

## TRENDS IN MATERNAL MORTALITY IN TAMALE TEACHING HOSPITAL, GHANA

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*Conflict of interest:* None declared

### SUMMARY

**Objective:** To determine the yearly maternal mortality ratio over the period 2006-2010 and trends in the causes of 139 audited maternal deaths from 2008-2010 at the Tamale Teaching Hospital in Ghana

**Study Design:** Retrospective descriptive review of maternal deaths

**Setting:** Department of Obstetrics and Gynaecology, Tamale Teaching Hospital

**Methods:** Data on maternal deaths that occurred over the review period were obtained from the patient folders, departmental monthly reports, midwifery monthly returns, audit reports, theatre, intensive care unit, maternity, gynaecology and the labour ward records.

**Results:** There were 280 maternal deaths from 1<sup>st</sup> January 2006 to 31<sup>st</sup> December 2010. The maternal mortality ratio dropped from 1870 per 100,000 live births in 2006 to 493 per 100,000 live births in 2010, a fall of nearly 74%. Using 2008 as the baseline, maternal mortality ratio dropped from 842 per 100,000 live births in 2008 to 493 per 100,000 live births in 2010, a fall of 41.4%. The main causes of 139 audited maternal deaths from 2008 to 2010 were sepsis (19.8%) hypertensive disorders(18.6%), haemorrhage (15.8%), unsafe abortion (11.5%), obstructed labour (5.7%), anaemia (8.7%), sickle cell disease (5.7%) and malaria (5.0%). The ages of the 139 audited maternal deaths ranged from 14-48 years; with mean age of 26.5±4.6years. Nearly 50% of the maternal deaths were aged 20-29 years and about 10% were 14-19 years. Eighteen(13%) of the maternal deaths were from towns over 150km from Tamale.

**Conclusion:** There has been significant reduction in maternal mortality at the Tamale Teaching Hospital, it is however still unacceptably high.

**Keywords:** Maternal Mortality Ratio, Maternal Mortality Trends, Millennium Development Goals, Ghana

### INTRODUCTION

“A maternal death is the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management but not from accidental or incidental causes”.<sup>1,2</sup> Maternal deaths are usually from direct or indirect causes. Direct maternal deaths are deaths resulting from obstetric complications of the pregnant state, from interventions, omissions, incorrect treatment, or from a chain of events resulting from any of the above. Indirect maternal deaths are from pre-existing disease or from a disease that developed during the pregnancy which was not due to a direct obstetric cause, but was aggravated by the physiologic effects of pregnancy.

The maternal mortality ratio is the number of maternal deaths during a specified time period per 100 000 live births during the same specified period.<sup>2</sup> Maternal mortality ratio is used as an index of the quality of health care delivery system of a country. Maternal deaths are largely preventable but the majority of these deaths continue to occur in developing countries particularly those in Sub-Saharan Africa. Ghana is one of the countries struggling with a high maternal mortality and it is making efforts at reducing it. The tragedy of maternal death informed representatives of some 189 nations at the United Nations millennium summit in September 2000 to commit themselves to reduce maternal mortality by 75% by the year 2015.<sup>1,2</sup> The expected rate of decline of maternal deaths if Millennium Development Goal on maternal health is to be achieved should be about 5% annually from the year 2000. Globally the annual percentage decline in maternal mortality ratio between 1990 and 2008 was only 2.3%.<sup>2</sup>

The maternal mortality ratio in sub Saharan African countries was 920 per 100 000 live births in 2000 and 640 per 100 000 live births in 2008.<sup>1,2</sup>

The developed regions of the world had a maternal mortality ratio of 14 per 100 000 live births in 2008.<sup>2</sup> There has been some 34% decline in maternal mortality worldwide from 1990 levels but Sub-Saharan Africa and South Asia still account for 87% of global maternal deaths.<sup>2</sup> Some 147 countries experienced a decline in maternal mortality ratio, 90 of which showed a decline of 40% or more from 1990 levels.<sup>2</sup> In Ghana there has been a slow decline of maternal deaths from 503 per 100,000 live births in 2005 to 451 per 100,000 live births in 2008<sup>2</sup>. Many countries in sub-Saharan Africa where the burden of maternal death is very high have made insignificant or no progress.<sup>2</sup>

The burden of maternal death in Sub-Saharan Africa is a serious challenge. The teaching and regional hospitals have higher figures than the national average because most of the very ill patients are usually referred to these tertiary centers for management. Maternal mortality has previously not been studied at the Tamale Teaching Hospital but being the main referral hospital in northern Ghana, its institutional figures from internal audits over the past few years have been unacceptably high. The objective of this review was to determine the yearly maternal mortality ratio over the period 2006-2010 and the trends of direct and indirect causes at the Tamale Teaching Hospital.

