

Retraction Notice

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Epidemiology of Maternal Deaths from 2017 to 2022 in the Obstetrics and Gynaecology Department of the University Hospital of Tengandogo, Burkina Faso

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Abstract

Background: Although maternal mortality is declining in most countries, it remains a significant public health problem worldwide, with high rates, particularly in developing and insecure countries like ours. **Objective:** To study the epidemiological factors and factors associated with the occurrence of maternal death in the Gynecology-Obstetrics Department of University Hospital of Tengandogo. **Method:** It was a retrospective case-control study with a descriptive and analytical purpose over a period of 6 years from January 1, 2017 to December 31, 2022. Cases were women with maternal deaths during the study period. Data processing and analysis were performed using Stata version 13 software. Univariate and multivariate analyses were performed with Stata version 13 software, and logistic regression modeling was used to estimate crude and adjusted odds ratios (OR), their 95% confidence intervals (CI), and the threshold for statistical significance was set at a p value < 0.05. **Results:** A total of 372 patients were included in the study, including 146 cases of maternal death. The in-hospital maternal mortality rate was 1933 deaths per 100,000 live births. The average age was 28.5 years. 58.9% of patients lived in rural areas. Married patients accounted for 88.7% of cases. The average parity was 3. Direct obstetrical causes were the main causes of death, accounting for 72.6%. They were dominated by post-partum hemorrhage (24.2%), puerperal infection (18.6%), pre-eclampsia/eclampsia (16.1%) and retroplacental hematoma (8.9%). Chronic anemia (12.9%) was the main indirect obstetric cause.

Risk factors associated with maternal death were primiparity (OR for pauci-gravida and multigravida at 0.05; $P = 0.001$); ambulance transport (OR for patients referred and brought in by personal vehicle = 0.3, $p < 0.001$) and vaginal delivery (OR for cesarean deliveries = 0.4, $p < 0.001$). Conclusion: To reduce maternal mortality in Burkina Faso, strategies such as educating women about danger signs during pregnancy and promoting women's education can be adopted.

Keywords

Maternal Death, Epidemiology, Associated Factors, University Hospital of Tengandogo

1. Introduction

Motherhood is a time of anticipation and happiness for a woman, her family and her community. However, for many women, it is a time of risk and danger. Indeed, the World Health Organization (WHO) has announced 287,000 maternal deaths in 2020, down slightly from 309,000 in 2016 [1]. Overall, the rate fell by around 15% between 2015 and 2020, and remains concentrated in the world's poorest regions and in countries affected by conflict. Indeed, around 70% of all maternal deaths in 2020 were recorded in sub-Saharan Africa. West and Central Africa has always had the highest mortality rate, three times the world average in 2020 despite a 19% reduction between 2000 and 2020. Chad, South Sudan and Nigeria are the three countries with the highest mortality rates [1]. With an estimated maternal mortality rate of 198 deaths per 100,000 live births in 2021, Burkina Faso is one of the African countries with a high maternal mortality rate, and maternal health remains a major concern [2]. Poverty is one of the main factors associated with maternal deaths, affecting over 45% of the population [3]. In order to reduce the poverty-related maternal mortality rate, several strategies have been put in place by the government with the support of technical partners, including free obstetric care in 2016, hospital empowerment and the promotion of emergency obstetric and neonatal care. Although a reduction in maternal mortality has been observed thanks to these strategies, Burkina Faso is still among the countries with high maternal mortality, especially in referral facilities such as the University Hospital of Tengandogo [4]. However, very few studies have been carried out on this subject. With this in mind, we conducted this study to investigate the epidemiology and factors associated with maternal death in the gynecology-obstetrics department at the University Hospital of Tengandogo.

