

CHANGING TRENDS IN MATERNAL MORTALITY IN A DEVELOPING COUNTRY

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ABSTRACT

Objective: To have a 5-year review of the maternal mortality ratio in the largest centrally located Mission hospital in Benin City where a large proportion of women deliver yearly.

Method: This was a 5-year (January 1, 1996 through December 31, 2000) review of the causes of maternal mortality at the Saint Philomena Catholic Hospital, Benin City. The case notes of those that suffered maternal mortality were retrieved and thoroughly perused. Information on all cases of maternal mortality were extracted from the patients' case-notes; the labour ward Registers; the antenatal, postnatal, the female ward and the theatre registers. The midwifery/nurses' reports were also examined. The duplicate copies of the death certificates were examined and the necessary information was also extracted. The total deliveries for the period were extracted from the delivery registers.

Results: There were 7,055 women who gave birth during the 5-year period. There were 32 maternal deaths; Maternal Mortality Ratio (MMR) of 454/ 100,000 live births. Unbooked emergencies accounted for 68.7% of all deaths, and were more than doubled the booked women. The MMR increased progressively from 325 in 1996 to peak at 765 in 1999 ($P < 0.0001$) with an insignificant drop in 1998 ($P > 0.06$). It was lowest in 2000 (241) ($P < 0.0001$). Paradoxically, as the number of deliveries decreased progressively from 1530 in 1996 to 1247 in 2000, the MMR increased progressively from 327 in 1996 to 675 in 1999. There were no postmortem examinations and no coroner's inquests. More than 76% of the women spent 48 hours or less from time of admission to death and majority of them were of low parity. Nulliparity was 37.5%. The mean parity was one. Young women 20-39 years old accounted for 81.3% with 9.4% teenage deaths due to illegally induced abortions. Eclampsia (34.4%), hemorrhage (25.0%), Infections (18.8%) and abortions (12.5%) were the four leading causes of death. Puerperal deaths were 56.3%. Five short case scenarios were presented to highlight the tortuous pathway the women passed to end in maternal mortality.

Conclusion: The MMR ratio was still unacceptably high. The causative factors were largely preventable. The puerperium was the most dangerous period. Women empowerment, free or highly subsidized universal antenatal care services, and provision of adequate emergency obstetric services with effective contraceptive backup is suggested. Re-orientation of care givers and community leaders to enhance awareness and early recognition of the danger signs and risk factors associated with pre-eclampsia and eclampsia with prompt and adequate management or referral is emphasized.

Key Words: Changing, Trends, Maternal, Mortality, Developing Country, Nigeria. (*Accepted 4 April 2007*)

INTRODUCTION

Maternal mortality is the death of a woman while pregnant or within 42 days after termination of the pregnancy irrespective of the duration or site of the pregnancy, from any cause related to or aggravated by the pregnancy itself or its management¹ It is still a major neglected tragedy,² and thus a great challenge to the contemporary obstetrician,³ the medical profession in general, the sociologists and the whole

of humanity The worrying alarming rate of annual maternal mortality led to the first International Safe Motherhood Conference in Nairobi, Kenya in 1987 which set for itself the goal of a 50% reduction in the levels of maternal mortality by the year 2000.⁴ Due to the difficulty of obtaining accurate data, various methods are used to estimate MMR. These include MMR data based on good registration system and relatively good attributes of the cause of death, vital registration data with good death registration systems but uncertain of the attributes of the cause of death, estimates based on sisterhood, reproductive age

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mortality studies (RAMOS), National Family Health Surveys, Proportion of maternal among deaths of women aged 15-49 years and estimates based on lower and upper uncertainty bounds.⁵

Maternal mortality rate is an index of the socio-economic standards in any society.⁷⁻¹⁰ "While living standards rise for many, more than a billion people on our planet live in extreme poverty, forced to make ends meet on a tiny income and very few basic services."⁸ Consequently, the international community set international development targets, which amongst others is "a reduction by two-thirds in the mortality rates for infants and children under the age of 5 and a reduction by three-fourths in maternal mortality- all by 2015."⁸

The high MMR in developing countries has been attributed to the failure of the affected countries to provide good pregnancy (and Intrapartum) care that results in the disturbing statistics of maternal mortality where women are more than 400 times as likely to die from complications during pregnancy than women in southern Europe.¹⁰

That more women die in pregnancy in India each week than in Europe each year under scores the important contribution poverty makes to maternal death and the wide gap between the richest and poorest countries on the planet.⁸ In Gaza, Egypt, maternal deaths was reportedly said to accounts for 19% of all reproductive age deaths in 1985 - 1986.¹¹ In spite of the recognition of the catastrophic effects of maternal mortality on the family and the society, and intervention measures instituted to reduce its rates², it continues to increase. According to the WHO and UNICEF, the global estimate ranges from 303,000 to 822,000 with poor quality data accounting for the wide range.¹² Africa alone contributed 235,000 to the yearly maternal deaths.² In 1995, the global estimates of maternal mortality was reported to be 515,000 with a MMR of 397/100,000 live births⁵ even though maternal mortality is often under reported.¹² East and West Africa have one of the world's highest maternal mortality ratios with a ratio of over 1000 per 100,000 live births. For example in 1995, the MMR in Rwanda (2318/100,000 live births) was almost 400 times higher than that of Finland (6/100,000 live births).^{8,12}

