

Dysfunctions in the Management of Patients Whose Outcome Was Classified as “Maternal Death” from 2017 to 2021, at the Departemental University Teaching Hospital of Borgou Alibori (Chud-Ba), Benin

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Abstract

Background: Maternal death is a major public health problem worldwide, particularly in sub-Saharan Africa. **Objective:** This study sought to investigate dysfunctions in the management of patients whose outcome was classified as “maternal death” in the Gynaecology-Obstetrics section of the Departemental University Teaching Hospital of Borgou Alibori (CHUD-BA) from 2017 to 2021. **Method:** This was a retrospective cross-sectional study with descriptive and analytical purposes. The study population consisted of pregnant women, parturients and puerperas admitted into the CHUD-BA maternity ward from 2017 to 2021. **Result:** A total of 2011 patients were included in this study. The in-hospital maternal mortality ratio was 1526 per 100,000 live births. The dysfunctions identified were the amount of time spent in the referring center (more than 48 hours) ($p = 0.001$), delay of more than 2 hours between referral and admission into the referral center ($p < 0.001$), means of transport (motorcycle or public transport) ($p < 0.001$), conditioning without compliance to the protocol for emergency obstetric and neonatal care (SONU) ($p < 0.001$) and delay of more than 2 hours in the etiological management of pregnant women ($p < 0.001$). **Conclusion:** Particular attention should be paid to the management of pregnant women in our healthcare system if we are

looking forward to reducing maternal mortality.

Keywords

Maternal Death, Dysfunction, Obstetric Care, Parakou, Benin

1. Introduction

Maternal death is a major public health problem worldwide [1]. According to recent estimates published by the World Health Organization (WHO), a woman dies every two minutes during pregnancy or childbirth [2]. The global maternal mortality ratio in 2020 was estimated to be 223 maternal deaths per 100,000 live births [2]. The burden of maternal deaths in Africa highly contributed to this global ratio. In sub-Saharan Africa, for instance, maternal mortality ratio remains among the highest across the world, *i.e.* 542 per 100,000 live births [3]. In Benin, the maternal mortality ratio was 523 per 100,000 live births in 2020 [4], compared with 397 per 100,000 live births in 2017 [5]. This emphasizes an increase in maternal death rates in Benin, despite the huge efforts that have been already made in order to reduce maternal mortality. Referrals made without accompaniment by a health worker contributed seven times more to maternal death [6]; similarly, caregivers may be responsible for malfunctions due to inadequate management [6]. The dysfunctions that contribute to maternal deaths need to be identified, and action should be taken to remedy them. With this in mind, the current study was initiated at the Centre Hospitalier Universitaire et Départemental du Borgou (CHUD/B), a reference center in northern Benin.

This study sought to investigate dysfunctions in the management of patients whose outcome was classified as “maternal death” in the Gynaecology-Obstetrics section of the Departmental University Teaching Hospital of Borgou Alibori (CHUD-BA) from 2017 to 2021.

2. Methods

The study was carried out in the Gynaecology-Obstetrics section of the Departmental University Teaching Hospital of Borgou Alibori (CHUD-BA). This was a retrospective cross-sectional study with descriptive and analytical purposes. The study population consisted of pregnant women, parturients and puerperas admitted into the CHUD-BA maternity ward from 2017 to 2021. Pregnant women, parturients and puerperas admitted into the CHUD-BA maternity ward for complications related to pregnancy, childbirth and the postpartum period were included in the study. Patients whose death did not meet the WHO definition of maternal death were excluded from the study. Patients whose charts were unusable were also excluded. Non-probability sampling was used, with exhaustive recruitment of all women meeting the inclusion criteria.

A set of criteria was used to identify the dysfunction. These criteria covered the

referral diagnosis, means of transport, pre-referral care and care received in the CHUD-BA maternity ward. These criteria were compared with the protocol for emergency obstetric and neonatal care (SONU). Any care or procedure that failed to meet more than 50% of the SONU protocol standards was considered a dysfunction.

