

# Trends in maternal mortality at the University of Calabar Teaching Hospital, Nigeria, 1999–2009

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**Background:** Maternal mortality remains a major public health challenge, not only at the University of Calabar Teaching Hospital, but in the developing world in general.

**Objective:** The objective of this study was to assess trends in maternal mortality in a tertiary health facility, the maternal mortality ratio, the impact of sociodemographic factors in the deaths, and common medical and social causes of these deaths at the hospital.

**Methodology:** This was a retrospective review of obstetric service delivery records of all maternal deaths over an 11-year period (01 January 1999 to 31 December 2009). All pregnancy-related deaths of patients managed at the hospital were included in the study.

**Results:** A total of 15,264 live births and 231 maternal deaths were recorded during the period under review, giving a maternal mortality ratio of 1513.4 per 100,000 live births. In the last two years, there was a downward trend in maternal deaths of about 69.0% from the 1999 value. Most (63.3%) of the deaths were in women aged 20–34 years, 33.33% had completed at least primary education, and about 55.41% were unemployed. Eight had tertiary education. Two-thirds of the women were married. Obstetric hemorrhage was the leading cause of death (32.23%), followed by hypertensive disorders of pregnancy. Type III delay accounted for 48.48% of the deaths, followed by Type I delay (35.5%). About 69.26% of these women had no antenatal care. The majority (61.04%) died within the first 48 hours of admission.

**Conclusion:** Although there was a downward trend in maternal mortality over the study period, the extent of the reduction is deemed inadequate. The medical and social causes of maternal deaths identified in this study are preventable, especially Type III delay. Efforts must be put in place by government, hospital management, and society to reduce these figures further. Above all, there must be an attitudinal change towards obstetric emergencies by health care providers.

**Keywords:** trends, maternal mortality, Nigeria

## Introduction

It is well known that the main indicator of a society's level of development is its state of maternal health, which also serves as an indicator of health care delivery system performance.<sup>1</sup> The ultimate failure of obstetric care is death of the mother, which often includes the baby as well. Reduction of maternal mortality is top on the agenda of many global efforts, such as the Safe Motherhood Initiative. Reduction in maternal deaths by 75% in 2015 is a cardinal target of the millennium development goals.<sup>1–3</sup> However, with less than six years to go until 2015, the year for realization of a two-thirds reduction in maternal mortality, Nigeria's maternal mortality figures remain unacceptably high, as in other countries in the developing world, even though the causes are mostly preventable. It is known that most midwives and obstetricians may go through their entire careers without seeing even one maternal death in the developed countries.<sup>4</sup> It would therefore

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appear that every woman in Nigeria in particular, and in the developing world in general, struggles to survive pregnancy, childbirth, and the puerperium. Compared with countries like Japan, which has a female life expectancy of 86.1 years, Nigeria has a female life expectancy of 47.3 years, and in this regard is ranked 182nd by the United Nations.<sup>5</sup> Even some of the sub-Saharan African states have better female life expectancy, including Ghana (60.5 years), Gambia (60.3 years), Togo (60.1 years), Chad (52.0 years), and Cameroon (50.8 years), and these figures are obviously better than those in Nigeria.<sup>5</sup>

The death of a woman during pregnancy or in pregnancy-related circumstances has an emotional impact not only on the attending health care provider but also on the family. As a result, maternal mortality continues to generate serious public health concerns because of its social, economic, and political implications.<sup>1</sup> It is even more worrisome when such deaths are preventable,<sup>6-9</sup> particularly when the factors that result in the three known delays are adequately tackled.<sup>1-3,6,10,11</sup> In 1991, Deborah Maine stated that delays in the management of pregnancy complications are the key determinants of maternal mortality in the developing countries.<sup>12</sup> Type I delay results from failure to seek medical treatment on time (40%); Type II delay results from difficulty in transportation (20%); and Type III delay occurs when the woman has arrived at the hospital (40%).<sup>1,13,14</sup> The third type of delay, that occurs within the health care facility, appears to be common throughout Nigeria in particular and in the developing countries in general.<sup>1</sup> The situation at the University of Calabar Teaching Hospital is no exception. We present recent trends in maternal mortality at this tertiary hospital, situated in the Niger Delta region of Nigeria, and providing tertiary health care to over 3.5 million people of the Cross River State of Nigeria and, until recently, Akwa Ibom State and the neighboring Republic of Cameroon and Equatorial Guinea.