As part of the strategies to confront the challenges of maternal mortality, many industrialized countries established organs, which critically examine the causes of each maternal death. These confidential enquiries are aimed at reducing or eliminating such causes. These steps have yielded dividends with resultant fall in maternal mortality rates. Obstetric haemorrhage, abortion, pre- eclampsia and

Eclampsia, obstructed labour and puerperal infections

are the known direct causes of maternal mortality.^{6, 13-17} Indirect causes are those that result from pre-existing diseases or diseases that developed during pregnancy and was not due to direct obstetric causes.¹ These indirect causes are the ones aggravated by the physiological effects of pregnancy. Human immunodeficiency virus infection / AIDS, malaria, anaemia, viral hepatitis, pulmonary tuberculosis, sickle cell disease, tetanus, infective diarrhea and heart diseases are some of these indirect causes.¹⁸⁻²⁰ Biological and socio-economic rather than administrative (medical services) factors have been identified as the most important factors for maternal deaths.⁸

In Nigeria, direct causes are the major implicated factors for maternal deaths. These have been identified to occur in this order of decreasing frequency; obstetric haemorrhage, infections, toxemia of pregnancy, obstructed labour and anaemia.¹ Poverty has been identified as the major indicator for maternal mortality in Nigeria and this is often worsened by ignorance.^{7,9}

Improved conditions of living for the vast majority, basic professional antenatal care for all pregnant women, provision of effective but affordable emergency obstetric care for life-threatening complications including operative interventions are the identified key elements for improved maternal survival.⁸⁻¹⁰ Hospital- and population-based studies,^{10, 11} "Sisterhood" and "networking" with respondents in surveys^{16, 21,22} are some of the known methods of assessing maternal mortality. The Reproductive Age Mortality Study (RAMOS) is described as one of the best methods of measuring maternal mortality.¹² Correlations between hospital- and population-based studies for the estimation of maternal mortality ratios have been reported to be very poor as consistently and considerably higher maternal deaths were often associated with the latter.¹⁶ Misclassification and under reporting were some of the adduced reasons.^{11, 12, 16}

In this study, we retrospectively analyzed and documented the causes of maternal death in the last half decade of the last millennium. This was with a view to determining whether or not the trend and causes of maternal deaths have changed over the years. The essence of documenting the last decade's maternal mortality data measured as maternal mortality ratio (MMR),^{5,12} is to critically examine the causes of maternal deaths and institute measures to prevent deaths from similar causes in future.

To achieve such a goal, there would be urgent need to formulate and implement good policies that ensure

adequate, affordable and accessible antenatal care services for all pregnant women in their struggle to execute their responsible role of propagating the human race. This will enable more appropriate actions to be taken and which may include re-orienting all health-care providers towards the new challenges. Also, appropriate health education of our pregnant women and care givers on early intervention measures to deal with complications during antenatal care, labour or puerperium can be well directed. There may be the need to advocate the re-allocation of resources towards targets aimed at eliminating or reducing the identified factors.

The MMR in the last 5 years of the last millennium in this oldest missionary hospital in this city was reviewed because a very large proportion of women deliver here due to its geographical location in the heart of the city.⁷ The other reason is to document this very important period for the records and for both pregnant women and care givers to learn from the causes of maternal mortality in this city and device ways to mitigate it. Considering the falling life expectancy in our country, only very few people who saw the end of the last millennium would witness the end of the current millennium. This article would help to bridge the gap and provide information about the roads our dear women in their attempt to propagate the human race passed to the great beyond.

Objective

To have a 5-year review of the maternal mortality ratio in the largest centrally located Mission Hospital in Benin City where a large proportion of women deliver yearly.

MATERIALS AND METHODS

This is a retrospective study of the causes of maternal mortality for a 5-year period; from January 1, 1996 through December 31, 2000 in the second largest maternity hospital (after the University Teaching Hospital) in Benin City.

The Catholic Maternity Hospital, Benin City where this study was conducted is a non-governmental mission hospital, centrally located, and has no bias for patients' selection. Also, the social stratification Pattern of the women attending this hospital was more representative of the overall pattern in Benin City than any other large hospital in this City.⁷ Information about each patient was extracted from the patient's case-note; the labour ward Register; the antenatal and postnatal wards registers; and the female ward where cases of abortions were usually admitted and the midwifery/nurses' reports. Also, the duplicate copies of the death certificates were examined and the necessary information was

extracted. No post-mortem records were available During the period studied, as this was not routinely done in this hospital; no pathologist in the services of this health institution. No coronary inquests were documented in the case notes.