The observed trends in this review would help assess progress in the hospital towards attainment of the millennium development goal on maternal health. Recommendations would then be made for improvement of maternal health.

## SUBJECTS AND METHODS

This is a retrospective descriptive review of maternal deaths that occurred at the Tamale Teaching Hospital (TTH), in the northern region of Ghana from 1<sup>st</sup> January 2006 to 31<sup>st</sup> December 2010. The Hospital is the biggest referral hospital in the northern part of Ghana and it is the teaching hospital for the School of Medicine and Health Sciences of the University for Development Studies. The hospital receives referrals of obstetric cases are received from all health facilities in the northern region and some districts of the Brong Ahafo and the Upper East regions of Ghana. The hospital started functioning as a teaching hospital from the year 2008 and that has greatly affected the quantum and quality of work in the hospital. The number of doctors and nurses at the hospital has increased significantly in all the departments of the hospital. The number of specialists in the Department of Obstetrics and Gynaecology increase from two to six between 2008 and 2010.

Sepsis was tallied mainly from puerperal genital tract infections most of which were outside health facilities, following prolonged or obstructed labour, retained products of conception following vaginal delivery and infections after caesarean section. Infections associated with abortion were classified under unsafe abortion and complications.

All the maternal deaths in this review were initially tallied from the monthly departmental reports and midwifery monthly returns. Confirmation and reconciliation of these figures were done using folders and audit reports of patients including those who died at the intensive care unit, maternity, gynaecological, labour wards and theatre. A specially designed form was used to collect the needed information on each of the maternal deaths. There were no records of maternal death audits for years 2006-2007 and the folders of majority of the patients needed for data collection for the two years were incomplete or missing and were therefore excluded from the analysis of maternal mortality ratios for 2006-2007.

Data on the total number of deliveries, number of live births were collected, the number of nurses, midwives, and doctors present in the department were also collected from the human resource records of the department. The data collected on the forms were coded and entered into Statistical Package for Social Sciences (SPSS) version 10.0 for windows (SPSS Inc, Chicago, IL). Cross tabulations were done to estimate the proportions of variables of interest.

## RESULTS

In this review there were 280 maternal deaths from 1<sup>st</sup> January 2006 to 31<sup>st</sup> December 2010. The records of 139 audited maternal deaths that occurred between 1<sup>st</sup> January 2008 and 31<sup>st</sup> December 2010 period representing about 50% of the total for the 5-year period were available for review. These numbers represented all maternal deaths in the hospital for the period under review using the definition of maternal death and its classifications based on the international classification of diseases 10<sup>th</sup> revision (ICD-10) codes. The total number of live births for the five years was 27487 and the number of maternal deaths was 280 giving a maternal mortality ratio of 1018.7 for the period 2006 to 2010 but 724.5 per 100 000 live births for 2008-2010 during which 139 maternal deaths for the three years were audited. While there were annual increases in the number of deliveries, the absolute number of maternal deaths had declined from 74 in 2007 to 33 in 2010.

The maternal mortality ratio reduced by 74% from 1870 per 100 000 live births for year 2006 to 493 per 100 000 live births for year 2010. If year 2008 audited maternal deaths were used as the baseline, the maternal mortality ratio dropped from 842 per 100,000 live births in 2008 to 493 per 100,000 live births in 2010, a fall of about 41.4%. The yearly details are shown in Table 1.

**Table 1** Maternal mortality ratio, number of doctors and nurses per year in the Department of Obstetrics and Gynaecology from 2006 to 2010

YEAR	2006	2007	2008	2009	2010
Total deliveries	3777	4940	6675	6314	7090
Number of live births	3582	4720	6535	5951	6699
Number of maternal deaths	67	74	54	52	33
Maternal mortality ratio	1870	1568	842	874	493
Midwives	37	52	62	67	50
Other nurses	23	13	9	12	80
Medical Officers and House officers	2	2	5	10	13
Specialist/ Consultant	2	2	3	6	6

The 139 audited maternal deaths from 2008 to 2010 were due to both direct and indirect causes. Ninety-nine (71.2%) of the women suffered direct maternal deaths while the indirect maternal deaths were 40 (28.8%). The leading cause of direct maternal deaths was sepsis contributing 19.4% of all the maternal deaths from 2008 to 2010. There was a drop of about 50% direct obstetrics deaths between 2009 and 2010.