2. Patients and Method

We conducted a descriptive and analytical cross-sectional case-control study. Data were collected retrospectively over a period of six (06) years from January 01, 2017 to December 31, 2022 in the obstetrics and gynecology department at the University

Hospital of Tengandogo which is a level 3 referral hospital. For cases, all women who suffered a maternal death during the study period were included in the present study. Controls were women hospitalized during the study period for a gravidopuerperal emergency, discharged alive and reviewed at the 45th day consultation. Each case was matched to two controls. Data were collected by documentary review of various media, including patients' clinical records, delivery registers, hospitalization registers and operative report registers from the gynecology-obstetrics and intensive care departments of the University Hospital of Tengandogo. We drew up an exhaustive list of cases and controls for the study period by taking the identity, file number and age of the patients from the admission, hospitalization and delivery registers. We then proceeded to randomly identify case and control files, and exclude files that did not meet the inclusion criteria. Controls were selected at random, taking into account the age of the cases. Once the identification of cases and controls had been completed, we began collecting information from the files. Epidemiological variables (age, gesture, parity, marital status, level of education, etc.), clinical data (number of antenatal consultations, mode of admission, duration of evacuation), therapeutic data (mode of delivery: vaginal or caesarean section), and causes of maternal death were studied. The data were entered using Epi info software version 7.2.5. Processing and analysis were carried out using Microsoft Excel 2016 and Stata version 13. Univariate and multivariate analyses were performed using Stata version 13 software, and logistic regression modelling was used to estimate crude and adjusted odds ratios (ORs), with confidence intervals (CIs) set at 95%. The threshold for statistical significance was set at $p < 0.05$. Patient anonymity and data confidentiality were respected.

3. Results

3.1. In-Hospital Maternal Mortality Ratio

During the study period, we recorded 146 deaths and 7550 live births, giving a hospital maternal mortality rate of 1933 per 100,000 live births. It should be noted that 124 files were exploitable. In 2018, the maternal mortality rate peaked at 2,851 per 100,000 live births, before declining in subsequent years to reach 970 per 100,000 live births in 2019 and 1,535 in 2020. In 2021 and 2022, the maternal mortality rate was around 2,500 deaths per 100,000 live births.

Figure 1 shows the annual change in the maternal mortality ratio.

3.2. Socio-Demographic Characteristics

The mean age of the patients who died was 28.5 ± 7.1 years. The extremes were 16 and 49 years. The 25 - 29 and 30 - 34 age groups accounted for 21.8% and 21.8% respectively; 58.9% of the patients who died lived in rural areas. Non-employed accounted for 93.5% of the deceased patients. Married women represented 88.7% of the deceased patients. A total of 65 patients (52.4%) had a primary/secondary education. Multi-gesture patients accounted for 47.6% of deaths. The average parity was 3; 64.5% of the patients who died were multiparous (**Table 1**).

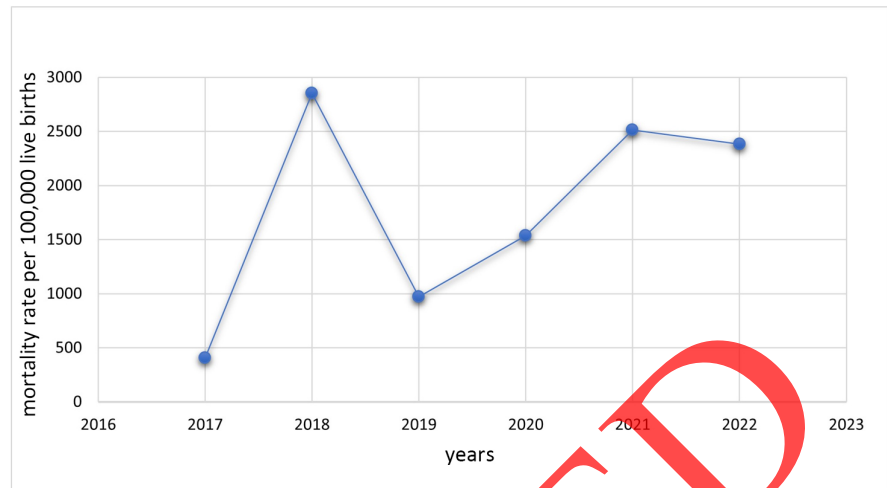


Figure 1. Annual change in the maternal mortality ratio.

Table 1. Socio-demographic characteristics of deceased patients (n = 124).