Statistical Analysis

Using the GraphPad InStat tm software version 2.05a statistical package, the Chi-square test was used to compare the MMR between the years and the clinical periods.

RESULTS

There were 7, 055 deliveries and 32 maternal deaths within the period of study. The booked women were 10(31.3%) while the unbooked women were 22(68.7%).

The average MMR for the period was 454/100,000 live births. The MMR was highest (34.4%) in 1999 and lowest in 2000(P<0.0001; 95% Confidence Interval 2.338 to 3.248; Odd ratio 2.753), (See Figure 2). There was a progressive and statistically significant rise in MMR from 1996 to 1997 (P<0.001; 95 Confidence interval 1.217 to 1.671 and from 1998 to 1999 (P< 0.001; 95 CI 1.354 to 1.785; Odd Ratio 1.555) with an insignificant drop in 1998 (P>0.068; 95% Confidence Interval 0.7673 to 1.034). In the year 2000, the hospital had the largest number of obstetricians Two Consultants (one on Locum) and 4 Senior Registrars who were on rotation to the hospital from the University of Benin Teaching Hospital, Benin City, Nigeria. The highest number of obstetricians this hospital ever had at any time during the period and before 2000 was 2.

When compared with the antenatal (p<0.0001; OR 0.819; 95% Confidence Interval 0.04922 to 0.01355) and the intrapartum periods (p<0.0001; OR 0.1915; 95% Confidence Interval 0.1118 0.3242), the puerperal period was the most dangerous and accounted for 56.3% of all maternal deaths. Postabortal sepsis (which did not fall into any of these classifications) accounted for 12.5% deaths.

Eclampsia was the commonest cause of death in 1996(60.0%), 1999(45.5%) and over all, 11(34.4%) for the five years period. Sepsis 3(42.2%) and abortion-related 2(66.6%) deaths were the commonest for 1997 and 2000 respectively. In 1998, there were 2 (33.3%) deaths each for Eclampsia, post partum hemorrhage and sepsis. The four commonest causes of death that accounted for 90.6% of all mortality were Eclampsia 11(37.9%), Hemorrhage 8(27.6%), Sepsis 6(20.7%) and Abortion 4(13.8%) all of the deaths. In the classification of these causes of death, as indicated in the death certificates and the case notes, the primary rather than the secondary causes were used. There were no post mortem reports for these deaths. This hospital Had no pathologist and no inquests were documented in the case notes.

Table 1: Showing the Booking Status of the Study Population and The Maternal Mortality Ratio Per Year for The Period Under Review

YEAR	1996	1997	1998	1999	2000	TOTAL
Booking Status:						
Booked	2 (40.0%)	3 (42.9%)	3(50.0%)	1 (9.1%)	1(33.3%)	10 (31.3%)
Unbooked	3 (60.0%)	4 (57.1%)	3(50.0%)	10(90.9%)	2(66.7%)	22 (68.7%)
TOTAL	5(15.6%)	7(21.9%)	6(18.8%)	11(34.4%)	3(7.3%)	32(100.0%)
Total birth	1,530	1,516	1,324	1,438	1,247	7,055
Maternal						
Death	5(15.6%)	7(21.9%)	6(18.8%)	11(34.4%)	3(7.3%)	32(100.0)
MMR	327	462	453	765	241	454

(MMR = Maternal Mortality Ratio; No. of Maternal deaths /100, 000 live birth; abortions included in this study).

Table 2: Showing The Age Distribution of The Maternal Deaths

Age Range	Frequency	Percent
15-19	3	9.4
20-24	4	12.5
25-29	0	31.3
30-34	10	31.3
35-39	3	9.3
Not indicated	2	6.2
TOTAL	32	100.0

The age range (in years) was 17-37; modal age 30; median age 28 and Mean age 25.57 ± 4.92 .

Table 3: Showing The Parity of The Maternal Deaths

Parity	Number	Percent
0	12	37.5
1	3	6.2
2	3	9.4
3	3	9.4
4	1	3.1
Not indicated	11	34.4
Total	32	100.0

The mean parity for all those documented was one. The mean gestational age (excluding those in the puerperium) was 33.0 ± 14.8 weeks (Table not shown).

Table 4: Showing The Clinical Period At The Time of Maternal Death

Clinical Period	Number of Death	Percent
Postabortal sepsis	4	2
Undelivered (Antenatal)	7	21.9
Intrapartum/ intra-operative	3	9.4
Puerperal (post-partum)	18	56.5
Total	32	100.0

Table 5: Showing The Duration of Admission Before Maternal Death

Duration {Day(S)}	Number	Percent
<1 (< 24 hours)	9	28.1
1-2	19	59.4
3-4	2	6.3
4	1	3.1
Not Indicated	1	3.1
TOTAL	32	100.0

Majority (59.4%) of death occurred in the group that spent 1-2 Days on admission. A larger Proportion, 28(87.5%) spent two days or less before their death .