Indirect causes of maternal deaths showed less significant and inconsistent decline between 2008 and 2010. The contribution of the three leading causes of indirect maternal death namely anaemia, sickle cell disease and malaria over the period 2008 to 2010 was about 65% of the indirect deaths with no consistent decline. The maternal deaths are shown in Table 2.

The ages of the 139 audited maternal deaths ranged from 14 to 48 years; with a mean age of 26.5 ± 4.6 years. About 10% were less than 20 years old while 5% were 40 or more years old. Nearly 50% of the maternal deaths occurred in women aged 20-29 years.

Table 3 shows the age distribution of the maternal deaths.

**Table 2** Causes of 139 audited maternal deaths at the Tamale Teaching Hospital 2008-2010

Direct Causes	2008	2009	2010	Total <sup>†</sup>
Sepsis	15	7	5	27 (19.4%)
Hypertensive Disorders	4	16	6	26 (18.6%)
Haemorrhage	5	12	5	22 (15.8%)
Unsafe Abortion & Complications	7	6	3	16 (11.5%)
Obstructed Labour	6	2	0	8(5.7%)
SubTotal (%Direct Causes)	37 (68.5%)	43 (82.7%)	19 (57.6%)	99 (71.2%)
<b>Indirect Causes</b>				
Anaemia	3	3	5	11(8.7%)
Sickle Cell Disease	3	3	2	8(5.7%)
Malaria	3	2	2	7(5.0%)
HIV	2		2	4(2.9%)
Viral Hepatitis & Its Complications	2			2(1.4%)
Meningitis	1	1		2(1.4%)
Renal Failure	1		1	2(1.4%)
Snake Bite	1			1(0.7%)
Pyelonephritis			1	
Pleural Effusion ? Tuberculosis			1	1(0.7%)
Congestive Heart Failure	1			1(0.7%)
Subtotal (%Indirect Causes)	17 (21.5%)	9 (17.3%)	14 (42.4%)	40 (28.8%)
Grand Total <sup>††</sup>	54 (100%)	52 (100%)	33 (100%)	139(100%)

<sup>†</sup> Total numbers and percentages of audited maternal deaths due to various causes from 2008-2010

<sup>††</sup> Total numbers of audited maternal deaths due to direct causes and indirect causes from 2008-2010

The parities ranged from 0 to 11 with the mode being para zero. The main causes of maternal deaths in this group were unsafe abortion, anaemia and postpartum haemorrhage. About one in three of the deaths amongst the nulliparae were from unsafe abortion. About 48.2% of the maternal deaths were in the para 1-4 group while forty four women or 31.7% of maternal deaths from 2008 to 2010 were para 5 or more. Sixty three (45.3%) of the maternal deaths in 2008-2010 were in women from the Tamale metropolis and its surrounding communities.

**Table 3** Age distribution of 139 audited maternal deaths at Tamale Teaching Hospital 2008-2010

AGE (in years)	YEAR			TOTAL N(%)
	2008	2009	2010	
10-19	6	5	3	14 (10.06%)
20-29	27	28	15	70 (50.30%)
30-39	17	16	15	48 (34.53%)
40-49	4	3	0	7 (5.03%)
<b>TOTALS</b>	54 (38.8%)	52 (37.4%)	33 (23.7%)	139 (100%)

Eighteen (13%) of the deaths occurred in women who had to be transported over 150km through other districts before getting to the Tamale Teaching Hospital; they were from Karaga, Gushiegu, Saboba, Chereponi, Zabzugu-Tatale and Nanumba North and Nanumba South districts. Fifty eight (41.7%) of the maternal deaths were referrals from communities and health facilities in districts such as Savelugu-Nanton, Tolon-kumbugu, Yendi, East and Central Gonja which share boundaries with Tamale. There was no clear monthly or seasonal pattern in the maternal deaths figures for the three years 2008 to 2010. Forty nine (35.2%) of the maternal deaths 2008-2010 occurred within 12 hours of admission to the hospital and 54% died within 24 hours of admission to the hospital. The causes of two-thirds of the deaths within 24 hour of admission were sepsis, postpartum haemorrhage and eclampsia.