Socio-demographic characteristics		Number	Percentage (%)	
Age (years)	15 - 19	13	10.5	
	20 - 24	26	20.9	
	25 - 29	27	21.8	
	30 - 34	27	21.8	
	35 - 39	23	18.6	
	40 - 44	5	4	
	45 - 49	3	2.4	
		Rural	73	58.9
Residence		Urban	51	41.13
	Occupation	Self-employed	116	93.5
Employed		8	6.5	
Marital status	Single	14	11.3	
	Married	110	88.7	
Level of education	Not enrolled	55	44.4	
	Primary/secondary	65	52.4	
	Higher	4	3.2	
Gesture	Primigeste (1)	32	25.8	
	Pauci-geste (2 - 3)	33	26.6	
	Multigeste (≥4)	59	47.6	
Parity	Nulliparous* (0)	22	17.7	
	Primiparous (1)	22	17.7	
	Multiparous (≥4)	80	64.5	

Nulliparous*: cases of abortion or ectopic pregnancy.

3.3. Causes of Maternal Deaths

Of the 124 cases of death, 90 (72.6%) were due to direct obstetric causes compared with 34 (27.4%) due to indirect obstetric causes. Direct obstetric causes were dominated by immediate postpartum haemorrhage in 30 cases (24.2%), followed by puerperal infections and preeclampsia/eclampsia in 23 (18.6%) and 20 (16.1%) cases respectively. Indirect obstetric causes were dominated by chronic anaemia in 16 cases (12.9%) (Table 2).

Table 2. Causes of maternal death (n = 124).

Obstetrical causes of death	Number	Percentage
Direct obstetric causes	90	72.6%
Immediate post-partum haemorrhage	30	24.2%
Puerperal infections	23	18.6%
Preeclampsia/eclampsia	20	16.1%
Retroplacental haematoma	11	8.9%
Abortion	5	4%
Uterine rupture	1	0.8%
Indirect obstetric causes	34	27.4%
Chronic anaemia	16	12.9%
Malaria	7	5.6%
Pulmonary embolism (Sickle cell)	4	3.2%
Pneumopathy	7	5.6%
Total	124	100%

3.4. Factors Associated with Maternal Death

3.4.1. Univariate Analysis

➤ Potential socio-demographic factors

Table 3 illustrates the socio-demographic factors in the univariate analysis.

Table 3. Univariate analysis of potential socio-demographic factors.

Socio-demographic factors	Death		OR [95% CI]	P
	Cases	Controls		
Age	15 - 25	46	102	0.5 [0.3 - 0.6]
	26 - 35	54	99	1
	≥36	24	47	1.1 [0.6 - 2.1]
Residence	Rural	73	94	0.8 [0.6 - 1.1]
	Urban	51	154	1
Occupation	Self-employed	109	188	0.6 [0.5 - 0.7]
	Employed	8	34	1

Continued

Marital status	Married	110	220	1	1.000
	Single	14	28	0.5 [0.4 - 0.6]	
Level of education	Not enrolled	55	72	0.8 [0.5 - 1.1]	0.0055
	Primary/secondary	65	156	0.6 [0.4 - 0.9]	
	Higher	4	20	1	
Gesture	Primigeste (1)	32	85	1	0.0104
	Pauci-geste (2 - 3)	33	85	1.03 [0.6 - 1.8]	
	Multigeste (≥ 4)	59	78	2 [1.2 - 3.4]	
Parity	Primiparous (1)	22	97	1	0.7976
	Pauci parous (2 - 3)	35	47	1.2 [0.6 - 2.3]	
	Multiparous (≥ 4)	67	104	1.02 [0.3 - 0.8]	

Multiple gestures (OR = 2, IC95% = [1.2 - 3.4], P = 0.0104), self-employed status (OR = 0.6, IC95% = [0.5 - 0.7], P = 0.0174), primary/secondary education level (OR = 0.6; IC95% = [0.4 - 0.9], P = 0.0055) and rural residence (OR = 0.8, IC95% = [0.6 - 1.1], P < 0.001) were socio-demographic factors statistically associated with maternal death.

➤ **Potential clinical factors**

Table 4 shows the univariate clinical factors.

Table 4. Univariate analysis of potential clinical factors.

