, who found 24.7% in the 30 - 34 age bracket [8], and differs from that of KAMGA, who found 33.1% of maternal deaths in the 20 - 24 age bracket [9]. This difference may be explained by the fact that the KAMGA study population included maternal deaths due to abortion and ectopic pregnancy. These two entities share the risk factor of young age. 50% of the women in our study had at least secondary education. DIASSANA and LHAGADANG found a majority of maternal deaths among women with no schooling (98.8% and 67% respectively) [10] [11]. This may be explained by the fact that our study was carried out in an urban setting, in Yaoundé (the capital of Cameroon), where the school enrolment rate is high. Most deaths occurred in multiparous women who were referred. The fact of having given birth several times might suggest that you can take care of yourself during pregnancy. Multiparous women may neglect prenatal consultations and wait for the last uterine contractions before going to hospital. Yet they are most at risk of malpresentation and post-partum haemorrhage due to uterine atony. YGOPH is a first-class, central-level hospital in the health pyramid. It is therefore a referral hospital for obstetric complications. We reported that 57.7% of women who died were transported in non-medical vehicles (cabs). In contrast, SISSOKO found that 50% of deceased mothers were transported in ambulances [12]. This could be explained by the fact that the reference health centers in Cameroon do not have ambulances, and that Yaoundé has only one Emergency Medical Service, which implies the payment of an additional sum

for patient transport (a sum that is often not available to the sick attendants). In our series, 77.8% of women admitted had been seen by a specialist doctor, unlike MALLE who found that 59.52% of women had been seen by obstetricians and midwives [13]. Yaoundé Gyneco-Obstetric and Paediatric Hospital is a university hospital, which permanently welcomes doctors undergoing specialization for their training. The existence of management protocols and the competence of doctors undergoing specialization are probably the factors favoring good patient conditioning on admission, contrary to the results of BERTHE [14]. The majority of women (72.2%) in our study died in the postpartum period. FOUMANE in 2015, in the same hospital, found 32.8% [15]. ALKASSOUN in Niger in 2018, found 70.1% of deaths in the postpartum period [16]. The predominance of maternal deaths during the postpartum period could be linked to the quality of the women in our series, who were multiparous and at risk of postpartum hemorrhage, which is the leading cause of maternal mortality in Cameroon. Direct obstetric causes were by far the most frequent, at 80.6%. As found by KANTA (78%) in 2013 [17]. Postpartum hemorrhage was the most frequent cause of death with 48.3%, followed by hypertension and its complications with 41.3%, and infection with 6.9%. Abortion was a cause of maternal death in only 3.4% of cases. Our results differ from those of FOUMANE, who in 2010 found hypertension to be the leading cause of maternal mortality [15]. Since 2010, YGOPH has been considered a reference center for the management of hypertensive pathology in pregnancy, which is why post-partum hemorrhage ranks first. This is probably due to a lack of awareness of the danger signs and a failure to anticipate the need for blood derivatives. Pneumopathies were the leading indirect obstetric cause, accounting for 42.8%. The advent of the coronavirus pathology in 2021, which is a pneumopathy, should be noted. Most deaths were preventable according to available summary reports, i.e. 69.4%. Our result is higher than those of DIASSANA and BERTHE who found in their study mostly preventable maternal deaths with respectively 39% and 31.71%, and lower than that of LHAGADANG who found a percentage of 84.8%. This percentage can be explained by the fact that the majority of patients came from health centers and arrived at the Yaoundé Gyneco-Obstetric and Paediatric Hospital with serious complications. The factor contributing most to maternal death was delay in the administration of care, at 64%, followed by delay in the decision to seek treatment, at 22%, and finally delay in access to the health service, at 14%. This can be explained by the lack of essential medicines, the lack of blood derivatives, the lack of staff and the low level of staff retraining in the infrastructures.

5. Conclusion

The study of maternal deaths at the Yaoundé Gyneco-Obstetric and Paediatric Hospital showed that the surveillance of maternal deaths and response is effective in this health facility. Several challenges remain for the management of the 3 delays, mainly that of the intra-hospital management of pregnant women, in labor

or in the aftermath of childbirth. It has been established that 69.3% of maternal deaths at the Yaoundé Gyneco-Obstetric and Paediatric Hospital between 2016 and 2023 were avoidable. Hence the need to put the emphasis on implementing the recommendations made during the death reviews in order to make the response effective.

