

Factors Associated with Maternal Mortality at Gynecology and Obstetrics Department in Departmental University Hospital Center of Borgou

Salifou Badariatou, Atadé Sèdjro Raoul, Sidi Imorou Rachidi, Obossou Achille Awede, Sounouvi Ernest, Salifou Kabibou*

Mother and Child Department, Faculty of Medicine (FM), University of Parakou (UP), Parakou, Benin
Email: *salifoukabibou@yahoo.com

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Abstract

Introduction: Maternal mortality is a robust indicator of human development. Most of it occurs in developing countries. **Objectives:** This study aims to determine the factors associated with maternal mortality in Gynecology and Obstetrics Department of Borgou Departmental University Hospital Center (CHUD-B). **Study method:** Our study took place at Gynecology and Obstetrics Department in Borgou Departmental University Hospital Center. This was a descriptive and analytical case-control study, covering a period of 7 years from January 1, 2012 to December 31, 2018. **Results:** Two hundred and twelve patients have been recruited consisting of 106 deceased women and 106 controls. The intra-hospital mortality ratio was 1100 deaths per 100,000 live births (LB). The mean age of deceased women was 27.06 ± 6.45 years with the extremes of 15 and 45 years. Direct obstetric causes were the most frequent causes of maternal death. They were dominated by immediate postpartum hemorrhage (32.93%), followed by High Blood Pressure (26.83%) and infections (17.07%). The general condition of patients on admission ($p=0.000$) and inadequate management ($p=0.001$) was associated with maternal mortality. **Conclusion:** Patients' general condition on admission and inadequate management was factors associated with maternal mortality.

Keywords

Maternal Mortality, Ratio, Direct Obstetric Causes, Indirect Obstetric Causes, Factors Associated

1. Introduction

Pregnancy and childbirth place a woman at significant risk because of the unforeseeable complications to which they expose her [1]. The World Health Organization (WHO) estimates that 350,000 women die worldwide each year from complications related to pregnancy, childbirth or postpartum [2]. It is classified as a preventable fatality in contrast with other causes of death [3] [4] [5]. Despite the preventable nature of these deaths, a large number occur in developing countries representing ninety-nine percent (99%) [6] [7]. According to World Health Organization (WHO), maternal mortality ratio was 239 per 100,000 live births in low-income countries compared to 12 per 100,000 live births in high-income countries in 2015 [8]. A reduction in maternal mortality of 75% between 1990 and 2015 was envisaged in the fifth Millennium Development Goal (MDG) [9]. Progress has been made over the past decade [10]. As a result, the global maternal mortality ratio has been reduced by 43.9% [11]. This progress varied from region to region or continent to continent. In Benin, maternal mortality ratio fell from 600 in 1990 to 370 in 2010 and then to 320 in 2015 [12]. To achieve the Sustainable Development Goal (SDG) which is to reduce maternal mortality ratio to less than 70 per 100,000 live births in 2030 [11], it is necessary to identify the factors we could influence in order to better adapt the strategies to the local context. That is the subject of this article.

2. Materials and Methods

2.1. Study Framework

Our study took place in Gynecology and Obstetrics department of Borgou Departmental University Hospital Center (CHUD-B) in Parakou city.

2.2. Study Methods

2.2.1. Type and Period of Collection

This was an analytical case-control study covering a period of 7 years from January 1, 2012 to December 31, 2018.

2.2.2. Study Population

The study population consisted of all women admitted to the gynecology and obstetrics department of Borgou Departmental University Hospital Center CHUD-B during the study period for an obstetric cause.

2.3. Inclusion Criteria

Case: Any woman admitted to the service for any reason related to pregnancy or childbirth, who died according to WHO definition of maternal death and has been registered.

Control: Any woman who survived after being admitted to the service for any reason related to pregnancy or childbirth.

2.4. Exclusion Criteria

All cases and controls with unusable medical records.

2.4.1. Non-Inclusion Criteria

- Any woman who died during pregnancy, childbirth or postpartum period outside of the service.
- Any woman who died in the service outside the context of pregnancy, childbirth or postpartum period.
- Death of a pregnant woman during pregnancy, childbirth or postpartum from a cause unrelated to pregnancy, childbirth or postpartum period.

2.4.2. Matching Criteria

The choice of controls was made as follows: We took either a woman of the same age or, failing that, whose age is more or less 2 years that of the case and who survived after her admission in the same month as the case for any reason in connection with the pregnancy.

