

Epidemiologic Profile of Maternal Deaths in Two Referral Hospitals in Cameroon

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Abstract

Introduction: Our objective was to compare the epidemiologic profile of maternal mortality in two structures serving as referral levels of care in Cameroon. **Methodology:** This cross-sectional, comparative study took place at the maternities of the Yaoundé Central Hospital (YCH) and the Bamenda Regional Hospital (BRH) from December 1st 2014 to May 31st 2015, a 6 months' period. The medical records of deceased women over 5 years, from January 2010 to December 2014, were collected. We calculated the MMR (Maternal mortality rate) and studied the causes and risk factors associated with maternal death. The Epi info software 3.5.4 was used to analyze data with a significance level of $P < 0.05$. **Results:** The maternal mortality ratio (MMR) was 964 and 247 per 100,000 live births for YCH and BRH, respectively. More deaths occurred within the aged group range 20 to 34 years, 76.8% at YCH and 64.7% at BRH. At YCH, 70.7% of these patients were referrals versus 32.4% at BRH. Complication from abortion was often implicated at BRH ($P = 0.007$; $OR = 0.31$; $CI = 0.13 - 0.74$). Others causes were hemorrhage (YCH = 43.4%; BRH = 35.5%), hypertensive diseases (YCH = 17.2%; BRH = 14.7%) and infections (YCH = 8.1%; BRH = 17.6%). At YCH time elapsed from admission to death was <3 h ($P = 0.005$; $OR = 6.63$; $CI = 1.49 - 29.5$). **Conclusion:** Both hospitals have similar causes of maternal deaths, differing only in the context within which

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the deaths occurred. Improving access to good quality health care, satisfying unmet needs for family planning, availability of blood products and the establishment of health insurance could decrease the maternal mortality rate.

Keywords

Maternal Mortality, Causes, Maternal Death, Referral Hospital, Cameroon

1. Introduction

Maternal mortality is an indicator of the quality of the healthcare system in a country or a region thereof. Maternal death is a tragedy since it occurs most of the time, at the end of a normal process. According to WHO [1], 830 women die each day from preventable causes associated with pregnancy and delivery, and 99% of these deaths occur in developing countries.

Maternal mortality remains a major public health issue despite the disparities in the different regions of the world. The maternal mortality ratio is 16 per 100,000 and 230 per 100,000 live births in industrialized and developing countries, respectively [2]. However, Sub-Sahara Africa has the world's highest maternal mortality rate at 510 deaths per 100,000 live births [2].

Cameroon has one of the world's highest maternal mortality ratio, occupying the 9th position worldwide [3]. Though was observed a 44% decrease between 1990 and 2015 at the global level [1], the maternal mortality rate has steadily risen in Cameroon despite the increase number of strategies proposed by the government to crush maternal mortality. It rose from 430 to 782 per 100,000 live births from 1998 to 2014 [4].

Most of the causes of maternal deaths are known and are preventable [2] [5] [6]. In 1987, WHO developed an initiative of risk-free birthing aimed at reducing MMR. One of the four features of this initiative is accessibility to emergency obstetrical and neonatal care. Delay in administering emergency care is a determining factor in the fight against MM in a hospital setting [7] [8].

Maternal deaths occur in hospital settings as well as in the community. However, only hospital data are used in assessing the scope of the problem. The level of maternal deaths may shed light on the inequalities in accessing health care services, and deficiencies in the healthcare system [1], and thus guide strategic interventions aimed at reducing the MMR.

All levels of the healthcare pyramid are involved in the fight against MM. By studying the factors influencing MM, we will better appreciate the work still needed to deflect the MM curve. The goal of this study was to compare the epidemiologic profiles of maternal deaths in a regional hospital to a central hospital, both of which, are reference hospitals of the same levels.

2. Methods

It was a retrospective, cross-sectional and comparative study which lasted over 6 months, from 1st December 2014 to 31st May 2015, at the maternity of Yaoundé Central Hospital (HCY) and in the Department of Obstetrics and Gynecology of the Bamenda Regional Hospital (BRY). YCH even though has the Regional status, is one of the four University Teaching Hospitals in Yaoundé, the political capital of Cameroon. Its geographical location and accessibility to care, place it at the forefront of health care facilities in this town. BRH, located about 360 km from Yaoundé, is a Regional hospital with the highest level of care in the region. It has 02 obstetrician-gynecologists and average technical standards. Both hospitals have all the professional grade working within.