Table 6: Showing the Causes of Maternal Death Per Year 1996 - 2000

S/No.	CAUSES	1996	1997	1998	1999	2000	TOTAL	PERCENT
1.	Eclampsia	3	1	2	5	0	11	34.4
2.	PPH	0	0	2	3	1	6	18.8
3.	Sepsis	1	3	2	0	0	6	18.8
4.	Abortion-related	0	1	0	1	2	4	12.5
5.	Ruptured uterus	1	0	0	0	0	1	3.1
6.	Ruptured Ectopic Pregnancy	0	0	0	1	0	1	3.1
7.	APH	0	1	0	0	0	1	3.1
8.	Anesthetic (Mendelson Syndrome)	0	0	0	1	0	1	3.1
9.	Medical Diseases (Diabetes Mellitus)	0	1	0	0	0	1	3.1
	TOTAL	5	7	6	11	3	32	100.0

PPH= Postpartum hemorrhage; APH = Antepartum Hemorrhage.

Figure 1: Histogram Representing the Four Commonest Causes of Maternal Death

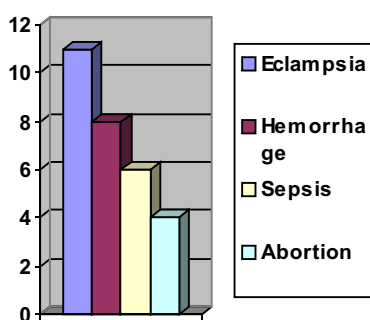
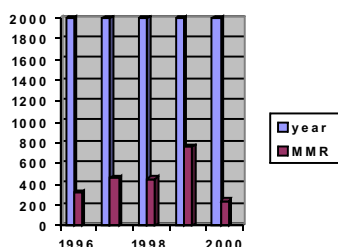


Figure 2: Bar Chart Showing the Maternal Mortality Ratio Per Year for the Period Under Review



Analysis of the antecedent factors to these maternal deaths showed that the three commonest causes of the deaths were also the same major antecedent factors to these deaths (excluding hemorrhage): Eclampsia 34.4%; Sepsis 18.8%: (Intrauterine fetal deaths (IUFD)/ macerated still births with

Chorioamnionitis 3 and Puerperal sepsis from other causes 3); and Abortion 4 (12.5%) - 3 induced and 1 missed Abortion. Others causes were 3(9.3%); one each (3.1%) from ruptured ectopic pregnancy; Mendelson Syndrome, and diabetes mellitus (Table not shown).

Combined clinical causes for the maternal deaths were found in 15(46.9%) cases e.g. Cephalopelvic Disproportion/Intra Uterine Fetal Death (IUFD)/Chorioamnionitis(3), Abortion/Ruptured ectopic pregnancy/Sepsis(5), Obstructed labor/Mendelson Syndrome(1), IUFD/Eclampsia (2), Pregnancy induced Hypertension /Retained placenta /PPH(2) (table not shown)

SOME CASE SCENARIO OF THE MATERNAL DEATHS

Case 1

A 30-year old nullipara who was admitted for 5 days into Antenatal ward at 30 weeks gestation with diagnosis of pregnancy induced hypertension. Her husband discharged her against medical advice. The patient was rushed back 3 days later with eclamptic fits. She had emergency caesarean section and died of acute renal failure two days later.

Case 2

A 32- year old Para 2 lady who had pre-eclampsia and was referred from a Private Maternity Home to the University of Benin Teaching Hospital, Benin City but presented at this hospital after two fits and died undelivered.

Case 3

A 29-year old Para 3 lady who had antepartum hemorrhage due to placenta previa. She was

managed by a traditional birth attendant who gave her some native medication. She bled for about 9 hours before presentation. She died undelivered with severe anemia shortly after arrival

Case 4

A 25 year-old Para 4 lady diagnosed to have severe pre-eclampsia with Blood Pressure of 181/130 mm Hg but declined admission. She went home to tell her husband. She represented later with restlessness and died shortly after re-admission.

Case 5

An unbooked 32-year old Para 2 lady, who was managed in a religious home and presented with complication of intra-uterine fetal death (IUFD) due to pre-eclampsia. She had intrapartum eclampsia (2 fits) at the religious home and was referred to the University of Teaching Hospital, Benin City but the patient presented at this mission hospital and died soon on arrival undelivered.