2.5. Sampling

2.5.1. Sample Size

The sample size was calculated assuming an odds ratio between cases and controls of 7.5, taking 0.05 as a risk of first species and 20% (80% power) as a risk of second species. One (1) control per case and a mortality rate of 1.63% in 2018 were used as the basis for the calculation. It was thus obtained using Epi Tools epidemiological calculators with a minimum number of 102 cases and 102 controls.

2.5.2. Sampling Technique

An exhaustive census of all women meeting our inclusion and matching criteria has been conducted during our collection period. The sample size corresponded to the weight of control for a case.

2.6. Data Collection

2.6.1. Collection Technique

This involved a review of the individual files of cases and witnesses in order to gather the necessary information were gathered through a review of individual files of cases and controls.

2.6.2. Data Collection Tools

A previously drawn up counting sheet was used to collect information in the registers of death, childbirth, reports of the interventions of the operating theatre, reference sheets, individual patient records. The count sheet included sections on general information, obstetric history, complications and procedures experienced by women.

2.7. Study Variables

2.7.1. Dependent Variable

Maternal mortality.

2.7.2. Independent Variables

- Sociodemographic characteristics: age, profession, residence, marital status.
- The medical, surgical and gynecological histories of patients.
- Pregnancy follow-up: Ante Natal Consultation (ANC), number of Ante Natal Consultation (ANC).
- Method of coming to care: by herself, referral.
- Referral: transport, referral form, venous access, referral center.
- Initial assessment of the patient on admission.
- Management: Diagnosis, complementary investigations, etiologic treatment, delay in treatment, causes of the delay.
- Characteristics relating to death: time between admission and death of patients, period of death, obstetric causes (direct and indirect), clinical audit performance.

2.7.3. Data Processing and Analysis

Data collected was entered into Epi data 3.1.fr software and processed using EPI INFO 7.2.0.1 software.

The odds ratio was used to measure the odds of dying or not. Pearson's chi-square test and Fisher's exact test were used as appropriate to measure association. The significance threshold was set at 5%. Variables with a p-value less than or equal to 20% were introduced into a logistic model to distinguish the real factors associated with maternal death.

3. Results

From January 2012 to December 2018, 140 maternal deaths were recorded for 12,728 LB. The intra-hospital maternal mortality ratio (RMMIH) during that period was 1100 deaths per 100,000 LB. The evolution of these maternal deaths over time is shown on **Figure 1**.

Among those maternal deaths, 106 were the subject of our study; the others (34 cases) were excluded for lack of documentation. Results will therefore relate to 212 subjects including 106 (50%) maternal deaths and 106 (50%) controls.

The mean age in deceased patients was 27.06 ± 6.45 years with extremes of 15 and 45 years; 27.10 ± 6.30 years with extremes of 14 and 45 years in controls. The proportion of unaccompanied patients, patients referred without a referral form and without venous access was greater among the deceased women than among the controls with respective P-values at 0.008, 0.021 and 0.001 (**Table 1**).

There were more women who had not performed Ante Natal Consultation (ANC) among the deceased than among the controls with $p < 0.001$.

The number of miscarriages ($p = 0.029$) and the number of children who died ($p = 0.04$) were associated with maternal mortality (**Table 2**).

There was no significant difference between patients in the death group and controls for indirect obstetric causes, $p > 0.05$.

Association reports between clinic and maternal deaths analyzed in **Table 3** show a significant difference.

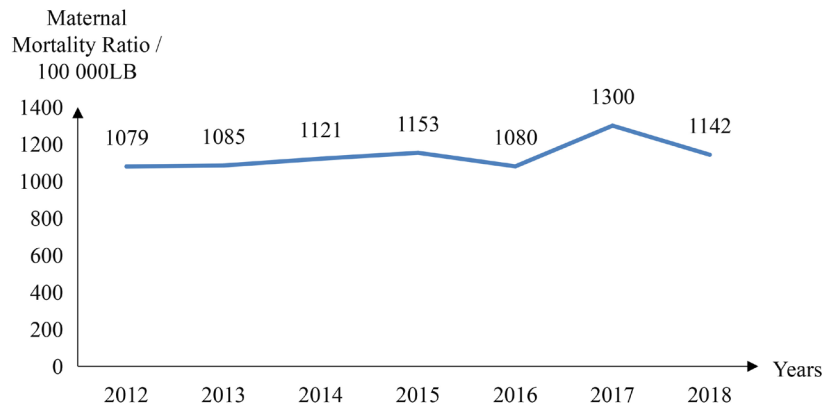


Figure 1. Distribution of the mortality ratio from 2012 to 2018 in gynecology and obstetrics department of CHUD-B in Parakou.