After obtaining appropriate consent for our study, we collected medical records of all women who died over a 5-year period in the aforementioned departments from January 2010 to December 2014.

The records included women who died during pregnancy, delivery or postpartum. We also documented the number of live births during the same period. Our study excluded medical records of deceased women who had no evidence of pregnancy.

The variables studied were: age, level of education, matrimonial status, profession, gravid state, parity, number of prenatal consultations, gestational age at time of death, type of admission, admission diagnosis, overall well-being on admission, mode of delivery, fate of neonate, location of delivery, time elapsed from admission to

death, causes of death (direct and indirect).

Data were analyzed using Epi Info software version 3.5.4. Results for quantitative variables were presented as mean (\pm standard deviation) versus frequencies for qualitative variables. Comparative analyses were done using Fisher Exact and Chi-square tests. The difference was statistically significant for $P < 0.05$. The measure of association used odds ratio (OR) with its confidence interval (CI) set at 95%.

3. Results

During the period of study, 173 maternal deaths and 17 943 live births were registered at the YCH, giving a maternal mortality ratio of 964/100 000 live births. During the same period 41 maternal deaths and 16 596 live births were reported at the BRH, giving a maternal mortality ratio of 247/100 000 live births (**Table 1**).

Our final analysis included 99 medical records from YCH (99/173; 57.2%) and 34 from BRH (34/41; 82.9%). Patients' ages varied between 16 and 43 years with a mean age of 27.9 ± 6.3 ; 28.4 ± 7.1 and 27.2 ± 5.9 years in Yaoundé and Bamenda, respectively. The age group 20 to 34 years was most represented, 76.8% at YCH and 64.7% at BRH. Women with a secondary education level were mostly implicated (54.8%). At BRH, the death toll was highest among married women ($P = 0.002$; OR = 0.27; CI = 0.11 - 0.65). Maternal age, level of education, matrimonial status, profession, gravid state, parity, and number of prenatal consultations done were similar in both hospitals (**Table 2**).

Place of delivery, fate of neonate and admission diagnosis were similar in both hospitals (**Table 3**).

There were more deaths prior to 28 weeks gestation at BRH ($P = 0.007$; OR = 0.31; CI = 0.13 - 0.74). More deaths occurred less than 3 h from admission at YCH ($P = 0.005$; OR = 6.63; CI = 1.49 - 29.5) (**Table 4**).

Death related to medical causes were comparable in both hospitals (**Table 5**).

Of the direct causes of death at BRH shown in **Figure 1**, post-abortion sepsis was contributory (6/25; 24%). This is contrary to YCH where deaths resulting from post-abortion sepsis and puerperal sepsis were seen, 6.9% (5/72) and 4.2% (3/72) respectively. Disseminated Intravascular Coagulation was a frequent cause of death at YCH (12/72; 16.7%) as compared to 4% (1/25;) found at BRH. Uterine rupture was not registered as a cause of death at BRH versus 5 (5/72; 6.9%) at YCH.

4. Discussion

Our study showed that the maternal mortality ratio (MMR) was 3.9 times higher at YCH (964/100,000 live births) than at BRH (247/100,000 live births). In India and Nigeria several authors report MMR between 90 and 151 per 100,000 live births [6] [9] [10]. Yaoundé is more cosmopolitan than Bamenda. This cultural differences may influence patient care.

The high MMR at YCH is due to the high number of referred cases received, 70.7% of deceased women were referred versus 32.4% at BRH. This finding could be supported by the fact that referred women arrived at YCH in a hemodynamically compromised state, and more died 3 hours after arrival at YCH than BRH, 29.3% and 5.9% respectively. FOMULU *et al.* [11] found that 82.05% of women who died were referred from other healthcare facilities. Tort *et al.* [12] showed that referred cases increased the risk of death 13 fold in cases of post-partum hemorrhage.

Table 1. Maternal mortality rate from 2010 to 2014 at YCH and BRH.