Author Contributions

All authors were involved in developing the manuscript, and PME conceptualized and validated the manuscript, PME, JAMN and NKF drafted the first version of this manuscript, PME, JAMN and NKF collected the data, WLT and XJAN did the statistical analysis. All authors have contributed to writing and revising the manuscript.

Acknowledgements

The authors would like to thank the administrative staff and all the staff at HGOPY, especially those in the archives, who helped us throughout the study. The authors also declare that they received no funding to carry out this study.

Conflicts of Interest

The authors declare no competing interests.

References

[1] World Health Organisation (2024) Maternal Mortality. https://www.who.int/fr/news-room/fact-sheets/detail/maternal-mortality

[2] Audibert, M. (2024) Le chèque santé: Une voie pour la réduction de la mortalité maternelle et néonatale au Cameroun? CNRS Sciences Humaines & Sociales. https://www.inshs.cnrs.fr/fr/cnrsinfo/le-cheque-sante-une-voie-pour-la-reduction-de-la-mortalite-maternelle-et-neonatale-au

[3] MINSANTE (2024) Normes et standard. https://www.minsante.cm/site/sites/default/files/Normes%20et%20standard%20SR_Final.pdf

[4] Ministère de la Santé Publique, Institut National de la Statistique. Enquête Démographique et de Santé. https://www.minsante.cm/site/sites/default/files/Enqu%C3%AAte%20D%C3%A9mographique%20de%20Sant%C3%A9%20-V_%202018_0.pdf

[5] (2024) Sustainable Development Goal 3: Bonne santé et bien-être. Les Nations Unies au Cameroun. https://cameroon.un.org/fr/sdgs/3

[6] Ndiaye, M.L. (2021) Mortalité maternelle dans les maternités chirurgicales de Ziguinchor: A propos de 90 cas. *JOURNAL DE LA SAGO* (*Gynécologie - Obstétrique Et Santé De La Reproduction*), **21**. https://jsago.org/index.php/jsago/article/view/65

[7] N'daou, K. (2018) Audit des décès maternels à l'hôpital Fousseyni Daou de Kayes. https://www.bibliosante.ml/handle/123456789/1966

[8] Thiam, M. (2017) Mortalite Maternelle au Centre Hospitalier Regional de Thies: Etiologies et Facteurs Determinants, a Propos de 239 Deces. *Journal de la Sago* (*Gynécologie - Obstétrique et Santé de la Reproduction*), **18**, 34-39.

http://www.jsago.org/index.php/jsago/article/view/3

[9] Kamga, D.V.T., Nana, P.N., Fouelifack, F.Y. and Fouedjio, J.H. (2017) Contribution des avortements et des grossesses extra-utérines dans la mortalité maternelle dans trois hôpitaux universitaires de Yaoundé. *Pan African Medical Journal*, **27**, Article 248. https://doi.org/10.11604/pamj.2017.27.248.12942

[10] Diassana, M., Dembele, S., Macalou, B., Ndaou, K., Sidibe, A., Bocoum, A., *et al*. (2020) Audits de Décès Maternels dans un Hôpital Régional du Mali (Kayes), Place des 3 Retards et Impact sur le Service de Gynécologie-Obstétrique. *Health Sciences and Disease*, **21**, page. https://www.hsd-fmsb.org/index.php/hsd/article/view/2337

[11] Lhagadang, F. (2018) Revue des deces maternels dans trois hopitaux regionaux et a l'hopital de la mere et de l'enfant de n'djamena au tchad. *Journal de la Sago* (*Gynécologie - Obstétrique et Santé de la Reproduction*), 19, 30-35. http://jsago.org/index.php/jsago/article/view/44

[12] Sissoko, A. (2020) Etude de la mortalité maternelle dans le district de Bamako/Mali. Master's Thesis, Université des Sciences, des Techniques et des Technologies de Bamako. https://www.bibliosante.ml/handle/123456789/4046

[13] Malle, C.K. (2008) L'audit des décès maternels au Centre de Santé de Référence de la Commune V du District de Bamako (à propos de 42 cas). Master's Thesis, Université de Bamako. https://www.bibliosante.ml/handle/123456789/8461

[14] Berthé, M., Diallo, A.T., Kokaina, C., Traoré, T., Soumaré, M.D., Berthé, O., *et al*. (2021) [Study of Factors Associated with Maternal Mortality by the Audit Method in the Segou Region]. *Mali Medical*, **36**, 54-58.