Table 1. Distribution of the 212 women studied according to a companion presence during the referral, referral form and venous access from 2012 to 2018 in gynecology-obstetrics department of CHUD-Borgou.

	Cases		Controls		OR	IC _{95%}	p
	n	(%)	N	(%)			
Referrals (140 cases)							
Accompanied							0.008
Yes	2	2.67	10	15.38	0.15	0.03 - 0.72	
No	73	97.33	55	84.62	1		
Referral form							0.021
Yes	17	22.67	26	40.00	0.44	0.21 - 0.92	
No	58	77.33	39	60.00	1		
Venous access							0.001
Yes	42	56.00	18	27.69	3.32	1.64 - 6.75	
No	33	44.00	47	72.31	1		

Table 2. Distribution of the 212 women studied according to pregnancy follow-up, obstetric history from 2012 to 2018 in the gynecology and obstetrics department of CHUD-Borgou.

	Cases		Controls		OR	IC _{95%}	p
	n	(%)	N	(%)			
Antenatal consultations							<0.001
Yes	29	27.36	71	66.98	0.19	0.10 - 0.33	
No	77	72.64	35	33.02	1		
Obstetrical histories							
Number of miscarriage							0.029
<1	85	80.19	97	91.51	0.38	0.16 - 0.86	
≥1	21	19.81	9	8.49	1		
Number of deceased children							0.004
<1	78	73.58	95	89.62	0.32	0.15 - 0.69	
≥1	28	26.42	11	10.38	1		

Table 3. Distribution of the 212 women studied according to the time between the onset of symptoms and admission to hospital, general and hemodynamics condition, vital distress and intensive care management from 2012 to 2018 in gynecology-obstetrics department of CHUD-Borgou.

	Cases		Controls		OR	IC _{95%}	p
	N	(%)	N	(%)			
Time between the onset of symptoms (hours) and admission to hospital							<0.001
<24	52	49.06	68	64.15	0.16	0.07 - 0.40	
24 - 47	18	16.98	28	26.42	0.14	0.05 - 0.37	
48 - 71	3	2.83	3	2.83	0.21	0.04 - 1.28	
≥72	33	31.13	7	6.60	1		
General condition							<0.001
Good	15	14.15	98	92.45	0.01	0.01 - 0.03	
Poor	91	85.85	8	7.55	1		
Hemodynamic condition							<0.001
Stable	67	63.21	90	84.91	0.31	0.16 - 0.59	
Unstable	39	36.79	16	15.09	1		
Vital distress							<0.001
Yes	48	45.28	17	16.04	4.33	2.27 - 8.25	
No	58	54.72	89	83.96	1		

The relation between treatment modalities and maternal deaths is summarized in **Table 4**.

Diagnostic errors and unavailability of complementary investigations on time were related to maternal deaths (**Table 5**).

Basing on the multivariate analysis, woman's general condition on admission ($p < 0.001$) and third delay ($p = 0.002$) were the factors influencing maternal mortality (**Table 6**).

4. Discussion

In our study, intra-hospital maternal mortality ratio (RMMIH) recorded during the 07 years was 1100 per 100,000 LB. Denakpo *et al.* [13] in 2010 in Cotonou found 1042 deaths per 100,000 LB as a ratio. Higher RMMIH was recorded in 2003 in Benin by Saizonou *et al.* [14] and in Niger by Garba *et al.* [15] in 2010 (2640 deaths per 100,000 LB). But, Saleh *et al.* [16] in Egypt, MacDorman *et al.* [17] in Colombia and Tej Delladji *et al.* [18] in Tunis reported lower ratios with respectively 79; 20 and 41 deaths per 100,000 LB. The RMMIH therefore greatly varies from country to country and from region to region. That great variability results from the difference in the socio-health organization level of countries or regions.

Table 4. Distribution of the 212 women studied according to management adaptation to complementary investigation results, compliance with protocols and the third delay from 2012 to 2018 in the gynecology-obstetrics department of CHUD-Borgou.

