

Maternal Mortality in the Context of Targeted Free Maternal Healthcare at the Regional Hospital Center of Yamoussoukro, Côte d'Ivoire

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Abstract

Objective: Describe trends, causes, and factors associated with maternal mortality. **Patients and Methods:** This was a retrospective descriptive study conducted in the gynecology and obstetrics department of the Yamoussoukro Regional Hospital Center. The study took place over a period of 5 years, from January 1, 2016, to December 31, 2020. All patients who died in the gynecology-obstetrics department of the Yamoussoukro CHR and met the WHO definition were included in the study. Data entry and analysis of the results were performed using EpiInfo 7 software. **Results:** The maternal mortality rate was 485.8 per 100,000 live births. The maternal mortality ratio was 492.9 in 2016 compared to 695.4 in 2020, representing a growth rate of 202.5%. The average age was 30 years, and the 26 - 30 age group was the most common, accounting for 26.3%. Women without any level of education represented 60.2%, and 45.1% were single. In 44.4%, they had no income-generating activity. Women had between 1 and 3 prenatal consultations (PNC) in 55.6%. Multiparous women were the most numerous, at 30.3%. Deaths mainly occurred in the immediate postpartum period (71.4%), and direct obstetric causes accounted for 89.5%, with obstetric hemorrhage dominating at 63.2%. Poor prenatal care and lack of blood products were associated with deaths, at 64.7% and 40.6%, respectively. **Conclusion:** Maternal mortality was increasing at the Yamoussoukro Regional Hospital. The direct causes of death were predominant, with obstetric hemorrhage as the main cause. Poor prenatal care and the lack of blood products were associated with the deaths.

Keywords

Targeted Free Services, Obstetric Hemorrhage, Maternal Mortality, Poor Prenatal Care, Blood Products, Ivory Coast

1. Introduction

Maternal mortality is the death of a woman occurring during pregnancy or within 42 days of termination of pregnancy, regardless of the duration or location, for any cause, whether determined or aggravated by pregnancy or the care provided, but not accidental or fortuitous [1]-[3]. It is a major public health issue worldwide, especially in developing countries [4] [5]. In 2017, the WHO estimated the number of maternal deaths at 211 deaths per 100,000 live births. Every minute worldwide, 110 women experience a pregnancy-related complication, one woman dies from a pregnancy-related complication, and thirty women suffer a disability due to childbirth [6]. The majority of maternal deaths occur in low-income countries. In more than 80%, these deaths are avoidable [7].

The risk of death for a woman during childbirth or postpartum is 1 in 13 in Sub-Saharan Africa, compared to 1 in 4100 in industrialized countries [8]. Several countries have adopted policies of free maternal healthcare to improve access for pregnant women, laboring women, and new mothers in order to reduce maternal mortality rates. This policy has been implemented in Côte d'Ivoire since 2011, following the post-election crisis, initially offering free care and, in 2012, targeting both mothers and children aged 0 to 5 years. This targeted free care covers prenatal consultations, prenatal check-ups, ectopic pregnancies, vaginal and caesarean deliveries, and postnatal consultations, and only applies to procedures performed in hospitals. There are also difficulties in fully implementing the policy because prenatal check-ups are still subject to a fee, surgical kits are basic, and any additional products required are paid for by the patients. There are recurring shortages of the delivery and caesarean kits provided by the government, and blood products are subject to a fee. According to the EDS-CI 2021, mortality rates decreased from 614 per 100,000 live births in 2012 to 385 per 100,000 live births. However, this decline remains far from the Sustainable Development Goals of 2030, which aim for fewer than 70 deaths per 100,000 live births. Given the slow reduction in maternal mortality despite the provision of free care, we deemed it appropriate to study maternal mortality at this maternity hospital, which is an important referral center in the central region of the country. The overall objective is to describe trends, causes, and factors associated with maternal mortality.

2. Patients and Methods

This was a retrospective descriptive study conducted in the gynecology and obstetrics department of the Regional Hospital Center of Yamoussoukro. The study took place over a period of 5 years, from January 1, 2016, to December 31, 2020.