[15] Foumane, P., Dohbit, J.S., Meka, E.N.U., Nkada, M.N., Minkande, J.Z. and Mboudou, E.T. (2015) Etiologies de la mortalité maternelle à l'Hôpital Gynéco-Obstétrique et Pédiatrique de Yaoundé: une série de 58 décès. *Health Sciences and Disease*, **16**, 5 p. http://www.hsd-fmsb.org/index.php/hsd/article/view/483

[16] Alkassoum, I., Djibo, I., Hama, Y., Abdoulwahabou, A.M. and Amadou, O. (2018) Risk Factors for In-Hospital Maternal Mortality in the Region of Maradi, Niger (2008-2010): A Retrospective Study of 7 Regional Maternity Units. *Médecine et Santé Tropicales*, **28**, 86-91. https://doi.org/10.1684/mst.2018.0770

[17] Kanta, A. (2016) Audits des décès maternels au Centre de Santé de Référence de Ké-Macina sur cinq années (2009-2013). Master's Thesis, Université des Sciences, des Techniques et des Technologies de Bamako. https://www.bibliosante.ml/handle/123456789/5286

Appendix: Data Collection Sheet

Results of maternal death reviews at the Yaoundé Gynaeco-Obstetric and Paediatric Hospital

Year of death:……. Month of death:…….

N°	Question	Response mode	code
		Section I: PATIENT IDENTIFICATION	
1	Age (years)		/...../
2	Region of origin	1-West; 2-Center; 3-Littoral; 4-North; 5-Other(specify)…….	/……/
3	Profession	1-housewife; 2-Civil servant; 3-Businesswoman; 4-student; 5-Other (specify)……	/…..../
4	Place of residence	1-Rural; 2-Urbain	/…..../
5	Religion	1-Catholic; 2-Protestant; 3-Muslim; 4-Other(specify)……	/……/
6	Marital status	1-Single; 2-Married; 3-Divorced; 4-Widowed; 5-Other(specify)…….	/……./
7	Education level	1-No schooling; 2-Primary; 3-Secondary; 4 = Tertiary	/……/
8	Gestational age	/……../SA/……/J	
9	Pregnancy formula	Gestity…; Parity….. Number of abortions …….. Number of premature deliveries ……. Number of live births …….	
		Section II: PRE-ADMISSION PATHWAY	
10	Arrival time		/……/
11	Referred patient	1 = Yes; 2 = No	/……/
12	If yes, referring structure	1 = CMA; 2 = HD; 3 = CDS; 4 = Referral hospital; 5 = Category 3 hospital; 6 = Not documented	/……/
13	If yes, transport conditions	1-Ambulance; 2-Taxi; 3-Personal vehicle; 4-Other(specify)……	/……/
14	If yes, reference reason	1-Convulsion; 2-Severe anemia; 3-Per vaginal bleeding; 4-PRM; 5-Breech presentation; 6-No reason; 7-Pregnant hypertension; 8-Scarred uterus; 9-Vaso-occlusive crisis; 10-Gemellar pregnancy; 11-Other (specify)……	/……/
		Section III: ADMISSION	
15	Home by whom	1-Obstetrician; 2-Resident; 3-Students; 4-Midwife; 5-Nurse; 6-Caregiver; 7-Other (specify)…….	/……/
16	Reason for admission of non-referred patient	1-PRM; 2-Convulsion; 3-Per vaginal bleeding; 4-Pregnant hypertension; 5-Anemia; 6-Lumbopelviagia; 7-Other(specify)……	/……/

