

## The Impact of Audits of Maternal Deaths and Near Miss at University Hospital of Mother and Child Lagoon (Benin)

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### Abstract

**Introduction:** The maternal deaths audit is one of the three major strategies recommended by WHO for the reduction of maternal and neonatal mortality.

**Objective:** To measure the impact of maternal death and near miss review on maternal mortality and morbidity after 7 years of practice at the University Hospital of Mother and Child "Lagoon" of Cotonou.

**Methodology:** It was a transversal, descriptive, and analytical study with retrospective data from 1<sup>st</sup> January 2007 to 31<sup>st</sup> December 2013. The studied population consisted of maternal deaths cases and of near miss occurred in the hospital during the study period.

**Results:** During the study period, the hospital registered a total of 321 maternal deaths, 3825 perinatal deaths and 3827 of near miss. The frequency of maternal death review was 18.7%, the perinatal death of 0.2% and the near miss 0.4%. The most frequent disorders were inadequate reference (69.7%), inadequate treatment (53%), poor supervision (62.1%) and poor files documentation (49.9%). Globally, the period of conducting clinical review was significantly associated with decreased postpartum hemorrhage ( $p < 0.001$ ), pre-eclampsia and eclampsia episodes ( $p < 0.001$ ) and the occurrence of uterine rupture ( $p = 0.02$ ). The occurrence of HRP decreased from 2007 to 2013, but this decrease was not statistically significant ( $p = 0.09$ ). However, there was a significant decrease between 2006 and 2007 (reference period), between 2008 and 2006 and between 2010 and 2006. There is a tendency to lower placenta praevia episodes from 2008-2013 but this decrease does not statistically significant ( $p = 0.18$ ). Moreover, a significant increase in cases of placenta praevia is observed between 2006 and 2007 ( $p = 0.02$ ).

**Conclusion:** The introduction of maternal death audits is a good approach to reducing maternal mortality and morbidity. However the decrease in indicators of our study can't be solely attributed to the effect of audits.

### Introduction

Maternal mortality is a major public health issue in the Third World countries, especially in sub-Saharan Africa. Truly, in 2008 Maternal Mortality Ratio (MMR) averaged between 470 and 930 maternal deaths per 100,000 live births (NV) in poor countries, versus 13-16 maternal deaths per 100,000 live births in the country developed [1]. In Benin, in 2006, it was estimated at 397 maternal deaths per 100 000 NV [2,3]. To reduce maternal and neonatal mortality, especially those related to third delay, the World Health Organization (WHO) recommends three major strategies which are the implementation of recommendations for Care in Obstetric and Neonatal Emergency Care (EmONC), skilled attendance at delivery and review / audit of maternal deaths and near misses. Studies in sub-Saharan Africa have shown that the implementation of the practice of the review / audit of death reduced significantly maternal mortality. In Benin, this strategy started at University hospital of mother and child Lagoon (CHU-MEL) in 2007. In our study, we proposed to evaluate their effectiveness after 7 years of practice. Objectives: Assessing the impact of audit of maternal

death and near miss on mortality and maternal morbidity after 7 years of practice at CHU-MEL in Cotonou.

### Framework and Methodology

It was a transversal, descriptive, and analytical study with retrospective data that took place at the CHU-MEL from 1st January 2007 to 31st December 2013. The study population was constituted by the maternal deaths and near miss which occurred in CHU-MEL and have been reviewed. Have been included in or study, all pregnant women in labor or who have given birth or died, or victims of maternal morbidity. All cases of death and serious maternal morbidity which record and/or audit summary were not found, were excluded from the study. Our sample was exhaustive. Our dependent variables were maternal mortality (variable used in a binary form: coded as "1" for death and "0" if the woman did not die, and quantitatively: number of deaths per year) and severe maternal morbidity (used variable binary form: coded 0 if the woman has severe complication and 1 death in the cases and quantitatively: number of near misses per year).

Our independent variables consisted of variables related to reviews of maternal deaths (date of completion, time between death and auditing, availability of report, positive and/or negative audit, possibility of death eviction), variables related to near miss audits (realization date, time between the complication and auditing, availability of audit report, positive and/or negative audit). Morbidity was assessed on the five known pathologies of near miss: the postpartum haemorrhage, preeclampsia/eclampsia, uterine rupture, placenta praevia and placental retro hematoma (PRH). The processing and data analysis were made by Epidata and Stata software. The logistic regression model was used to investigate the impact of the conduct of audits on mortality and maternal morbidity at a significance level of 5%.