All patients who died in the gynecology-obstetrics department of the Yamoussoukro CHR and met the WHO definition were included in the study. Patients referred from other healthcare facilities who arrived deceased, as well as all deceased patients with incomplete medical data (all cases where information on the parameters studied was missing. We had five cases of incomplete records, and these were cases that had not undergone a maternal death review session), were not included. The study focused on the completeness of data regarding deceased patients in the gynecology-obstetrics department of the Yamoussoukro CHR who met the WHO definition of maternal death during the study period. The parameters studied included socio-demographic data (age, profession, marital status, ethnic group, residence), clinical data (causes of death, risk factors, time of death), paraclinical data (hemoglobin level, hematocrit, and platelet count from blood count), and therapeutic modalities.

Data collection was carried out from the medical records of deceased patients meeting the inclusion criteria. The data were collected using an anonymous, structured, and standardized survey form designed for this purpose. Data entry and analysis of the results were performed using EpiInfo 7 software, Microsoft Office Word 2007, and Microsoft Office Excel 2007, and it was a purely descriptive study.

3. Results

During the study period, 133 cases of death were recorded according to our inclusion criteria for 27,378 live births, resulting in a maternal mortality rate of 485.8 per 100,000 live births. The maternal mortality ratio was 492.9 in 2016 compared to 695.4 in 2020, representing a growth rate of 202.5% (**Figure 1**). The average age was 30 years, with extremes of 15 and 44 years. The age group of 26 - 30 years accounted for 26.3% (**Table 1**). Women with no education level represented 60.2%, while those with primary and secondary education followed with the same proportion of 18%. Single women were the most numerous, accounting for 45.1% of cases, and 29.3% and 25.6% were in free union and married, respectively. In 44.4%, they had no income-generating activity, followed by those engaged in liberal professions at 39.1%. They resided outside Yamoussoukro city in 51.1% of cases. They were referred in 56.4%, and 66.2% were admitted by taxi. The women had between 1 and 3 prenatal consultations (PNC) in 55.6%, followed by at least 4 PNC in 26.3%, and 18.1% had no PNC. Multiparous women dominated with 44.7%, followed by pauciparous and primiparous women with 28.8% and 14.4%, respectively. They were mainly multiparous, pauciparous, and primiparous, with respective proportions of 30.3%, 26.5%, and 21.2%. The women were in the third trimester of pregnancy in 72.3%, in the second trimester in 14.5%, and in the first trimester in 13.2% of cases. Deaths occurred mainly in the immediate postpartum period (71.4%) and during pregnancy (21.8%). Direct obstetric causes accounted for 89.5%, with obstetric hemorrhage dominating at 63.2% (**Table 2**). Indirect obstetric causes were dominated by anemia at 3.8%, followed

by severe malaria at 2.3%. Regarding community-related factors contributing to deaths, poor pregnancy follow-up was the main issue (**Table 3**). As for health system-related contributing factors, the primary issue was the lack of blood products (**Table 4**).

Table 1. Distribution of maternal deaths by age group.

Age Group (Years)	Frequency	Percentage (%)
[15 - 20]	13	9.8
[21 - 25]	17	12.8
[26 - 30]	35	26.3
[31 - 35]	33	24.8
[36 - 40]	29	21.8
[41 - 45]	06	4.5
TOTAL	133	100%

Table 2. Distribution of deaths by direct obstetric causes.

Direct Obstetric Causes	Frequency (n = 119)	Percentage (%)
Obstetric hemorrhage	84	63.15
Hypertensive disorders (HTA)	15	11.28
Puerperal infection	10	7.52
Abortion-related complications	5	3.76
Pulmonary embolism	3	2.26
Anesthetic complications	2	1.50
Total	119	100.00