The documentary data collection technique was used. Manual patient's chart proceeding was performed using a checklist designed for this purpose. The checklist was pre-tested for validity and reliability. The dependent variable was maternal death. It was dichotomous: "Deceased" (yes = 1) and "Not deceased" (no = 0). In accordance with the WHO definition, maternal death was defined as the death of a woman during pregnancy or within 42 days of termination of pregnancy, irrespective of duration or location, from any cause determined or aggravated by pregnancy or pregnancy-related care, but neither accidental nor incidental. Co-variables included the patient's sociodemographic characteristics, background, referral data and data related to the management.

After data collection, the checklists were manually sorted to ensure data consistency. Data entry was performed using EPI DATA 3.1 French version, and data analysis using Stata IC 15. The χ^2 and Fisher's exact tests were implemented accordingly with a simple logistic regression, to determine relationships between variables. A significance level of 5% was used.

The research proposal was approved by the local research ethics committee of the University of Parakou. In order to ensure data confidentiality, data collection was anonymous, and raw data were reachable only to the restricted research team. A unique identification number was assigned to each chart.

3. Result

A total of 2030 charts were identified, 19 of which were unusable. The study therefore focused on 2011 charts.

3.1. In-Hospital Maternal Mortality Ratio

During the study period, we recorded 148 maternal deaths for 9696 live births, *i.e.* an in-hospital maternal mortality ratio of 1526 per 100,000 live births. As shown in **Figure 1**, we evidenced an increasing trend of the in-hospital maternal mortality ratio at the CHUD-BA over the period from 2017 to 2020 (**Figure 1**).

3.2. Socio-Demographic Characteristics of the Deceased Women

The mean age of the deceased women was 27.85 ± 7.10 years, with a range of 15 and 55 years. More than half of the deceased women were householdwives (60.14%). They were Muslim (63.51%), married (80.41%) and lived in urban areas (50.68%). **Table 1** shows the distribution of deceased women by age, occupation, religion, marital status and residence.

3.3. Medical, Surgical and Obstetrical Background

Medical history included sickle cell disease (45.44%), hypertension (31.81%),

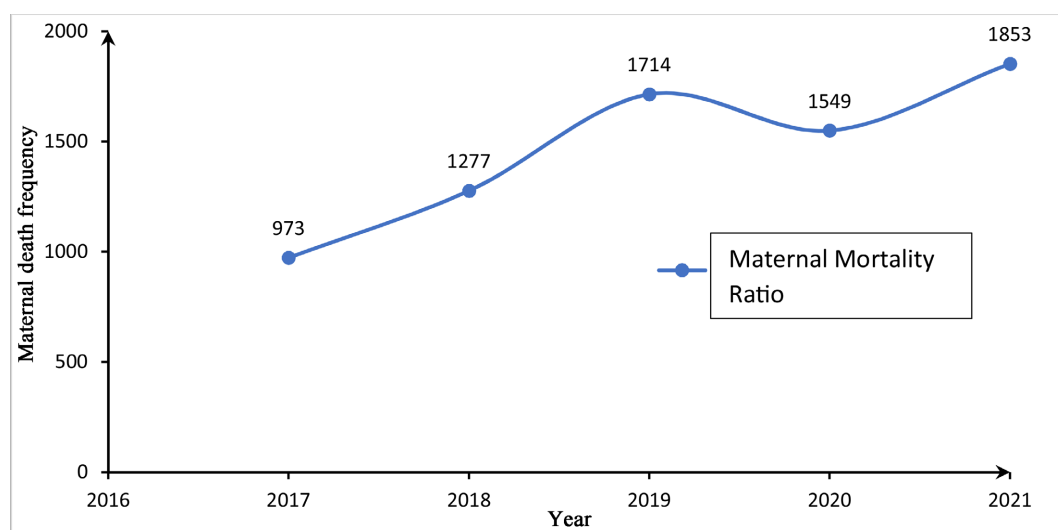


Figure 1. Distribution of in-hospital maternal mortality ratios at the CHUD-BA from 2017 to 2021.

Table 1. Distribution of women who died in the Gynaecology-Obstetrics section of the CHUD-BA from 2017 to 2021 according to socio-demographic characteristics.