The Cross River State of Nigeria covers a large area with a very difficult geographic terrain. It has a population of about 3,155,932 people, with a population growth rate of 2.99%, and 45.5% of the population are rural dwellers.<sup>15</sup> About 22% of the total population is in the reproductive age group (15–49 years).

## Materials and methods

This was a descriptive study of maternal deaths at the University of Calabar Teaching Hospital, which is the only tertiary health institution in the Cross River State (Niger Delta region) of Nigeria. Approval for this research was given by the Research and Ethics Committee of the hospital.

All the medical records of women who died in the obstetrics department between January 1999 and December 2009 were retrieved from the hospital medical records and reviewed for immediate and remote causes of death. A total of 231 maternal deaths were identified and subjected to in-depth analysis.

Factors analyzed included the sociodemographic characteristics of the women who died, the main causes of death, pattern of health-seeking behavior for antenatal care/delivery, and place of labor and delivery. Also assessed were the types of delays leading to maternal death, causes of maternal death in hospital, as well as duration of hospital stay before death.

## Results

During the study period, a total of 15,264 live births were recorded in the hospital. A total of 231 maternal deaths were recorded, giving a maternal mortality ratio of 1513.4 per 100,000 live births. No post mortem was conducted after any of these maternal deaths because of objections from relatives. The annual trend in maternal mortality in the hospital is shown in Table 1.

The relationship between annual pregnancy-related admissions, total maternal deaths, cases referred to the hospital, deaths among those referred, live births, and percentage survival are cross-tabulated in Table 2. A total of 18,728 pregnancy-related admissions were recorded, of which 18,510 (98.8%) survived. About 633 (3.4%) were referred either from hospitals of lower status or came unbooked, and 26.7% of those classified as referrals died. About 73.2% of those who died resulted from the referred cases.

Table 3 shows the sociodemographic characteristics of those who died in hospital during the review period. Most of the women (65.3%) who died were in the highly active reproductive age group (20–34 years), and 16.8% were

**Table 1** Annual trends in maternal mortality

Year	Total deliveries (live births)	Maternal deaths	MMR/100,000 live births
1999	826	25	3026.6
2000	874	30	3432.5
2001	905	23	2541.4
2002	901	22	2441.7
2003	935	20	2139.0
2004	1,197	17	1420.2
2005	1,229	9	732.3
2006	1,849	25	1352.1
2007	1,949	20	1026.2
2008	2,165	18	831.4
2009	2339	22	940.6
TOTAL	15,264	231	1513.4

**Abbreviation:** MMR, maternal mortality ratio (1513.4/100,000 live births).

**Table 2** Cross-tabulation of total admissions, deaths, referred cases, referred deaths, live births, and percentage of survivors

Year	Total admissions in labor (n)	Total deaths (n, %)	Total referred (n, %)	Total deaths from referrals (n, %)	Total live births (n)	Survivors (%)
1999	881	25	52	20	826	97.7
2000	968	30	61	22	874	97.7
2001	966	23	48	17	905	97.6
2002	948	22	50	16	901	97.7
2003	1146	20	58	13	935	98.3
2004	1614	17	72	11	1197	98.9
2005	1538	9	66	5	1229	99.4
2006	1874	25	60	22	1849	98.7
2007	2529	20	49	15	1949	99.2
2008	2963	18	55	11	2165	99.4
2009	3301	22	62	17	2339	99.3
Total	18,728	231 (1.2)	633 (3.4)	169 (26.7)	15,264	98.8*

\*Total maternal survivors = 18,510.

younger than 20 years. The age of about 7.4% of the women could not be ascertained. About 33.3% of those who died had completed at least primary education, while 25.1% had either partly or fully completed their secondary education. Eight women (3.5%) had tertiary education, while the educational attainment of about 23.4% was not stated. In total, 67.1% of the women were married, 26.8% were single, and about 6.1% were cohabiting. There were no recorded cases of separation

or divorce. Those who were unemployed constituted 55.4%. However, 21.2% were employed, 11.3% were students, while in 12.1% of cases occupation was not stated.