	Cases		Controls		OR	IC _{95%}	p
	N	(%)	n	(%)			
Adaptation of management according to complementary investigations results							
Yes	15	14.15	6	5.66	2.75	1.02 - 7.38	0.032
No	91	85.85	100	94.34	1		
Etiologic treatment							
In compliance with the protocol	55	51.89	103	97.17	0.96	0.51 - 1.82	<0.001
Delay in performance	31	29.25	0	0.00	-	-	
Non-compliant with the protocol	20	18.87	3	2.83	1		
Third delay							
Yes	58	54.72	2	1.89	62.83	14.73 - 268.00	<0.001
No	48	45.28	104	98.11	1		

Table 5. Distribution of the 212 women studied according to the diagnosis rightness and the time taken to get complementary investigations results from 2012 to 2018 in the gynecology and obstetrics department of CHUD-Borgou.

	Cases		Controls		OR	IC _{95%}	p
	n	(%)	n	(%)			
Diagnosis							
Right	87	82.08	104	98.11	0.19	0.04 - 0.88	<0.001
Non-established	10	9.43	0	0.00	-	-	
Wrong	9	8.49	2	1.89	1		
Complementary investigations results							
Performed on time	64	60.38	93	87.74	0.21	0.11 - 0.43	<0.001
Delay in performance	42	39.62	13	12.26	1		

Table 6. Logistic model of factors associated with maternal mortality in multivariate analysis.

Facteurs associated	OR Adjusted	IC _{95%}	p
General condition	62.97	1.91 - 208.10	<0.001
Hemodynamic condition	22.56	0.67 - 756.81	0.082
Vital distress	0.05	0.00 - 0.74	0.078
Diagnosis	0.28	0.01 - 15.34	0.536
Complementary investigations	0.34	0.03 - 3.87	0.382
management adapted to the complementary investigations	8.57	0.33 - 220.11	0.194
Etiologic treatment without protocols	0.03	0.00 - 0.74	0.032
Third delay	7.49	2.12 - 26.52	0.002
Inadequate management	0.10	0.03 - 0.37	0.001

On univariate analysis, several factors are identified as being associated with maternal mortality. Among these factors, there is the place of residence. Women who lived in rural areas were twice more likely to die than those living in urban areas in this study, by contrast with Godefay *et al.* [19] who did not find a significant link between the living environment and maternal mortality. In Benin, women living in rural areas are housewives. As a result, pregnancies are not well followed and deliveries take place without qualified assistance. Thus, women who have not performed ANC are five times more likely to die than those who had at least four antenatal visits. For Yambare *et al.* [20] in Congo, the risk of death is three times higher among those who did not have a good follow-up. Nair *et al.* [21] and Bauserman *et al.* [22] reported that inadequate use of care is a contributing factor in maternal death and 20% to 40% of complications are detected during pregnancy follow-up. Pregnancy follow-up therefore appears to be a necessary strategic complement to reduce maternal mortality [23].

Referrals made without support from a health worker as companion contributed seven times more to maternal death. Under these conditions, the continuum of care is not ensured during transport even if a venous access has been put in place before evacuation. As a consequence, a venous access presence is not the assurance of a continuum of care. It only indicates the passage in a health structure before admission. Similarly, patients referred without documents providing information on their condition and the level of care received before the referral died twice as frequently.

In Congo [24] and Chad [25], when the delay is greater than 72 hours, it is often associated with maternal death; as Moyo *et al.* [26] reported with a significant link between delay in seeking care and maternal death. Death also occurred 4 times more in a context of vital distress.

Based on multivariate analysis, the woman's general condition at admission ($p < 0.001$) and the third delay ($p = 0.002$) were the factors influencing maternal mortality. The third delay included inadequate management ($p = 0.001$) which included delay in initiating aetiologic treatment and non-compliance with protocols ($p = 0.032$). Inadequate management contributes 63 times more to maternal death. This situation reflects shortages in human resources, medico-technical equipment and emergency kits; all made worse by the frequent lack of blood supply. That third delay was found in significant proportions in series by Mgawdere *et al.* [25] (96.8%) and that of Agan *et al.* [26] (48.5%). Only the poor condition on admission and inadequate management were associated with maternal mortality after a multivariate analysis.

Limit of the Study

The type of case-control study made it possible to determine the factors associated with maternal mortality and to measure the risk of maternal death. However, it should be noted that this was a retrospective collection study and like all studies of this type, the present study is limited by the fact that it uses obstetric

records that are often insufficiently completed in the context of extreme urgency. This limit means that certain variables can sometimes be missing or that their level. With regard to the methodology, we can say that the objective is reached that the results obtained are valid

Conflicts of Interest

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

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