Clinical factors	Death		OR [95% CI]	P	
	Cases	Controls			
History of abortion	Yes	14	64	0.8 [0.5 - 1.5]	0.5383
	No	110	184	1	
Previous caesarean section	Yes	14	64	0.6 [0.5 - 0.8]	0.0007
	No	110	184	1	
Mode of admission	Direct	6	51	1	0.000
	Referred	118	197	5.1 [2.1 - 12.2]	
Means of transport	Ambulance	106	136	1	0.000
	Personal vehicle	13	61	0.3 [0.1 - 0.5]	
Pregnancy follow-up	Yes	101	241	1	0.000
	No	23	7	3.3 [1.4 - 7.7]	
Number of PNCs	1 PNC	11	1	11.5 [1.4 - 9.2]	0.000
	2 - 3 PNCs	37	78	0.04 [0.005 - 0.4]	
	≥ 4 PNCs	56	162	1	
Mode of delivery	Vaginal route	68	90	1	0.0002
	Caesarean section	51	155	0.4 [0.3 - 0.7]	

Previous caesarean section (OR = 0.6, IC95% = [0.5 - 0.8], $P < 0.001$), admission on referral (OR = 5.1, IC95% = [2.1 - 12.2], $P < 0.001$), transport by personal vehicle (OR = 0.3, IC95% = [0.1 - 0.5], $P < 0.001$), lack of pregnancy follow-up (OR = 3.3, IC95% = [1.4 - 7.7], $P < 0.001$) and caesarean delivery (OR = 0.4, IC95% = [0.3 - 0.7], $p = 0.0002$) were clinical factors statistically associated with maternal death.

➤ Potential care-related factors

Table 5 illustrates the care-related factors in univariate analysis.

Table 5. Univariate analysis of potential care-related factors.

Care factors	Death		OR [95% CI]	P	
	Cases	Controls			
Adequate time between diagnosis and start of treatment	Yes	105	222	1	0.0833
	No	21	26	1.74 [0.94 - 3.24]	
Adequate emergency treatment	Yes	97	321	1	0.000
	No	27	17	3.78 [3.3 - 5.3]	
Effectiveness of blood transfusion	Yes	61	20	1	0.0682
	No	15	1	0.92 [0.61 - 39.6]	

Lack of adequate emergency treatment (OR = 3.78, CI95% = [3.3 - 5.3], $P < 0.001$) was the care-related factor statistically associated with maternal death.

3.4.2. Multivariate Analysis

Paucigravida and multigravida (OR = 0.05 for both, IC95% = [0.009 - 0.3] and [0.008 - 0.3] respectively, $P = 0.001$), transport by personal vehicle (OR = 0.3, IC95% = [0.1 - 0.5], $P < 0.001$) and caesarean delivery (OR = 0.4, IC95% = [0.2 - 0.7], $P < 0.001$) were the factors statistically associated with maternal death in multivariate analysis (**Table 6**).

Table 6. Multivariate analysis of associated factors.

Associated factors	Death		OR [95% CI]	P	
	Cases	Controls			
Gesture	Primigeste (1)	32	85	1	0.001
	Pauci-geste (2 - 3)	33	85	0.05 [0.009 - 0.3]	
	Multigeste (≥ 4)	59	78	0.05 [0.008 - 0.3]	
Means of transport	Ambulance	106	136	1	0.000
	Personal vehicle	13	61	0.3 [0.1 - 0.5]	
Mode of delivery	Vaginal route	68	90	1	0.000
	Caesarean section	51	155	0.4 [0.2 - 0.7]	

4. Discussion

4.1. Limitations of the Study

The limitations of our study are inherent in retrospective studies. In fact, it was essentially a case of insufficiently completed data, which certainly did not allow certain factors to be identified. Despite these limitations, we believe that the majority of the data enable us to achieve the objective of our study and to compare them with those in the literature.