Table 4 shows the medical and social causes of the maternal deaths in hospital. Obstetric hemorrhage was the largest single cause of death, accounting for 33.4% of mortality. However, primary postpartum hemorrhage accounted for 28.6% of deaths. This was followed closely by hypertensive diseases

**Table 3** Sociodemographic characteristics of the maternal deaths

	Number	Percentage
<b>Age (years)</b>		
<15	7	3.0
15–19	32	13.8
20–24	49	21.2
25–34	102	44.2
35–44	24	10.4
Not stated	17	7.4
Total	231	100.0
<b>Educational level</b>		
Partial primary	34	14.7
Complete primary	77	33.3
Part secondary	28	12.1
Complete secondary	30	13.0
Tertiary	8	3.5
Not stated	54	23.4
Total	231	100.0
<b>Marital status</b>		
Married	155	67.1
Single	62	26.8
Cohabiting	14	6.1
Total	231	100.0
<b>Employment status</b>		
Employed	49	21.2
Unemployed	128	55.4
Student	26	11.3
Unknown	28	12.1
Total	231	100.0

**Table 4** Medical and social causes of maternal deaths

	Number of deaths	Percentage
<b>Medical cause</b>		
Antepartum hemorrhage	11	4.8
Postpartum hemorrhage	66	28.6
Prolonged obstructed labor/ruptured uterus	21	9.1
Sepsis	33	14.3
Severe pre-eclampsia/eclampsia	49	21.2
HIV/AIDS in pregnancy	11	4.7
Hepatitis/jaundice in pregnancy	3	1.3
Malaria/anemia in pregnancy	12	5.2
Ectopic pregnancy	6	2.6
Abortion	15	6.5
Anesthesia	4	1.7
Total	231	100.0
<b>Delays (n)</b>	20	8.6
Type I	82	35.5
Type II	17	7.4
Type III	112	48.5
Total	231	100.0%
<b>Causes of delay</b>		
Delayed referral	36	32.1
Lack/or inadequate blood	34	30.4
Refused blood transfusion	8	7.1
Inability to pay fees	15	13.4
Personnel problems	15	13.4
Lack of drugs/light/logistics	4	3.6
Total	112	100.0

**Table 5** Pattern of health-seeking behavior and duration of admission before death

	Number of deaths	Percentage
<b>Place of initial care</b>		
None	160	69.3
Hospital of lower status	44	19.0
Same hospital	27	11.7
Total	231	100.0
<b>Duration of admission before death (hours)</b>		
≤24	77	33.3
25–48	64	27.7
49–96	83	35.9
97 hours–10 days	5	2.2
>10 days	2	0.9
Total	231	100.0

of pregnancy (21.2%). Sepsis accounted for 14.3%, while obstructed labor/ruptured uterus was responsible for 9.1% of deaths. Anesthetic death from failed intubations and total spinal was responsible for 1.7% of the cases. The contribution of other medical causes to the deaths is shown in Table 4.