## Results

During the study period, CHU-MEL registered a total of 321 maternal deaths, 3825 perinatal deaths and 3827 near miss. 86 audits were conducted of which 60 maternal deaths, 9 of perinatal deaths and 17 near misses. The frequency of maternal death audits was 18.7%, the perinatal death of 0.2% and the near miss of 0.4%. 66 audit reports with their medical records were available. The average time between the occurrence of complications and the conduct of audits was 81.9 days with extremes of 17 and 180 days. The main diseases involved in the 66 cases were the exploitable haemorrhage with 30.3%, eclampsia/preeclampsia with 18.2%, uterine rupture with 16.7%, and the HRP placenta praevia with 7.6% each. The other conditions were represented by anemia (6%), the help syndrome (4.5%), peritonitis postpartum / post abortion (3%), the uterine pregnancy (3%) and endometritis (1.5%).

## Disorders and Recommendations Implementation

The most frequent disorders were inadequate reference (69.7%), inadequate treatment (53%), poor supervision (62.1%) and poor documentation (49.9%). During the reviews, about 244 recommendations were issued to the peripheral health facilities place of CHU-MEL and the Ministry of Health. The level of implementation of recommendations was variable depending on the year: The rates of executed recommendations ranged from 22.2% to 72.7% between 2012 and 2013. The rate of unexecuted recommendations ranged from 26.5% in 2008 and 44.4% in 2012. Unconfirmed recommendations rate ranged from 7% in 2010 and 33.3% in 2012.

## Impact of Reviews on Mortality and Morbidity Indicators

Table 1 shows the relationship between the achievement of maternal deaths and near miss reviews at CHU-MEL and other maternal deaths occurred during the study period. We note that there is a statistically significant relationship between the two (See Table 1).

Year	Regression coefficient	IC 95%	P-value	global P-value
2006 *	0.2	[-1.6; 1.9]	0.86	<0.001
2007	-1.4	[-3.2; 0.4]	0.13	
2008	-2.1	[-3.9; -0.3]	0.03	
2009	-3.6	[-5.4; -1.6]	<0.001	
2010	-3.6	[-5.4; -1.6]	<0.001	
2011	-2	[-3.8; -0.2]	0.03	

2012	-2.2	[-3.9; -0.3]	0.02
2013	-3.3	[-5.2; -1.5]	<0.001

**Table 1:** Relationship between the occurrence of maternal deaths and clinical audits at CHU-MEL from 2006 to 2013.

Globally, the period of conducting clinical audits was significantly associated with the decrease of postpartum hemorrhages ( $p < 0.001$ ). There is a gradient decrease from 2007 to 2013 (-12.3 to -25.9) with a mean difference each year statistically different compared to that of 2006 (base year).

Preeclampsia and eclampsia occurrences were globally significantly reduced during the study period ( $p < 0.001$ ). After 7 years of clinical audits, the average rate of preeclampsia and eclampsia occurrences was significantly lower in 2013 than in 2007 ( $dm = -5.9$ ;  $p = 0.02$ ). This decrease was also observed for episodes rate eclampsia 2012 ( $dm = 6.6$ ;  $p = 0.006$ ), 2011 ( $dm = 7.8$ ;  $p = 0.001$ ), 2010 ( $dm = -9.3$ ,  $p < 0.001$ ), 2009 ( $dm = -5.1$ ;  $p = 0.003$ ) compared to 2007.

There was a significant decrease in the incidence of uterine rupture between 2009 and 2011 ( $p = 0.02$ ). From 2012 to 2013, a slight decrease was observed in uterine ruptures but the association was not statistically significant.

The occurrence of PRH decreased from 2007 to 2013 but this decrease was not statistically significant ( $p = 0.09$ ). However, we observe a significant decrease between 2007 and 2006 (reference period), between 2008 and 2006 and between 2006 and 2010.

Globally, there is a tendency to lower placenta praevia episodes from 2008-2013 but this decrease was not statistically significant ( $p = 0.18$ ). Besides, there was a significant increase in cases of placenta praevia between 2006 and 2007 ( $dm = 5$ ;  $p = 0.02$ ).

The audits conducting had no impact on uterine rupture and placenta praevia even if there is a lower trend (Table 2).