	Size	Percentage (%)
Age (years)		
[15 - 25[48	32.43
[25 - 35[65	43.92
[35 - 45[32	21.62
[45 - 55[3	2.03
Occupation		
Householdwife	89	60.14
Shopkeeper	20	13.51
Civil servant	19	12.84
Craftswoman	17	11.49
Student	3	2.03
Religion		
Muslim	94	63.51
Christian	54	36.49
Marital Status		
Maried	119	80.41
Common-law union	28	18.92
Single	1	0.68
Residence		
Urban area	75	50.68
Rural area	73	49.32

asthma (13.63%) and mellitus diabetes (9.09%). Surgical procedures were dominated by Caesarean sections (87.50%). In addition, the women who died were paucigravida (31.76%) and primiparous (24.32%).

3.4. Characteristics Related to Prenatal Consultations (PNC) and Referral

The pregnancy was poorly monitored (PNC between 1 and 3) in 57.43% of the women who died, and not monitored in 23.65%. More than half of the women who died (68.24%) had been referred. Referrals came from district hospitals (44.55%), peripheral maternity (40.59%) and private facilities (14.85%). Midwives (55.44%) and physicians (22.77%) were the main health workers who referred these patients. Deceased women had benefited from a venous catheterization prior to referral (82.18%), and 68.31% had received pre-referral care of a specified nature. The care received was consistent with the suspected pathology (75.38%). Moreover, these women had spent less than 24 hours in the pre-referral facility in 72.28%, 24 to 48 hours in 13.86% and more than 48 hours in 13.86%. The transportation means used to get to the referral hospital (CHUD-BA) was public transport (53.46%), ambulance (26.73%) and motorbike (19.80%). They had come with a referral form in 76.24% of cases. On the other hand, the referral center had not been aware of the referral in 93.07% of cases.

3.5. Admission Data

The time between referral and admission was more than 2 hours in 72.29%, between 1 and 2 hours in 11.88%, and less than an hour in 16.83%. The main reasons for referral were hypertension and pregnancy (21.62%), genital haemorrhage (15.54%) and dystocia (14.86%). Hemorrhage occurred in the postpartum period in 95.65% of cases, compared with 4.35% during pregnancy. The majority of women were admitted in the prepartum period (73.65%). At the CHUD-BA, women who died were managed by interns (6th year medical students) (66.89%), and the initial check up took less than 15 minutes in 58.43% of cases. General condition was bad in 85.13% of cases, with altered consciousness in 62.16%. Vegetative vitals were normal in over 14%. First cares were administered more than 2 hours after admission in 58.10%, and less than an hour in 25%. In 57.43% of cases, conditioning did not comply with the SONU protocol. The diagnosis was made in less than 30 minutes (66.21%), and was correct in 96.72% of cases. The care received was consistent with the diagnosis made in 95.27% of cases. The workups requested were consistent with the diagnosis in 94.59% of cases, and the time taken to obtain their results was greater than one hour in 73.64% of cases.

3.6. Management and Surveillance Data

A blood transfusion was indicated in 52.7% of the women who died. Of these, 91.02% received a transfusion, compared with 8.9% who did not. The main rea-

sons given were lack of blood product (71.4%) and lack of financial means (28.57%). More than half of the women who died (51.35%) had benefited from etiological management according to the SONU protocol, but the delay in etiological management was greater than two hours (88.51%). The indication for surgery was established in 64.86% of women, 3.85% of whom were not admitted to the OR. The reasons for not being taken to the operating theater were unavailability of blood products (50%) and lack of anaesthetic products (50%). Women who died were monitored in 87.16% of cases, and 88.51% were monitored according to the SONU protocol.

3.7. Data on Complications and Maternal Death

Complications occurred in 41.22% of women during their hospital stay, most of them after one hour (78.69%). Death occurred before 24 hours in 79.79% of women, and after 24 hours in 25.21%. They died in postpartum (58.15%), in prepartum (37.16%) and in postpartum (4.05%). Causes of death were dominated by direct obstetric causes (58.78%) and indirect causes (41.22%). The main direct causes were hemorrhage (49.2%), eclampsia (45.97%) and amniotic embolism (4.60%). Indirect causes were, in decreasing order, anemia (50.82%), sepsis (16.40%) and shock (11.47%).