We also reviewed the delay phenomena in these maternal deaths. The analysis showed that in 8.6% of the cases there were no delays, 35.5% died as a result of Type I delay, while 7.4% had Type II delay. Type III delay was responsible for 48.5% of the maternal deaths. Of the 112 (48.5%) resulting from Type III delay, failure of the junior health care providers to call a senior staff member early enough to manage serious cases was responsible for 32.1% of the deaths. About 30.4% of the deaths were attributed to lack of or inadequate blood for transfusion, while 7.1% refused blood transfusion for religious reasons. Other causes of Type III delays in this study were inability to pay hospital fees (13.4%), personnel problems (13.4%), and lack of drugs and/or logistic issues (3.6%)

Patterns of health seeking behavior for antenatal care and delivery are shown in Table 5. About 69.3% of the patients had no documented antenatal care and were brought as unbooked emergencies. However, 19.0% of the women attended antenatal care in hospitals of lower status, and were referred to the teaching hospital following onset of complications. It was observed that 11.7% of the women who died were booked in at the teaching hospital. About 61.0% of the deaths occurred within 48 hours of admission, while 35.9% died thereafter, but within four days.

## Discussion

Maternal mortality remains a major public health issue, especially in the developing countries.<sup>1,6</sup> The maternal mortality ratio at the University of Calabar Teaching Hospital of 1513.4 per 100,000 live births during the study period is worrisome.

However, this is in agreement with similar studies from other parts of the country.<sup>1,6,19</sup> Teaching hospitals in developing countries deal with high-risk obstetric cases, and so more maternal deaths will be recorded.<sup>4</sup> The teaching hospital in Calabar is a referral center that receives all cases, including moribund ones, from within and outside the state. With the exception of this teaching hospital, accurate data collection on maternal deaths is lacking throughout the state in particular and in the country as a whole. Where available, the data are not comprehensive. It is therefore expected that the outlying mortality data will underestimate true maternal mortality. Maternal death should therefore be made officially a notifiable event, and data collection enforced in order to review the problem.<sup>16</sup> A closer look at the yearly trends shows that the figures remained very high up to 2004. In 2005 the hospital put in place a strict mortality audit procedure so that detailed enquiries were made into every maternal death. The result was that people were held accountable for their actions and this helped to lower the maternal mortality rate. Confidential enquiries provide collective experience about serious and often rare conditions, and have led to innovative research, guideline development, and significant improvement in patient care.<sup>16</sup> Contrary to the situation in developed countries, there is an inadequacy of trained pathologists in Nigeria to carry out autopsies. This is compounded by the attitude towards post mortem examination by relatives, and it is not surprising that relatives refused a post mortem examination in all these deaths.

The maternal mortality figures rose again in 2006 and 2007 when staff in some departments were agitating for payment of withheld salaries. With improvement in staff remuneration, as well as improvement in infrastructures at the hospital, the subsequent years in this study were characterized by improved public confidence, resulting in increased delivery rates and a fall in maternal mortality figures. This implies that socioeconomic determinants have a strong influence on maternal morbidity and mortality.<sup>4</sup> The reduction of 68.9% in maternal deaths in 2009 from the 1999 figures was evident. However, when compared with a maternal mortality rate of 12.1 per 100,000 live births in The Netherlands and 13.8 per 100,000 live births in the United Kingdom, the data presented in this study could be described as outrageous.<sup>16</sup> Given that the cream of Nigeria’s highly skilled manpower and facilities are located at this teaching hospital, these figures should be able to be reduced to an absolute minimum.

Looking at Table 2, the overall survival rate of at least 90% of women admitted with pregnancy-related conditions is gratifying, especially given that those who died accounted for only 1.2%. Most cases referred to the center

were emergencies that came in a moribund state, at least 70% of whom died. The majority (65.3%) of those who died were in the very active reproductive age group (20–34 years), and 16.8% were younger than 20 years. This is in agreement with previous studies.<sup>1,6–10,13,18</sup>