Year	Coefficient of regression	IC 95%	p-value	Global P-value
Delivery hemorrhages and reviews				
2007	-12.3	[-17.6; -6.9]	<0.001	<0.001
2008	-18.9	[-24.2; -13.6]	<0.001	
2009	-22.6	[-27.9; -17.3]	<0.001	
2010	-26.1	[-31.4; -20.7]	<0.001	
2011	-26.3	[-31.6; -20.9]	<0.001	
2012	-21.6	[-26.9; -16.3]	<0.001	
2013	-25.9	[-31.2; -20.6]	<0.001	
Pre eclampsies/eclampsies and reviews				
2007	Référence	-	-	<0.001
2008	-1.1	[-5.7; 3.6]	0.64	
2009	-5.1	[-9.7; -0.4]	0.03	
2010	-9.3	[-13.9; -4.7]	<0.001	
2011	-7.8	[-12.5; -3.2]	0.001	

2012	-6.6	[-11.2; -1.9]	0.006	
2013	-5.9	[-10.8; -1.1]	0.02	
Uterine ruptures and reviews				
2007	0.5	[-0.8; 1.8]	0.45	0.02
2008	-0.7	[-1.9; 0.6]	0.31	
2009	-1.5	[-2.8; -0.2]	0.03	
2010	-1.6	[-2.9; -0.3]	0.02	
2011	-1.4	[-2.7; -0.1]	0.03	
2012	-0.6	[-1.9; 0.7]	0.38	
2013	-0.9	[-2.2; 0.4]	0.17	

**Table 2:** Relationship between near miss and audits from 2007-2013 at CHU-MEL.

## Discussion

The study has some limitations. In fact, our study is observational which does not allow us to establish a causal relationship between the conduct of reviews and indicators of maternal mortality and morbidity. An experimental or quasi-experimental design would be more appropriate to validate a possible causality. However, due to financial and time constraints, the experimental scheme was not implemented. Furthermore, a significant number of review reports and medical records that may influence our results was not available for exploitation. However, these limits do not hinder the validity of our results.

Among the failures recorded in the reviewed cases inadequate reference, poor supervision, inadequate treatment and poor documentation of medical records were the most reported and counted for 69.7%, respectively, 62.1%, 53% and 40.9%. These results are dependable and similar to those reported by Nyamtema and al. in Tanzania in 2010 [4] and Denakpo and al. in Benin in 2007 [5].

The recommendations made to the administration or caregivers to CHU-MEL were most executed. Those issued to bordering centers were mostly either unverified (unknown status) or not executed. The high rate of implementation of recommendations to CHU-MEL can be explained by the fact that it is the seat of the audits and the audit committee was represented by the CHU-MEL staff. The verification of the implementation of the recommendations was more accessible with ease for efficient monitoring of the latter. However, the real constraint lies at peripheral centers where lack of motivation at the nursing staff and especially the virtual absence of supportive supervision result in poor follow recommendations. All this indicates the importance of not only the applicable recommendations but accompanied by an effective monitoring system.

During our study, 18.7% of maternal deaths, 0.4% and 0.2% near miss perinatal deaths were reviewed. The higher results than ours were reported by van den Akker and al in Malawi [6] who found that 52.2% of maternal deaths and 6.2% of audited near miss for 2 years. Similarly, Gumanga and al. [7] in Ghana have reported a higher result to ours which was 49.6%. Our results could be explained by the irregular rhythm of the conduct of reviews and untimely strikes that paralyze our health system.

We observed a significant reduction of 24.8% of the maternal mortality ratio (MMR) as in other studies [6,8,9]. Higher results were reported by Galadanci and al., Ezugwu and al. in Nigeria who found respectively 43.5% and 47.5% reduction in MMR [9,10]. Similarly, Gumanga and al and Ganyaglo and al in Ghana, have found superior results in our which were respectively 41.4% and 31.6% [7,11]. This reduction in MMR could be explained by the practice of reviews on the one hand, and secondly by improving the reference system and then against the implementation of emergency obstetric care. Certainly, registered deaths are often the result of referrals as noted by Wellfens and al at the University Hospital of Cocody [12], Roopaand al. in India (86.9%) in 2012 [13] and Tuncalpand al (64.4%) in a literature review in 2011 [14]. Our study reported significant decreases in postpartum haemorrhage and eclampsia respectively 16.3% and 9.4%. For postpartum hemorrhage, results in line for a reduction were reported by van den Akkerand al [10] and lower results were reported by Ezugwu and al. [6] To eclampsia, higher results were found by Ezugwu and al. [10] The practice of reviews, the improving the peripheral caring and improving the referral and counter-referral system could explain the decrease of these different maternal morbidities.

## Conclusion

Even though maternal mortality remains high in Benin and especially in CHU-MEL, the introduction of maternal death review was a good approach for both their reductions as those of maternal morbidities. However the decrease of the indicators used in this study cannot be only attributed to the effect of the reviews. Hence, there's the need of an experimental study to better assess their actual impact on improving maternal and newborn health.

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