## DISCUSSION

In this review, the maternal mortality ratio for the period 2008-2010 was 724.5 per 100 000 live births. Though proper comparison cannot be made here due to different denominators and time, this ratio is lower than the 734.4 per 100 000 deliveries at Korle-Bu Teaching hospital and 1140 per 100 000 deliveries at the Komfo Anorkye Teaching hospital done over a decade ago in which total deliveries were used as the denominators.<sup>3,4</sup> The maternal mortality ratio of 724.5 per 100 000 live births for the years 2008-2010 at the Tamale Teaching Hospital is, however, higher than the national estimate of 451 per 100,000 live births for the year 2008.<sup>2,5</sup> Our

maternal mortality ratio shows a declining trend over the three year period.

The teaching hospitals have an important role to play towards attainment of millennium development goal on maternal health since they are the main referral centers in the country where many very ill obstetrics patients are referred for management because they are the centers with both human and technical resources that can manage these complicated cases. The rates at the Teaching Hospitals are expected to be higher than the national figure because they manage very ill and complicated cases, and these hospitals are sometimes inadequately resourced with personnel, equipment and other requirements for the management of these cases.

Though there has been a decline of about 41.4% in the maternal mortality ratio from 842 per 100,000 live births in 2008 to 493 per 100,000 live births in 2010, the number of maternal deaths is still unacceptably high with many preventable deaths still occurring.

The decline in maternal mortality ratio seen at the Tamale Teaching Hospital over the period of the review may be due to increase in the number of nurses and doctors in the Department of Obstetrics and Gynaecology, free maternal health care, improvement in blood transfusion service, improvements in supplies of antibiotics, oxytocics, intravenous fluids, antihypertensive drugs, anticonvulsants and availability of an intensive care unit where some critically ill patients were managed. The number of midwives did not increase consistently but there were significant increases in the numbers of general nurses, house officers and medical officers who provided 24 hours' duty presence on the labour ward with specialist coverage which has improved the quality of supervised delivery. The care of patients on admission and at the antenatal clinic also improved due to daily involvement by specialists in patient management.

Attendance and delivery at the hospital has been rising since its designation as a teaching hospital and the arrival of more obstetrician-gynaecologists, which has won the confidence of women. Direct maternal deaths contributed 99 (71.2%) from 2008 to 2010 mainly from sepsis, haemorrhage, hypertension, unsafe abortion and obstructed labour these findings are consistent with causes of maternal death at other teaching hospitals and national health surveys.<sup>3,6,7</sup> From 2008 to 2010 there were yearly variations in the causes of direct maternal deaths.

Hypertensive disorders and haemorrhage increased by threefold in 2009 compared to 2008 figures but there was a decline in all causes of direct maternal deaths

from 2009 to 2010. The contribution of various factors to the observed decline from 2009 to 2010 in direct maternal deaths has not been studied in this review. The change might, however, be due to the composite effect of improvements in management of hypertensive disorders in pregnancy, supervised delivery and emergency obstetrics service, the use of the partograph, provision of comprehensive abortion and family planning services all of which will reduce obstetric deaths.

Use of uterotonics to manage the third stage and uterine atony, safe and comprehensive blood transfusion service, antenatal care, transport service improvements and the supply of effective antibiotics have all contributed to reduction in direct maternal deaths.<sup>8</sup> Sepsis (19.4%) was the leading cause of direct maternal deaths in this review a finding which is in contrast with studies of maternal deaths in other teaching hospitals and trends observed nationally in which hypertensive disorders and haemorrhage were the leading causes of maternal deaths.<sup>3,4,5,7</sup>

Sepsis (19.4%) is lower than the rate in Malawi where sepsis was the leading cause and accounted for 29.4% of direct maternal deaths.<sup>9</sup> Sepsis accounted for more direct maternal deaths than haemorrhage (40.5% vs 13.5%) or hypertensive disorders (40.5% versus 10.8%) in 2008, this however declined by about 50-66% between 2009 and 2010.

Inadequate supply of antihypertensive drugs and anticonvulsants at the tertiary level of the health delivery system may have accounted for delays in management. Some of these very ill patients were transported on different kinds of vehicles over long distances and for several hours on bad roads to the teaching hospital, sometimes without the initial management of these hypertensive emergencies when these drugs are in short supply at some referring health facilities.