DISCUSSION

The reality of maternal mortality continues to stare us in the face. Since the initiation of the Safe Motherhood Initiative in 1987 with the goal of reducing MMR by half in the year 2000, the goal continues to be elusive in the developing countries. During the 5 year period, the total birth recorded was 7,055. With maternal deaths of 32, the average Maternal Mortality Ratio (MMR) was therefore 454/100,000 live births. This is lower than the national average of 1,129/100,000 estimated for Nigeria by the United Nation in 1995 due to lack of accurate information on MMR.⁵ The average MMR was also lower than the 827/100,000 and the 1406/100,000 earlier reported respectively for this city²³ and Enugu,²⁴ Nigeria and the 557/100,000 live births reported for Uganda.²⁵ This ratio, though lower, is still unacceptably high as the causative factors are largely preventable. The 5 short case scenarios presented above to highlight the tortuous way women pass through in our environment to end in maternal mortality speak for themselves. The over all average MMR was higher than the point estimate of maternal mortality of 28 per 100,000 live births for Europe but lower than the point estimate of 1006 per 100,000 live births for Africa even if a lower uncertainty bound estimates of 18 per 100,000 and 544 per 100,000 live births for Europe and Africa respectively were made.¹²

Table 1 showed the booking status of the study population and the maternal mortality ratio per year for the period under review. The MMR increased progressively from 325/100,000 in 1996 to peak at

765/100,000 in 1999 ($P < 0.0001$) with a small insignificant drop in 1998 ($P > 0.06$). Similar progressive increase in MMR from previous to later decade had earlier been reported for Enugu, Nigeria²⁴ where the MMR rose from 270/100,000 for the period 1976-1985 to 1406 from 1991 to 2000. Paradoxically, while the number of deliveries in this study decreased progressively from 1,530 in 1996 to 1,247 in 2000, the MMR increased progressively from 327 in 1996 to 675 in 1999 ($P < 0.0001$) but lowest in 2000 (241/100,000); $P < 0.0001$ (Table 1): a level less than 1/3 or 31.7% of the previous year. The reason for this dramatic fall in MMR could be attributable to the largest number of specialist manpower in the service of the hospital that year. This goes to buttress the importance of providing competent medical manpower in obstetric units to handle complicated cases.

Unbooked emergencies, in this study, accounted for 22 (68.7%) of all maternal deaths. This was more than doubled the booked women 10 (31.3%) (Table 1). Unbooked emergencies were therefore major contributors to the causes of maternal death ($p < 0.0001$; OR 0.01456; 95% Confidence interval 0.007359 to 0.02788). Lawson and others^{1, 6-9} had earlier decried the continued increase in unbooked emergencies which is the main gateway to maternal death. Consequently, providing adequate emergency obstetric services has recently become a major issue in contemporary obstetrics.²⁵

Table 2 showed the age distribution of the maternal deaths. The majority of the deaths 26 (81.3%) occurred in the 20-39 years old group with teenage death accounting for 9.4% of all deaths. These teenagers were supposed to be in school and actively involved in academic activities or are productive in learning a trade. All the teenage deaths were due to illegally induced abortions from unwanted pregnancy, 75% of which had pelvic abscess. Abortion accounted for 13.8% (or fourth) of the four major and 12.5% of all causes of death in this study (Table 6). This was however lower than the 22.5% reported in 1997 for Lagos from 1986-1995.¹⁴ Apart from the one death from septicemia that complicated missed abortion in a 30 year old lady, sex education and effective contraceptive counseling and utilization would have prevented these unwanted pregnancies and thus the deaths. Induced abortion is still legally forbidden in Nigeria except to save the mothers' lives and which can only be proven after a rigorous corroboration by other clinicians.^{26,27} The issue of legalized induced abortion in Nigeria, as far as these authors are aware, is such a contentious issue that can tear members of the same family apart for religious and cultural reasons. In the absence of availability of

legal abortion services, effective utilization of contraceptive services would, no doubt, have prevented these unwanted pregnancies and thus the deaths.

Table 3 showed the parity of the study population. Most of the deaths occurred in low parity women with nulliparous women constituting 37.4%. The mean parity was one. In 11 women (34.4%), the parity was not indicated. This may be accounted for by the fact the women might have presented in a state too ill to communicate (Table 5). Also, those that brought these women to hospital in the emergency state might not be very close relatives or those that have good knowledge about the past obstetric history of these women, which was not unexpected. Similarly, the urgency to institute resuscitative measures might have led to poor documentation on the part of the attending health personnel especially when such measures fail to revive the patient. From our experience, the close relatives in such situations are often unwilling to give more information after mortality. The low parity was also reflected in the etiological causes of the maternal death; eclampsia (Table 6), commoner in low parity women, was the dominant cause of death in these women.

Table 4 showed the clinical period at the time of maternal death. While antenatal deaths occurred in 21.9% of cases, Intra-partum and Post-partum deaths were 9.4% and 56.3% respectively. The mean gestational age (excluding those in the puerperium) was 33.0 ± 14.8 weeks (Table not shown). The Puerperal period was the most dangerous period when compared with the Antenatal ($p < 0.0001$; OR 0.819; 95% confidence interval 0.04922 to 0.01355) and the intrapartum periods ($p < 0.0001$; OR 0.1915; 95% confidence interval 0.1118 to 0.3242) for maternal death. Postabortal sepsis (which did not fall into any of these classifications) accounted for 12.5% deaths.