4.2. Maternal Mortality Ratio

The maternal mortality ratio recorded over the 6 years of the study was 1933 per 100,000 live births. The mortality ratio varies from one hospital structure to another throughout the world. Baldé in Guinea in 2016 observed a similar ratio of 1944 per 100,000 live births [5]; in Niger in 2018, the study by Alkasoum *et al.* reported a higher ratio of 2,512 per 100,000 live births [6]. In 2017, Thiam *et al.* in Senegal found a lower ratio of 794 per 100,000 live births [7]. In Benin, a hospital study carried out by Raoul *et al.* in 2019 at the Zone Saint Jean Hospital found a ratio of 1173 per 100,000 live births [8]. According to Fomulu *et al.* in Cameroon, the ratio was 1198 per 100,000 live births [9]. In France, according to Tharaux *et al.* between 2016 - 2018, it was 11.8 per 100,000 live births [10]. This maternal mortality ratio in our context confirms the data in the literature [1]. This very high ratio in our context, although most of our studies are hospital-based could be explained by the unfavourable socio-economic conditions in our countries but also by the lack of technical facilities in our hospitals. The year 2019 saw a relatively low maternal mortality ratio of 1535 per 100 000 live births, compared with the last 3 years of our study. This could be explained by the low attendance at the University Hospital of Tengandogo maternity unit during the peak of the covid-19 pandemic. Indeed, the university hospital of Tengandogo was the centre for the management of covid-19 cases, which limited its use by other patients during this period.

4.3. Socio-Demographic Characteristics

The mean age of the patients who died was 28.5 years. The average age is similar to that reported by most African authors [9] [11] [12]. The profile of the deceased patients shows that the 25 - 34 age group was the most represented, with 43.6%. These results are comparable to those of Thiam M in Senegal in 2017 who reported that the age group between 25 - 34 years was the most represented with 41.8% of cases [7]. In contrast, in the series by Tiako *et al.*, the 20 - 24 age group was in the majority with 33.1% of cases [12]. Age, particularly extreme age, has been recognised as a factor linked to the risk of maternal death. The risk of maternal death is eight times higher at 40 than at 20 - 24 [13]. Self-employed women were the most represented, at 93.5%. These results are similar to those of many authors such as Baldé and Fomulu, who found 73% [5] and 74.8% [9] respectively. These results reflect, on the one hand, the low level of development of our countries, where the unemployment rate is very high and, on the other hand, the limited access to care

by this underprivileged segment of the population, which exposes them to multiple obstetric complications. The majority of the women who died (58.9%) lived in rural areas. These results are comparable to those of Baldé *et al.* who noted that 66.7% of the women who died came from rural areas [5]. The higher frequency of patients from rural areas could be explained by the lack of technical facilities in rural areas and the excessively long evacuation times. In the literature, numerous studies have shown that difficulties in accessing health services, the availability and geographical accessibility of health services, and sometimes even the inadequacy of health services, especially in rural areas, are key factors in the increase in mortality by limiting people's access to better quality health care services [14].

Among the patients who died, 64.5% were multiparous. This finding is similar to that of Baldé *et al.* [5] and Thiam M *et al.* [7], but with varying rates of 87% and 44.3% respectively. Multiparity is linked to lifestyles: early marriages lead to early and long pregnancies, and numerous pregnancies are often close together. Also, the concept in our societies that having many children is a source of wealth and happiness for the woman and her family could encourage this high rate of multiparity. Women aged around 30, who are usually multiparous and have a low level of income, neglect prenatal consultations because they believe that previous pregnancies have gone well, so this one should be no exception to the "rule". In our study, 18.5% of patients had no antenatal care contact and only 56 patients (45.1%) had at least 4 antenatal contacts. Even if antenatal care cannot predict all the risks, good antenatal care can identify women with a major history and refer them to a referral facility in good time. According to WHO recommendations in 2016, at least 8 antenatal care contacts are required to reduce perinatal mortality and improve women's experience of care [15].

4.4. Causes of Maternal Death

The most frequent causes of death were direct obstetric causes (72.6%). Immediate post-partum haemorrhage was the main cause of death, accounting for 24.2%. It remains the leading cause of death in most developing countries [5] [9] [16] [17], but also in developed countries [13]. The difference is that the proportions of deaths due to haemorrhage are much higher in countries with limited resources, while the causes of haemorrhage in industrialised countries are dominated by coagulopathies [13]. This high frequency of haemorrhage in maternal deaths calls for particular attention to be paid to the management of haemorrhage to resuscitation measures and, above all, to their prevention, given that labile blood products, which guarantee effective resuscitation in haemorrhagic states, are rare in our context [18]. Direct obstetric causes included puerperal infections (18.55%), pre-eclampsia/eclampsia (16.1%), retro placental haematoma (8.9%) and induced abortion (4%). Indirect obstetric causes accounted for only 27.4% of causes of death, led by chronic anaemia, which accounted for 12.9% of causes of death. This high frequency of anaemia among indirect causes underlines the importance of antenatal care with iron and folic acid supplementation for the prevention of anaemia, as recommended by the

WHO [19].