Forty maternal deaths (29%) were from indirect causes with the leading causes of indirect deaths being anaemia (8.7%), sickle cell disease (5.7%), and malaria (5.0%), rates which are similar to studies at the Korle-Bu Teaching Hospital.<sup>1,10</sup> Anaemia, sickle cell disease and malaria were responsible for 65% of all the indirect maternal deaths that occurred. Anaemia and malaria are preventable conditions by simple and inexpensive interventions at the antenatal clinic. Seventy-five (54%) of the 139 audited died within 24 hours of admission. These deaths were due to delays associated with complications during home deliveries or delays in referrals and transportation between health facilities when complications arise. Mortality associated with

sepsis is very high even with use of good antibiotics since these women are brought late to the hospitals and may die in the first 24 hours. In some cases deaths in the first 24hrs were due to inadequate or inappropriate intervention by junior staff that institute initial management for these patients.

Nearly 55% of the deaths were in women from districts outside Tamale and 13% were referrals from towns over 150km to the Tamale Teaching Hospital. Access to health care may be adversely affected by lack of financial resources and unavailability of health care provider.<sup>7</sup> With the inception of free maternal healthcare, new health facilities with the needed doctors and nurses and provision of ambulances to these health facilities, these difficulties should be things of the past. About 45% of the maternal deaths were in women from the Tamale metropolis and its surrounding communities some of whom developed fatal complication as result of home delivery in spite of availability of free maternal care. Free maternal health care leads to a drop in maternal mortality<sup>11</sup> however, some beliefs and cultural practices based largely on ignorance may not view pregnancy and child birth as conditions that require care from a skilled service provider in spite of public education and free delivery services.

The Ghana Demographic and Health Survey of 2008 shows that over 95% of pregnant women attended antenatal clinic but only 27% had supervised delivery by skilled provider while 56% of women were delivered by a TBA and about 17% were delivered by a relative or no one in the northern region.<sup>7</sup> The presence of skilled personnel at birth is critical to reducing maternal mortality. The major causes of maternal death can be prevented if women have access to good quality emergency obstetric care.<sup>12</sup> The reductions seen at the Tamale Teaching Hospital may be due to improved access to emergency obstetric care and improvements in the supervised delivery services at the hospital as seen from the annual increases in the number of live births at the hospital.

In this review some 30% of the maternal deaths are para 4 or more, with a high maternal mortality ratio, a woman's lifetime risk of dying from a maternal death will be higher with each pregnancy and it is estimated to be 1 in 31 in sub-Saharan Africa.<sup>2</sup> Many of these women could be saved if contraceptive services are available and they are well patronized. About 10% of the maternal deaths were adolescent with the youngest being 14 years old. Unsafe abortion was the main cause of adolescent deaths because adolescent pregnancies are mostly unwanted pregnancies and they are likely to seek unsafe methods for termination.

Adolescent sexual education and provision of safe abortion services can help reduce pregnancy related deaths amongst the adolescent.

About 55% of the maternal deaths were referrals from other districts and since the leading causes of maternal deaths in 24 hours were direct obstetric causes a case can be made for improving the performance of district health systems in the northern region. Improvements of health services in districts by making available a sustainable emergency obstetric care can lower maternal mortality considerably.<sup>12</sup> The significant declines in the yearly maternal mortality ratios were seen from 2008 when auditing of maternal deaths became effective at the hospital. Auditing of maternal deaths makes it possible to identify causes of maternal deaths and avoidable factors for preventing future occurrences.

Though there have been yearly declines in maternal mortality over the review period, a lot still remains to be done to further reduce these high maternal mortalities in our hospitals. Most maternal deaths are avoidable tragedies; many mothers can be saved if there are interventions aimed at improving maternal health at the national and institutional levels. It is recommended that local communities, non-governmental organizations in the health sector, health facilities, government agencies and political authority should play their roles effectively to accelerate efforts aimed at reducing maternal deaths to make attainment of millennium development goal on maternal health a possibility. Further research is needed to assess the impact of the various interventions aimed at improving maternal health within the hospital.

A limitation of this review is the non-availability of audited reports, some patients' folders and other records of patients who suffered maternal deaths in the hospital from 2006 to 2007. The review did not also look at factors that impacted positively on maternal health care at Tamale Teaching Hospital that has resulted in the reduction of maternal mortality.

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