That the largest number of maternal deaths occurred in the postpartum period may suggest that once women were delivered of their babies and discharged home from the hospitals, the desire to return to hospital when complications develop is trivialized. The euphoria of the new born might be a cause for the neglect of the mother especially when other relations join the family after the birth of a child for celebration, as is practiced in the extended family system in Nigeria. A review of the literature in a meta-analysis, Li et al²⁸ reported that more than 60% (comparable with 56.3% in this study) of maternal deaths occurred in the post-partum period in both developing countries and the United States. More than 45% of the deaths occurred within the first post-partum day in this study, which may suggest

possible complications in late pregnancy (for example pre-eclampsia and eclampsia) or in labor (for example post-partum hemorrhages). Though most of the deaths occurred in the immediate post-partum period, the patients were already in very moribund states. For example, the cases of PPH were cases that failed to respond to therapeutic measures to arrest hemorrhage even though the placenta had been delivered. Though, cases of ruptured ectopic pregnancy and abortions were classified under undelivered, the fetuses were unviable at the time of termination of the pregnancy or maternal death.

Illiteracy, poverty and inaccessibility to quality health care⁸ have been implicated as the bedrock for maternal deaths. Even though the educational qualifications and the social classes of these women were not documented and so not assessed in this study, it has been shown that women with university education have equal maternal mortality rate in Nigeria as in developed countries.^{6,9}

Table 5 showed the duration of admission before maternal death. A large proportion of the women; 28.1% and 59.1% of the maternal deaths spent less than 24 hours and 24 to 48 hours respectively in the index hospital before deaths. Over all, over 87% of the women spent 48 hours or less before their death. This could be due to all forms of delay where poverty, ignorance and difficulties with transportation might have contributed significantly. Transportation is poor and emergency public service transportation is non-existent in this city especially at odd hours of the night. This might have contributed to the delay in the patients presenting in hospital. It is only about four years ago that communication was made easy in this city through the availability of cellular phones that is still out-of-reach of most persons due to poverty. Delay at presentation in good obstetric centers when complications develop in pregnancy, labor or in the puerperium is a major factor that have been implicated in most reports of maternal deaths.^{1, 23, 24}

This delay often leads to the patient presenting in very moribund state as seen in this study. Similar report from Uganda showed that 91.6% of maternal death spent less than one hour between admission and maternal death.²⁹

The lack of emergency ambulance services for public use in nearly all states of this country that the pregnant women in danger could contact is a serious issue that needed to be addressed. The major salvage hospitals (secondary and tertiary hospitals) in this city and in deed Nigeria have no emergency rescue team like the "flying squad" in most developed countries that can rescue these women in danger. The implication of this is delayed health care, poor quality services and high MMR.

Table 6 showed the causes of maternal death for the period under review. The ultimate complication of pre-eclampsia (Eclampsia) accounted for 34.4% of the deaths. It consistently displaced post-partum hemorrhage (18.8%) from the first to the second position in the order of causes of deaths through out the period reviewed. This was a departure from the commonly known order of causes of maternal death in developing countries over the years, which were in decreasing order, Hemorrhage, Infection, Toxaemia of pregnancy / pre-eclampsia / eclampsia, Obstructed labour and Abortion,^{1, 23, 24, 28 -30} which we called, in pneumonic terms, HITOA.

Of the 11 deaths recorded in 1999, eclampsia 5 (45.5%) and Postpartum haemorrhage 4 (36.4%) were the two leading causes of maternal deaths. Maternal death was also highest 11(34.4%) in 1999. Over all, eclampsia accounted for 11(37.9%) or the highest of the four major and 34.4% of all causes of maternal deaths. This is higher than the 10% maternal deaths from eclampsia reported for women in the United Kingdom³¹ whose national incidence of eclampsia is put at 4.9/10,000 maternities.³² Eclampsia and postpartum hemorrhage were the two leading causes of maternal deaths during the period. Postpartum hemorrhage was closely followed by infections and then abortions. Both paternal and maternal factors have been implicated as among precursors for pre-eclampsia.³³ Mutsumbi et al³¹ had reported eclampsia to be a major cause of death in British women especially in the early puerperium. Though cases of near-miss could not be assessed in this study, the finding of high mortality rate due to eclampsia calls for re-orientation of our health care providers on ways to recognize early signs of the disease, ways to manage it and refer appropriately if the need arises. While strategies to improve the early recognition and adequate management hypertensive diseases in pregnancy should be the goal to reduce maternal mortality from eclampsia, those geared towards the reduction of obstetric hemorrhage (antepartum, intrapartum and postpartum), abortion and infections should continue.