Year	Yaoundé Central Hospital			Bamenda Regional Hospital		
	Number of live births	Number of deaths	MMR	Number of live births	Number of deaths	MMR
2010	3463	42	1212.8	3204	8	249.7
2011	3300	38	1151.5	3228	8	247.8
2012	3673	27	735.1	3313	4	120.7
2013	3666	37	1009.3	3203	8	249.8
2014	3841	29	755.0	3648	13	356.4
Total	17943	173	964.2	16596	41	247.1

Table 2. Socio-demographic characteristics of deceased women at YCH and BRH. 2010-2014.

variables	YCH	BRH	P value	OR (*CI)
	N = 99	N = 34		
	N (%)	N (%)		
Age (yrs.)				
<19	8 (8)	4 (11.8)	0.517	0.66 (0.19 - 2.35)
20 - 24	25 (25.3)	8 (23.5)	0.841	1.1 (0.44 - 2.74)
25 - 29	24 (24.2)	6 (17.6)	0.427	1.49 (0.55 - 4.03)
30 - 34	27 (27.3)	8 (23.5)	0.671	1.22 (0.49 - 3.02)
35 - 39	9 (9)	7 (20.6)	0.075	0.39 (0.13 - 1.15)
>40	3 (3)	1 (2.9)	1.000	1.03 (0.1 - 10.25)
Not specified	3 (3)	0 (0)	0.306	
Educational Level				
Tertiary	10 (10.1)	2 (5.9)	0.458	1.8 (0.37 - 8.66)
Secondary	58 (58.6)	15 (44.1)	0.144	1.79 (0.82 - 3.93)
Primary	25 (25.3)	8 (23.5)	0.841	1.1 (0.44 - 2.74)
None	1 (1)	3 (8.8)	0.021	0.11 (0.01 - 1.1)
Not specified	5 (5)	6 (17.6)	0.021	0.25 (0.07 - 0.88)
Matrimonial status				
Single	49 (49.5)	6 (17.6)	0.001	4.57 (1.74 - 12)
Married	46 (46.5)	26 (76.5)	0.002	0.27 (0.11 - 0.65)
Not specified	4 (4)	2 (5.9)	0.655	0.67 (0.12 - 3.83)
Profession				
Employed	31 (31.3)	17 (50)	0.0503	0.46 (0.21 - 1.02)
Unemployed	64 (64.6)	15 (44.1)	0.035	2.32 (1.05 - 5.12)
Not specified	4 (4)	2 (5.9)	0.655	0.67 (0.12 - 3.83)
Gravid state				
1	18 (18.2)	6 (17.6)	1.000	1.04 (0.38 - 2.88)
2	20 (20.2)	7 (20.6)	1.000	0.98 (0.37 - 2.57)
3 - 4	29 (29.3)	10 (2.4)	1.000	0.99 (0.42 - 2.33)
≥5	26 (26.3)	8 (23.5)	0.751	1.16 (0.47 - 2.88)
Not specified	6 (6)	3 (8.8)	0.577	0.67 (0.16 - 2.84)
Parity				
0	20 (20.2)	7 (20.6)	1.000	0.98 (0.37 - 2.57)
1 - 2	41 (41.4)	11 (32.4)	0.351	1.48 (0.65 - 3.37)
3 - 4	23 (23.2)	10 (2.4)	0.471	0.73 (0.3 - 1.75)
≥5	9 (9)	3 (8.8)	1.000	1.03 (0.26 - 4.05)
Not specified	6 (6)	3 (8.8)	0.578	0.67 (0.16 - 2.84)

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PNC				
0	21 (21.2)	10 (2.4)	0.330	0.65 (0.27 - 1.57)
1	5 (5)	2 (5.6)	0.841	0.85 (0.16 - 4.6)
2	16 (16.2)	2 (5.6)	0.130	3.08 (0.67 - 14.16)
3	18 (18.2)	4 (11.8)	0.386	1.67 (0.52 - 5.34)
4	11 (11.1)	3 (8.8)	0.708	1.29 (0.34 - 4.93)
≥5	12 (12.1)	7 (20.6)	0.224	0.53 (0.19 - 1.48)
Not specified	16 (16.2)	6 (17.6)	0.841	0.9 (0.32 - 2.52)

%; percentage; OR: Odds Ratio; CI: confidence interval.

Table 3. Admission diagnosis of deceased women at YCH and BRH. 2010-2014.

Variables	YCH N = 99 N (%)	BRH N = 34 N (%)	P value	OR (CI)
Referred patients				
Yes	70 (70.7)	11 (32.4)	0.000	5.05 (2.18 - 11.68)
No	29 (29.3)	23 (67.6)		0.2 (0.09 - 0.46)
Emergency admissions				
Post-partum hemorrhage	18 (18.2)	1 (2.9)	0.028	7.33 (0.94 - 57.17)
Abortion	11 (11.1)	8 (23.5)	0.074	0.41 (0.15 - 1.13)
Hypertensive disease	17 (17.2)	5 (14.7)	0.740	1.2 (0.41 - 3.55)
Antepartum hemorrhage	9 (9.1)	1 (2.9)	0.240	3.3 (0.4 - 27.06)
Non-emergency admissions				
	44 (44.4)	19 (55.9)	0.249	0.63 (0.29 - 1.38)

%; percentage; OR: Odds Ratio; CI: confidence interval.