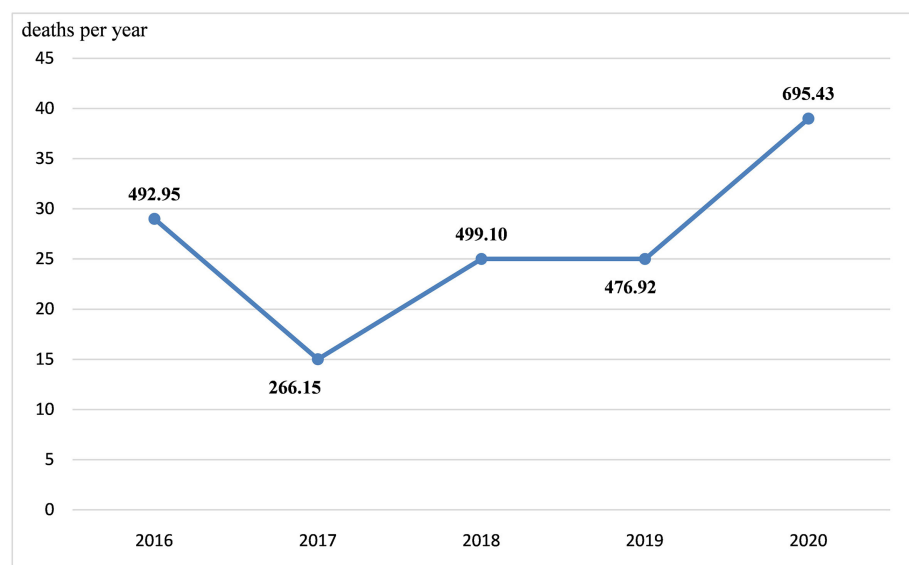


Figure 1. Trend in the maternal mortality rate.

Table 3. Distribution of cases by community-related contributing factors.

Community-Related Contributing Factors	Frequency	Percentage (%)
None	24	18.05
Poorly monitored pregnancy	86	64.66
Financial constraints	19	14.29
Remoteness of residence	10	7.52
Delay in consultation	10	7.52
Use of traditional oxytocin	7	5.52
Transportation problems	5	3.76
Home delivery	2	1.50
Refusal of cesarean section	1	0.75

Table 4. Distribution of cases by contributing factors related to the gynecology and obstetrics department of Yamoussoukro Regional Hospital (CHR).

Service-Related Contributing Factors	Frequency	Percentage (%)
None	29	21.08
Blood bank dysfunction	54	40.60
Insufficient staff	45	33.83
Delay in case management within the facility	32	24.06
Inappropriate therapeutic decision	10	7.52
Delay in patient transfer	9	6.77
Delay or error in diagnosis	9	6.77
Lack of postpartum monitoring	6	4.51
Lack of transportation means	5	3.76
Failure to assess the woman's condition	4	3.01
Lack of diagnostic tools	2	1.50
Unrecognized high-risk pregnancy	2	1.50

4. Discussion

Our mortality rate increased to reach a peak of 695.4 in 2020 during the study despite free healthcare. The average rate was 484.8 deaths per 100,000 live births. This observation was higher than that of Aftab *et al.* in 2021 [9] and Thiam *et al.* in 2017 in Thies, which reported 239 deaths per 100,000 live births [10]. It was also much higher than France's rate between 2010 and 2012, which was 10.3 deaths per 100,000 live births [11]. This difference could be explained by the weakness of our healthcare system. The increase in the rate could be due to referral centers evacuating all cases of severe morbidity to the Yamoussoukro Regional Hospital to lower their rates under pressure from authorities. Furthermore, efforts to reduce maternal mortality remain slow despite commitments made under the Maputo Protocol. Some countries like South Sudan, Chad, and Nigeria still have