Apart from one death due to anesthesia (Mendelson syndrome) during emergency cesarean section, the route of delivery appeared to have had no significant effect on maternal mortality between vaginal 10(31.3%) and Cesarean 8(25.0%) delivery (Table not shown); $P=0.6033$, 95% Confidence Interval 0.5462 to 2.936. Antenatal deaths of 11(34.4%) was however higher than death due either to vaginal delivery or cesarean section. Hemorrhage was a more common cause of death in vaginal delivery 6(60.0%) than eclampsia 3(30%) for the same route. Eclampsia 4(50%) and cephalopelvic disproportion /

rupture of the uterus 3(37.5%) accounted for 87.5% deaths from cesarean delivery. The institution and implementation of the basic principles of active management of the third stage of labor is crucial to the reduction of PPH and its attendant mortality even as the use of the partogram in labor could detect early cases of cephalopelvic disproportion /obstructed labor with prompt intervention including early referrals and the prevention of the rupture of the uteri and the deaths. Detailed analysis of the antecedent factors to these maternal deaths showed that apart from PPH (75.0% of all cases of hemorrhage), the other three commonest causes of the deaths were also the same major antecedent factors to these deaths: antepartum eclampsia 4/11 (36.4%), IUFD with chorioamnionitis 3/6 (or 50.0% of all cases of sepsis) and induced abortion 3/4(75.5%) (Table not shown). No doubt, prompt presentation and adequate attention devoted to their management could have prevented some of these deaths. Sensible anticipation of those at risk and prompt institution of preventive or therapeutic measures obtainable in good antenatal care settings remains the best milieu to reducing maternal deaths from these causes.

In the classification of these causes of death, the primary rather than the secondary causes, as indicated in the death certificates and the case notes, were used. Though, there were no postmortem reports for these deaths, Mahmoud Fathala² and Kane et al¹⁶ have pointed out that maternal death is often associated with multiple factors. The causes or events leading to a maternal death occur at different stages before or during the pregnancy, delivery or postpartum.³⁰ Though, this hospital had no pathologist, no coroner's inquests were documented in the case notes and no postmortem was done for any of the mortalities. It goes to suggest that once a woman is dead, the cause of death is of no consequence to the members of the family. This is burying the cause of death with the dead requiring no further investigations or inquests, which in itself is an un-encouraging attitude.

CONCLUSION

The Puerperal period constituted the most dangerous period for all maternal deaths. The MMR is still unacceptably high as the causative factors are largely preventable if timely and appropriate interventions were instituted. The impact of interventions to mitigate the ever-increasing MMR in Nigeria for the first decade in the new millennium would be assessed based on improvement on the level of reduction of MMR achieved for the last millennium year, especially for this large mission hospital.

Ignorance, socioeconomic, cultural, poor health infrastructure and lack of communication tools and

non-availability of emergency public ambulance services to assist the women in distress including lack of political will to address maternal mortality¹ were factors that appeared to have summated to propagating the ever increasing maternal death during the period

Women (and girls) empowerment through non-discriminatory effective education and employment policy would go a long way to financial solvency and thus reduction of maternal mortality. Free or highly subsidized universal antenatal care services should be made available and accessible to all pregnant women with effective contraceptive backup to prevent unwanted pregnancies and thus reduce the incidence of illegally induced abortions and its attendant sequelae.

Eclampsia remains one of the major killers of our women. We suggest that care-providers and the community be mobilized to enhance awareness and early recognition of the danger signs, symptoms and risk factors associated with pre-eclampsia and eclampsia. Prompt and adequate management or effective referral system will enhance reduction of maternal morbidity and mortality. These should be the goal for the new millennium.