Death occurred within 24 hours of admission at the YCH (75.6%) as against 58.9% at BRH. Other authors found rates similar to the latter [6] [10]. Limited resources for resuscitation, such as, oxygen in the emergency unit, emergency crash carts, a proficient emergency medical team and lack of blood products could explain the time lapse from arrival to death at YCH. Untimely referrals and delay in management have also been reported in the literature [7] [10].

Most women died in the post-partum with 83.8% occurring at YCH versus 61.8% at BRH. There were more deaths post-abortum at BRH, 38.2%. This can be explained by the fact that in Bamenda, most of these abortions are unsafe and believed to be done by drug vendors. Children out of wedlock is still frowned upon. Unwanted pregnancies, low level of education and socio-economic status place these women at higher risk of illicit pregnancy termination.

Similar to TU AGAN *et al.* [6], more deaths occurred between ages 20 and 34 years, 76.8% at YCH and 64.7% at BRH. Other authors reported death occurring in older women [10]. Compared to BRH, women who died at YCH had at least a secondary level of education (68.7%), a more superior level than those at BRH, where only half of them had this level of education.

There were more married women at BRH (76.5%) than at YCH where single women were more representative (49.5%). Cohabitation is more frequently seen in rural settings. Maternal deaths occur more often in married women [6]. Most of the women who died at YCH were unemployed (64.6%) versus 44.11% at BRH. Financial constraints contributed to the delay in management at YCH since patients and their families were to pay for all the costs of care upon arrival. Delay in management is usually incriminated as cause of death in hospital settings [6].

Table 4. Risk factors associated with maternal deaths at YCH and BRH. 2010-2014.

Variables	YCH	BRH	P value	OR (CI)
	N = 99	N = 34		
	N (%)	N (%)		
Referred patients				
Yes	70 (70.7)	11 (32.4)	0.000	5.05 (2.18 - 11.68)
No	29 (29.3)	23 (67.6)		0.2 (0.09 - 0.46)
Gestational age at time of death (weeks)				
Post abortum	16 (16.2)	13 (38.2)	0.007	0.31 (0.13 - 0.74)
Post-partum	83 (83.8)	21 (61.8)		
Delivery at a health care facility				
Yes	53 (53.5)	12 (35.3)	0.066	2.11 (0.94 - 4.73)
No	46 (46.5)	22 (64.7)	0.066	0.47 (0.21 - 1.05)
Fate of newborn				
Alive	31 (31.3)	13 (38.2)	0.458	0.74 (0.33 - 1.67)
Stillborn	22 (22.2)	4 (11.8)	0.185	2.14 (0.68 - 6.73)
Not specified	4 (4)	0 (0)	0.233	
Time elapsed from admission-death (hours)				
<3	29 (29.3)	2 (5.9)	0.005	6.63 (1.49 - 29.5)
[3 - 24]	46 (46.5)	18 (52.9)	0.512	0.77 (0.35 - 1.68)
[24 - 48]	9 (9.1)	3 (8.8)	1.000	1.03 (0.26 - 4.05)
[48 - 72]	1 (1)	2 (5.9)	0.099	0.16 (0.01 - 1.82)
D4 - D6	5 (5.1)	4 (11.8)	0.179	0.4 (0.1 - 1.59)
>7	6 (6.1)	2 (5.9)	1.000	1.03 (0.2 - 5.36)
Not specified	4 (4)	3 (8.8)	0.281	0.44 (0.09 - 2.07)

%; percentage; OR: Odds Ratio; CI: confidence interval.

Table 5. Medical causes of maternal death at YCH and BRH. 2010-2014.

Causes of death	YCH	BRH	P value	OR (CI)
	N = 99	N = 34		
	N (%)	N (%)		
Direct causes	72 (72.7)	25 (73.5)	0.371	1.52 (0.6 - 3.84)
Hemorrhage	43 (43.4)	12 (35.3)	0.406	1.41 (0.63 - 3.16)
Infections	8 (23.5)	6 (17.6)		
Hypertensive disease	17 (17.2)	5 (14.7)	0.740	1.2 (0.41 - 3.55)
Others	4 (4)	2 (5.9)		
Indirect causes	21 (21.2)	4 (11.8)	0.224	2.02 (0.64 - 6.37)
Not specified	6 (6.1)	5 (14.7)		

%; percentage; OR: Odds Ratio; CI: confidence interval.