Most of those who died had one form of education or another, including eight women who had tertiary education. Education usually affords the woman the opportunity to make the right decision to save herself, especially during an emergency health situation.<sup>9</sup> It is generally known that education has a positive impact on reproductive behavior and maternal health standards.<sup>9,11</sup> However, it can be deduced that factors other than educational level contributed to maternal mortality in this review. Maternal mortality is multifaceted in Nigeria, arising from a chaotic social, political, and economic situation leading to poor obstetric care.<sup>11</sup> The majority of those who died (67.1%) were married. About 21.2% of these women were employed in a formal salaried job. Other variables, such as perception and superstitious beliefs, play major roles in maternal deaths in these parts of the world.<sup>11,17</sup> The influence of faith-based churches in maternal mortality is enormous in Nigeria, and contributes immensely to antenatal defaulting, as well as a negative perception towards medical care.<sup>17,18</sup> Many of these churches attempt to manage emergency obstetric cases, and only send them to the hospital when the patient is moribund. Thus, people's spiritual beliefs have a significant impact on their health-seeking behavior.<sup>17,18</sup>

The medical and social causes of the maternal deaths recorded at the University of Calabar Teaching Hospital are not different from those at other centers in Nigeria.<sup>1,6</sup> Obstetric hemorrhage remains the leading cause of maternal mortality, and accounted for 33.3% of the deaths in this review. However, this is not the case for hypertensive disorders of pregnancy, which are the leading cause of maternal death in The Netherlands.<sup>16</sup> Hypertensive disorders of pregnancy were the second leading cause of death, accounting for 21.2% of the deaths in our study, and were the leading cause of death in earlier studies from Maiduguri, Kano, and Lagos.<sup>6</sup> It is important to state that some of these deaths may be due to multiple factors, because a ruptured uterus can be complicated by hemorrhage and sepsis, and delay in intervention may worsen the outcome.

Type III delay accounted for almost half of all the deaths. This is less than reports from Benin City<sup>19</sup> in Nigeria, but higher than in an earlier report from Ile-Ife in Nigeria.<sup>18</sup> The main reasons for these deaths were delayed referral, inadequate blood for transfusion, or refusal of blood for religious reasons. The concept of a user fee as a basis for

treating women who require emergency obstetric care has a direct relationship with medical emergencies, deliveries, and the number of women with complications.<sup>20</sup> Normal deliveries fall when user fees are introduced or increased.<sup>20</sup> In addition, the inability of junior health care providers to call senior staff early on to manage serious cases creates a dangerous vacuum in instituting definitive care, and was responsible for 32.1% of the deaths in our study. Some of these women present late at night with serious obstetric emergencies and may be left in the care of a junior resident doctor who lacks the knowledge and skill to attend such a serious problem. Hospital policies must be revised such that senior residents and consultants on call are contacted as soon as a life-threatening emergency arrives in a health care facility to reduce the delays which frequently occur. This appears to be commoner in developing countries where communication facilities and transportation systems are poor. We believe that reduction of maternal deaths attributable to Type III delay can be achieved with the provision of quality obstetric care services in the developing countries.<sup>20,21</sup>

Looking at the health seeking behavior for antenatal care, delivery, and the duration of admission before death, it is clear that over 69% had no documented antenatal care or history of visiting a health facility. Over 60% of these women died within 24 hours of admission. They were all brought in as emergencies. This confirms earlier reports.<sup>2,6–9</sup>

## Conclusion

The maternal mortality ratio in our tertiary hospital during the study period is still very high compared with what is achieved in the developed world. There was a downward trend in the maternal death ratio, but it was far from acceptable. The majority of these deaths were preventable. Efforts must therefore be made on the part of health care providers, hospital managers, individuals, and government to maintain the current downward trend in our maternal mortality ratio to meet the expectation of the millennium development goal of reduction in maternal deaths by 75% in 2015.<sup>22</sup> This can be done by setting up safe motherhood committees that will adequately audit all maternal deaths, instill discipline, and be responsible for emergency obstetric care. Regular skill-building workshops will also keep health care providers aware of the need to make motherhood safer.<sup>12</sup> There is also an urgent need to increase public awareness of maternal health issues through the media, community associations, churches, and community leaders. International efforts to assist developing countries in reducing maternal deaths must be sustained.

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## Disclosure

The authors report no conflict of interest in this work.

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