Continued

		Section IV: DIAGNOSIS	
17	Diagnostic de travail à entrée	1-Rupture extra-uterine pregnancy; 2-Uterine rupture; 3-Placenta previa; 4-HRP; 5-CIVD; 6-Stroke; 7-Post partum hemorrhage; 8-Hypovolemic shock; 9-Severe Pre-Eclampsia; 10-OAP; 11-Septic shock; 12-HRP; 13-Eclampsia; 14-Septic abortion; 15-Peritonitis; 16-Post-operative peritonitis; 17-PRM with poor bishop score; 18-Malaria in pregnancy; 19-Severe anemia; 20-IUFD; 21-Encephalopathy; 22-OAP; 23-Uterine perforation post abortum; 24-Other (specify)……	/……/
18	Proper conditioning	1 = Yes 2 = No	/……/
19	Complication at intake	1 = Yes 2 = No	/……/
20	Problems during hospitalization?	1 = Yes 2 = No	/……/
21	If so, what is the appropriate course of action?	1 = Yes 2 = No	/……/
		Section V: QUALITY OF CARE	
22	Initial treatment	1 = Yes 2 = No	/……/
23	Appropriate treatment of complications	1 = Yes 2 = No	/……/
24	Clear written daily	1 = Yes 2 = No	/……/
25	Time of death	1-During pregnancy; 2-During childbirth; 3-Carriage; 4-Post abortum; 5-After an Extra-uterine pregnancy; 6-Per operative; 7-Post operative; 8-Other(specify)……..	/……/
26	If during pregnancy, timing	1-First quarter 2-Second quarter; 3-Third quarter	/……./
27	Delivery mode	1 = Elective Caesarean Section; 2 = Emergency Caesarean Section; 3 = Eutocic vaginal delivery; 4 = Dystocic vaginal delivery	/……/
28	AMTSL made	1 = Yes 2 = No 3 = ND	/……/
29	Type of intervention	1-Caesarean saction; 2-Laparotomy; 3-AMIO; 4-Medical treatment	/……/
30	Newborn's condition at birth	1-Alive; 2-Intrapartum death; 3-Neonatal death; 4-Not specified	/……/
		Section VI: CAUSE OF MATERNAL DEATH BY TEAM	
31	Cause of maternal death	1-Direct obstetrical cause; 2-Indirect obstetrical cause	/……../
32	Direct Cause	1-Hemorrhage; 2-HTA; 3-Infection; 4-Anesthetic complication 5-Abortion; 6-Embolic disease; 7-Other(specify)…….	/……/
33	Indirect cause	1-Complications related to HIV/AIDS; 2-Malaria; 3-Decompensated cardiopathy; 4-Anemia; 5-Sickle cell disease; 6-Pneumonia; 7-Encephalopathy, 8-Intestinal obstruction; 9-Peri-partum Cardiopathy; 10-Trauma; 11-Other(specify)……..	/……/

Continued

		Section VII: CAUSE OF DEATH ACCORDING TO REVIEW	
34	Cause of maternal death	1-Direct obstetrical cause; 2-Indirect obstetrical cause	/……/
35	Direct Cause	1-Hemorrhage; 2-HTA; 3-Infection; 4-Anesthetic complication; 5-Abortion; 6-Embolic disease; 7-Other(specify)…….	/……/
36	Indirect cause	1-Complications related to HIV/AIDS; 2-Malaria; 3-Decompensated cardiopathy; 4-Anemia; 5-Sickle cell disease; 6-Pneumonia; 7-Encephalopathy; 8-Intestinal obstruction; 9-Peri-partum Cardiopathy; 10-Trauma; 11-Other (specify)……..	/……/
37	Avoid ability	1-Evitable; 2-Non-avoidable; 3-Evitability not established;	/……/
38	Problem identified according to the law of three delays	a-Decision-making 1 = Yes; 2 = No b-Delay to get to the health service 1 = Yes; 2 = No c-Delay in receiving care 1 = Yes; 2 = No	/……/
		Section VIII: DEATH REVIEW	
39	Maternal death revised	1 = Yes; 2 = No	/……/
40	Review year	……../……/……..	