3.8. Dysfunctions Leading to Maternal Deaths

Several dysfunctions were identified. Before admission, the dysfunctions evidenced were the time spent in the first center prior to referral ($p = 0.001$), the delay between referral and admission into the CHUD-BA ($p < 0.001$) and transportation means ($p < 0.001$). When patients spent more than 24 hours in the referral centre, they were 10 times more likely to die. Similarly, when patients took more than an hour to reach the reference centre, they were 4 times more likely to die. When the means of transport was the motorcycle or a transport vehicle, women were more likely to die. After admission, patients who were conditioned without compliance to the SONU protocol had 3.89 times the risk of death ($p < 0.001$). The risk of death was 137 times higher when the delay in etiological management was greater than 2 clock hours ($p < 0.001$) (**Table 2**).

4. Discussion

At the end of the study, dysfunctions in the management of maternal death cases were identified. The counting of all files from 2017 to 2021 made it possible to exhaustively identify death cases in the service during this period, which reduces any bias related to data selection. In the light of the methodology, we can say that this study is reliable and that the results obtained are valid. However, it should be noted that this was a retrospective collection study and like all such studies, it is limited by the fact that she uses obstetric records sometimes entered in a extreme emergency. This limit means that some variables can sometimes miss. But this did not affect the quality of the results.

Table 2. Dysfunctions contributing to maternal deaths at the CHUD-BA.

	Death			OR	[95% CI]	P
	N	Yes	%			
Before admission						
Amount of time spent prior to referral						
<24 H	1236	73	5.91			
24 H – 48 H	35	14	40	10.62	5.18 - 21.74	<0.001
>48 H	29	14	48.28	14.86	6.91 - 31.97	<0.001
Amount of time between referral and admission into the referral center						
<1 Hour	294	17	5.78	1		
1 Hour - 2 Hours	699	12	1.72	0.29	0.14 - 0.63	<0.001
>2 Hours	307	72	23.45	4.05	2.33 - 7.04	<0.001
Mean of transport						
Motorbike	560	20	3.57	0.05	0.02 - 0.11	<0.001
Public car	672	54	8.04	0.13	0.07 - 0.23	<0.001
Ambulance	68	27	39.71	1		
After admission						
Conditioning						
Without compliance to the SONU protocol	361	63	17.45	3.89	2.75 - 5.51	<0.001
With compliance to the SONU protocol	1650	85	5.15	1		
Time before etiologic management onset						
>2 Hours	230	131	56.96	137.3	79.66 - 236.63	<0.001
≤2 Hours	1781	17	0.95	1		

Despite the various approaches taken to reduce maternal deaths in Africa, maternal mortality is still increasing. In the current study, the maternal mortality ratio was 1526 per 100,000 live births. In the same hospital in 2020, Salifou *et al.* [6] reported a maternal mortality ratio of 1100 per 100,000 live births; *i.e.* an increase of 426 maternal deaths in one year. This is cause for alarm. Several hypotheses have been put forward, the most plausible of which is the separation of the private and public sectors. Indeed, in 2018, the Beninese government restricted access to private sector to government health care workers. Indeed, practitioners working in the public sector should only work for the private sector under certain conditions. Each practitioner was given a moratorium to decide whether to continue working in the private or public sector [7]. Choosing the public sector was inevitably followed by the closure of the practitioner's practice. The growing increase in maternal mortality from 2017 to 2020 at the CHUD-BA may be considered as a tangible proof that this reform has yielded more harm in the field of maternal health. For the overall population of Parakou, there were

only two gynecologists practicing in the private sector, and all the rest were devoted to the public sector. Patients struggled to access ultrasonography and good quality of care at non-working hours and on non-working days. As a result, care provided by unqualified workers was rapidly going underground. This may explain the increasing trend of maternal deaths. What's more, over 2/3 of patients died within 24 hours of admission into the CHUD-BA. Instead of referring them early on, women were only referred at the last minute to the CHUD-BA, when their situation got out of hand. So may it happen in other areas in Benin. Therefore, it is crucial that beninese health authorities at various levels and social partners be aware of these findings, so that appropriate measures could be taken in time to limit maternal deaths.