rates exceeding 1000 deaths per 100,000 live births [12] [13]. In our series, the average age was 30 years, and the 26 - 30 age group was the most affected. Our results were similar to those of Abdoun *et al.* in 2020 in Algeria and Thiam *et al.*, who reported average ages of 29 and 32 years, respectively, with a predominance in the 25 - 29 age range [3] [10]. This could be because it is a period of active reproductive life with increased fertility. More than half of the women who died in our series were uneducated (60.2%). This proportion is higher than that reported by Horo *et al.* in 2008 in Yopougon [14]. This difference might be due to our setting being semi-urban compared to Abidjan, the economic capital. We observed a predominance of women without income-generating activities. Horo *et al.* and Mayi-Tsonga *et al.* in 2010 also reported a predominance of this social category, with higher proportions of 71.4% and 86.5% [14] [15]. This could be explained by the lack of financial resources limiting access to care for this social group. Single women accounted for the largest share, with 45.1% of cases, unlike Gandzien in 2005 in Brazzaville, who reported a predominance of married women in 68% of cases [16]. According to Rafamatanantsoa *et al.* in 2017 in Antananarivo, being single was associated with death, with an OR of 5.95 [7]. Most of the women who died in our series were referred and had non-medicalized conditions. Other authors like Rafamatanantsoa *et al.*, Thiam *et al.*, and Foughali *et al.* in 2017 in Algeria observed the same, with 78%, 67.1%, and 70% of cases, respectively [5] [7] [8]. The explanation is that referral causes delays, increasing the risk of mortality, especially when done under suboptimal conditions. Women who had 1 - 3 prenatal consultations (PNC) were the majority, at 55.6%. Several authors, including Rafamatanantsoa *et al.*, Thiam *et al.*, and Gandzien, reported that 77%, 48%, and 63% of women who died had not had any PNC [7] [8] [16]. This may be because the absence or insufficiency of PNC prevents anticipation and management of complications. During our study, multiparous women were the most numerous, accounting for 30.3% of cases. This was similar to Thiam *et al.*, who reported a predominance of multiparous women with a higher proportion of 49% [8], unlike Rafamatanantsoa *et al.*, who observed a dominance of primiparous women at 57.6% [7]. The very high mortality rate among multiparous women can be explained by the fact that, during previous pregnancies, the uterus may have developed laxity and fragility, leading to abnormal presentations, with risks of uterine rupture and postpartum hemorrhage. Deaths mainly occurred in the immediate postpartum period (71.4%). Several authors, such as Abdoun *et al.* and Foughali *et al.*, observed similar patterns, with 88.6% and 72.3% of deaths occurring postpartum, more than half of which were immediate postpartum [3] [5]. These findings could be due to the leading cause being immediate postpartum hemorrhage in developing countries. Direct obstetric causes accounted for 89.5%, with obstetric hemorrhage being the most common at 63.2%. Many authors also reported a predominance of direct obstetric causes, with obstetric hemorrhage as the leading cause of maternal death [7] [8] [17] [18]. The fact that postpartum hemorrhage remains the main cause of maternal death in low-income countries may explain this. Regarding community-related factors contributing to deaths, poor pregnancy fol-

low-up was the main issue. Antenatal care (ANC) is one of the pillars of reducing maternal mortality [19] [20]. As for health system-related factors, the main issue was the lack of blood products. In settings where postpartum hemorrhage is the leading cause of death, the persistent shortage of blood products continues to contribute to maternal deaths. The lack of blood products was a contributing factor in maternal deaths, as reported by several authors: Blaise *et al.* in 2021 in the Democratic Republic of Congo; Hien *et al.* in 2022 in Burkina Faso; and Minkobame *et al.* in 2024 in Libreville, with respective cases of 33.3%, 28.9%, and 41.3% [21]-[23]. Insufficient staffing was the second health system factor contributing to deaths, accounting for 33.8% of cases. We believe that staff shortages cause fatigue among healthcare workers, reducing vigilance and concentration during patient management. These associated factors lead us to make recommendations aimed at reducing the maternal mortality rate. We suggest that health authorities raise awareness about the importance of blood donation and also provide referral maternity hospitals with a permanent supply of free blood products. In addition, human resources in referral maternity hospitals need to be strengthened.

5. Conclusion

Despite the free care targeted at mothers, maternal mortality was increasing at the Yamoussoukro Regional Hospital. The deceased were mainly between 26 and 30 years old and were predominantly multiparous. The direct causes of death were dominant, with obstetric hemorrhage as the primary cause. Deaths mainly occurred in the immediate postpartum period. Several factors contributed to the deaths, and the main community-related factor was poor prenatal follow-up. Regarding the healthcare system, the issue was the lack of blood products.

Limitations of the Study

This was a retrospective study, so some records were incomplete, which led to their exclusion. There were no statistical tests for associated factors. It was also a single-center study, so we could not generalize our results.

Conflicts of Interest

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

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