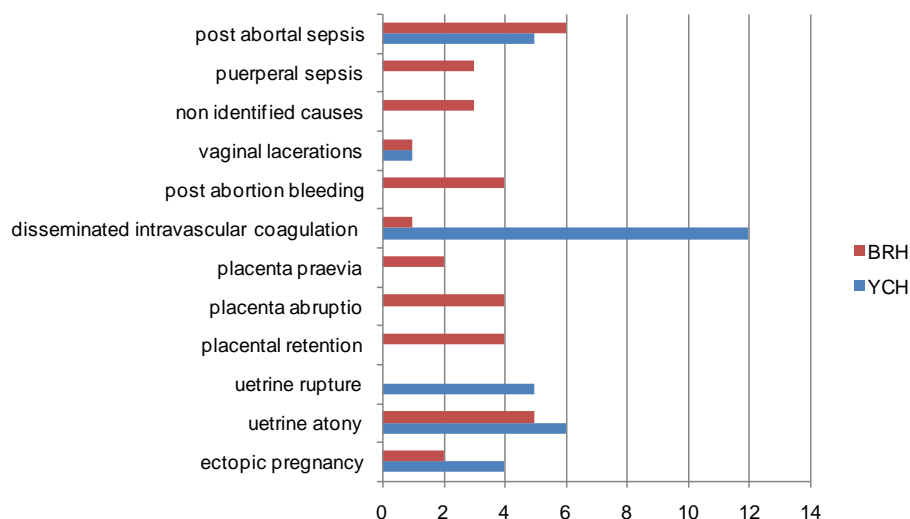


Figure 1. Direct causes of maternal death.

Adolescents accounted for 9% of maternal deaths, 8.1% at YCH and 11.8% at BRH. Financial constraints and single parenthood favor unsafe abortions and their consequences. Failure to receive antenatal care can result in the death of pregnant adolescents.

Most of the causes of death were direct, 72.7% and 73.5% at YCH and BRH, respectively. As with other authors hemorrhage is the first cause of death [13]. At the top of the list of causes were hemorrhage (43.4%) and hypertensive diseases (35.5%) at YCH, whereas at BRH hemorrhage topped the list (35.5%), followed by infection (17.6%) and hypertensive diseases (14.7%). Death due to septic abortion occurred in 10.5% of cases. Induced abortions and illicit providers are responsible for this finding.

Indirect causes of death occurred in 18.8% of cases. These included, at the forefront, anemia, meningitis and complications of AIDS. Other authors found similar rates [10]. The high frequency of anemia in malaria-endemic areas make it a likely cause since sub-optimal hemoglobin levels can become critical, in addition to anemia decreasing one's ability to fight infection. TEBEU *et al.* [5] showed that anemia caused death in 12.7% of cases. Anemia prior to delivery increases the risk of death 4 to 6 fold [9] [12].

Some limits of this study should be considered. It was a retrospective study that used medical records that were filled in emergency situations in a system with a sub-optimal archival services for medical records. We included only deaths which occurred in the maternities. For these reasons, some selection bias has to be considered. While MMR is likely underestimated, our findings can certainly be used to explore this subject in both hospitals.

5. Conclusion

Our results showed that although seen in different proportions, the causes of maternal mortality are the same and will remain thus. The contextual causes are however different, dominated in Bamenda by abortion related complications and in Yaoundé by financial constraints and lack of blood products. We recommend a review of the health delivery system through the improvement of accessibility and affordability to healthcare, as well as the introduction of a health insurance scheme to ensure prompt management of emergency cases. And finally, the creation of blood transfusion system with a national policy for donors will contribute to a quicker access to blood transfusion.

Conflict of Interest

The authors declare no conflict of interests.

Authors' Contributions

Nana P.J., Medoua KKES, Dohbit J. conceived the study, participated in the study design and collection data.

Essiben F. has been involved in analysis and interpretation of data and drafting the manuscript. Lifanji Morfaw, Eko F. and Esiene A. participated in data collection and review of the article. Mbu R. supervised the study. All authors have read and approved the final manuscript.

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