The deceased women had a mean age of 27.85 ± 7.10 years and were housewives (60.14%). Traoré *et al.* [8] in Mali reported such similar mean age of the deceased women that was 27.90 ± 7.30 years, and that they were also housewives (90.30%). This social stratum, which was the same in both studies, shows that vulnerable women were the most affected. In other words, they are women with low economic incomes who are subject to stress and intense physical effort. The corollary of this is the occurrence of complications during pregnancy.

The main direct obstetric cause of maternal mortality was haemorrhage (49.42%); several authors have reported the same findings in African series [9] [10]. Haemorrhage remains the dread of every obstetrician. It is an obstetric emergency requiring multidisciplinary management and the availability of blood products. Any delay in treatment can lead to a worsening of the maternal prognosis. The WHO reports that a bleeding woman can die within two hours of the onset of bleeding if adequate treatment is not instituted [11]. This underlines the extreme emergency skills that should be used to manage obstetric haemorrhage.

In terms of mode of admission, it was reported that more than half of the patients who died were referred (68.24%). Several authors had also evidenced that there were more maternal deaths among referred women [8] [12]. These high mortality rates evidenced among maternal referral leave no doubt that high-risk pregnancies are previously monitored in peripheral facilities. Dénakpo *et al.* [13] reported that most patients (90%) had undergone prenatal consultations in a peripheral maternity, often by unqualified health care workers, and were only referred when complications arose. Peripheral facilities have a vital role to play in reducing maternal mortality. Women should be examined by midwives and not by unqualified health care workers; and women at risk should benefit from cold referral.

Most referring did not inform the referral structure prior to evacuation. Thiam *et al.* [14] emphasized the importance of calling the referral center prior to any evacuation. Parakou's health care workers do not respect referral standards. This is a situation that persists in our referral system in Parakou; any health center or hospital wishing to refer to a more appropriate structure should inform the referral structure. This enables the referral center's workers to antic-

ipate the treatment to avoid the time-wasting factors we do call third delays, which can be deleterious to patients.

Medical referral of pregnant women is a real problem in Parakou. More than half the women who died (53.46%) came to hospital by public transportation. The unavailability of ambulances in most of our health facilities is the main cause. Added to this is the high cost of ambulance transport when they are available. This leads parents to refuse ambulance transport, preferring to use public transport means, which significantly increased the risk of death with a $p < 0.001$. The corollary of all this is a needless loss of time in getting to the referral hospital, as 72.29% of pregnant women who died took more than two hours to reach the referral hospital. Delays in reaching the referral facility have been evidenced in most African studies [12] [13]. Our referral system still has a long way to go. This delay can actually be avoided.

The third delay is also a factor associated with maternal death. In our study, patients who received etiological management two hours after admission died ($p < 0.001$). Actually, etiological management depends on the results of workups. And these must be paid for by the accompanying person before the sample is sent to the laboratory. If a companion does not have the means, the test cannot be carried out. The context of extreme emergency leaves no choice but to act quickly and act well. Some centers in the north of the country have opted for free treatment of patients on admission, or at least for initial care, with the bill sent to the parents once the emergency has been resolved or the patient has been discharged. Wouldn't this method be appropriate for CHUD-BA? Wouldn't it reduce the various delays observed in patient care?

5. Conclusion

Maternal mortality continues to rise at the CHUD-BA despite efforts to reduce the ratio. Women who died were young, married and householdwives. The three delays were evidenced among women who died. The dysfunctions evidenced were the amount of time (more than 48 hours) spent in the referring center, the delay of more than 2 hours between referral and admission in the referral center, the means of transport (motorcycle or public transport), the conditioning without respecting the SONU protocol and the delay of more than 2 hours in the etiological management of the women. Action should be taken at government and community level, as well as in peripheral centers and at CHUD-BA, if we are looking forward to reducing maternal mortality.

Conflicts of Interest

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

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