4.5. Factors Associated with Maternal Death

In multivariate analysis, paucigravida, multigravida, transport by personal vehicle and caesarean section ($OR < 1$, $P < 0.05$) were protective factors. Primiparity, ambulance transport and vaginal delivery therefore increased the risk of maternal death.

The factors associated with maternal death vary from one study to another and depend on the parameters studied. Indeed, Atadjé *et al.* found that the factors associated with maternal death were place of residence ($OR = 2.4$, $P = 0.952$), a delay of 5 days or more between the onset of symptoms and admission to hospital ($OR = 3$, $P = 0.003$); and non-medical transport ($OR = 0.3$, $P = 0.013$) [8]. Mahbouli, in a descriptive study, found that primiparity, multiparity, unfavourable socioeconomic conditions, high-risk pregnancy and poor pregnancy monitoring were the main factors associated with maternal mortality [20]. Furthermore, the descriptive study conducted by Thiam O showed that maternal age, parity, the quality of antenatal consultations and haemorrhagic pathology coupled with the route of delivery significantly influenced the occurrence of maternal deaths [11]. Thiam M in his descriptive and analytical study found that late arrival at the facility, absence or slowness of the care provider, late transfer to the appropriate level of care and late correct diagnosis were factors associated with the occurrence of maternal death [7]. The increased risk in primiparous women and in patients whose pregnancies were not followed up could be explained by the increased risk of obstetric complications in these patients [21]. This would also explain the increased risk of death in low socioeconomic patients with limited access to antenatal care. In referred patients, the increased risk of death could be linked to the reasons for referral, which in most cases are genuine obstetric emergencies with an immediate life-threatening condition requiring rapid evacuation by ambulance. As a factor increasing the risk of death, vaginal delivery could be linked to delivery complications and dystocia, with caesarean section therefore proving to be the solution, hence the reduced risk in caesarean section patients. In order to reduce maternal mortality in Burkina Faso, and in particular at the University Hospital of Tengandogo, a number of strategies can be adopted, including educating women about the danger signs during pregnancy, promoting women's education and making women literate in the national language. Educating women undoubtedly makes an extremely important contribution to empowering them by giving them knowledge, skills and self-confidence. Studies show that education enables women to embrace modernity and adopt new health behaviours that are favourable to modern medicine [22]. Lastly, it enables women to obtain the greatest benefits from the use of health services because they have access to information. This gives her a greater capacity to retain the advice given in hospital [23]. The construction of quality healthcare infrastructures, the availability of a technical platform that meets needs and the training of qualified human resources are essential in the fight against maternal mortality. A study carried out in an African

hospital revealed that in a series of 81 maternal deaths, the failure of health services was the cause of more than half the cases [23].

5. Conclusion

Maternal death is a real public health problem in our country. This study showed that the maternal mortality ratio was very high in the mother and child department of the University Hospital of Tengandogo. Direct obstetric causes, with postpartum haemorrhage in the first place, followed by puerperal infection and pre-eclampsia/eclampsia, were the leading causes of maternal death. Several factors, such as gesture, means of transport and mode of delivery, were associated with maternal death. The combined efforts of the population could considerably reduce maternal mortality, health service providers and public authorities. Several factors could not be studied because of the retrospective nature of our study, hence the interest of a prospective study with descriptive and analytical aims.

Conflicts of Interest

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

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History

Expression of Concern:

yes, date: 2025-6-29

no

Correction:

yes, date: yyyy-mm-dd

no

Comment:

This article has been retracted to straighten the academic record. In making this decision the Editorial Board follows [COPE's Retraction Guidelines](#). Aim is to promote the circulation of scientific research by offering an ideal research publication platform with due consideration of internationally accepted standards on publication ethics. The Editorial Board would like to extend its sincere apologies for any inconvenience this retraction may have caused.