REFERENCES

1. **Okpere EE.** Maternal Mortality in Nigeria. In: Clinical Obstetrics (revised edition) Ed. Eugene Okpere. Uniben Press, 2004; 389-397.
2. **Fathalla, MF.** Editorial. Safe Motherhood: The road from Nairobi. Afr. J. Reprod. Health. 1998(1): 6-7.
3. **Weinstein D, Chervenak F.** Editors: The First World Congress on Maternal Mortality, Marrakesh, Morocco; 1997; March 8-14.
4. **Ebeigbe PN.** The Safe Motherhood Initiative In: Clinical Obstetrics (revised Edition) Ed. Eugene Okpere. Uniben Press, 2004; 387-388.
5. **Hill K, AbouZahr C, Wardlaw T.** Estimates of maternal mortality for 1995. Bulletin of the World Health Organisation. The International Journal of Public Health 2001; 79 (3):182-193.
6. **Harrison KA.** Maternal mortality in developing countries. Br. J. Obstet. Gynaecol. 1989;1119-1123
7. **Olusanya O, Amiegheme N.** Biosocial factors in maternal Mortality- a study from a Nigeria mission Hospital. West Afr. J. Med. 1989; 8(3): 160-165.
8. Department for International development (DFID). Making Globalization work for the World's poor: An introduction to the UK Government's White Paper on International development.2000; 1-22.
9. **Harrison, KA.** The importance of educated healthy women in Africa. Lancet. 1987; 349: 644-647.
- 10 **Khanna J.** Research on antenatal care and maternal mortality and morbidity. The UNDP/UNFPA/ WHO / World Bank. Geneva. Switzerland. Progress in Reproductive Health Research 2001; 56:1-5.
- 11 **Kane T, Fortney L, Potter L. et al.** Measurement and magnitude of maternal mortality: The case of Egypt. Paper presented at the annual meeting of the Population Association of America, San Francisco 1986, 2-5 April.
- 12 **Buekens P.** Editorial: Is estimating maternal mortality useful? Bulletin of the World Health Organisation. The International Journal of Public Health 2001; 79 (3):179.
13. **Bugalho A. , Bacci A, Bergstrom S.** Risk Factors in Mozambican Women with eclampsia: A Case-Referent Study. Afr. J. Reprod. Health, 2001; 5(2): 30-35.
- 14 **.Emuvenyan EE, Agboghroma OC.** Trends in abortion related deaths maternal mortality in Lagos, Nigeria. Tropical J. Obstet. Gynaecol. 1997; 14(1): 39-42.
- 15 **Adewole IF.** Trends in Post abortal mortality and morbidity in Ibadan, Nigeria. Int.J. Gynecol. Obstet. 1992; 38:115-118.
16. **Kane TT, El-kady AA., Saleh S, Hage M., Stanback J , Potter L.** Maternal Mortality in Gaza, Egypt: Magnitude, Causes, and Prevention. Studies in Family Planning 1992; 23(1): 45-57.
17. **Odum CU.** Eclampsia: An analysis of 845 cases treated in the Lagos University Teaching Hospital, Nigeria over a 20- year period. J. Obst. Gyn. Cent. Afr. 1991; 9(16): 16-20.

18. **Offor E., Onakewhor JUE, Okonofua FE.** Maternal and Neonatal Seroprevalence of Human Immunodeficiency Virus Antibodies in Benin City, Nigeria. *J. Obstet. Gynaecol.* 2000; 20(6): 583-586
19. **Onakewhor JUE, Offor E, Okonofua FE.** Maternal and Neonatal Seroprevalence of Hepatitis B Surface Antigen (HBsAg) in Benin City, Nigeria. *J. Obstet. Gynaecol.* 2001; 21(6): 583-586.
20. **Onakewhor JUE, Offor E, Okonofua FE.** Seroprevalence of Maternal and Neonatal antibodies to Human Immunodeficiency and Hepatitis B Viruses in Benin City, Nigeria. *J. Med. and Biomed. Research* 2002.1(1): 32-38.
21. **Graham W. Brass W, Snow R.** Estimating maternal mortality: The sisterhood method. *Studies in Family Planning* 1989; 20(3): 125-135.
22. **Boerma JT, Mati JKG.** Identifying maternal mortality through networking: results from coastal Kenya. *Studies in Family Planning* 1989; 20(5): 245-253.
23. **Orhue AA.E.** Trends in maternal mortality in a depressed economy. The First World Congress on Maternal Mortality, Marrakesh , Morocco; 1997; March 8-14.129-133.
24. **Okaro, JM, Umezulike, AC, Onah, HE, Chukwuali, LI, Ezugwu OF, Nweke, PC.** Maternal Mortality at the University of Nigeria Teaching Hospital, Enugu, Before and after Kenya. *Afr. J. reprod. Health.* 2001. 5 (2): 91-97.
25. **Fortney JA.** Editorial: Emergency obstetric care: the keystone in the arch of Safe Motherhood. *Int. J. Gynecol. Obstet.* 2001; 74:95-97.
26. Federal Government of Nigeria. Criminal Code, Cap 77. Laws of the Federation of Nigeria 1990.
27. Federal Government of Nigeria. Penal Code, Cap 84. Laws of the Federation of Nigeria 1990.
28. **Li, XF, Fortney JA, Kotelchuck M, Glover LH.** The post partum period: the key to maternal mortality. *Int. J. Gynecol. Obstet.* 1996; 54:1-10.
29. **Mbonye AK.** Risk factors associated with maternal deaths in health units in Uganda. *Afr. J. Reprod. Health.* 2001(3): 47-53.
30. **Fathala M.** "The long road to maternal mortality" *People*, 1987; 13 (3): 8-9.
31. **Mushambi MC, Halligan AW, Williamson K.** Recent developments in the pathophysiology and management of pre-eclampsia. *British J. Anaesthesia* 1996; 76:133-148.
32. **Douglas KA. , Redman CWG.** Eclampsia in the United Kingdom. *British Medical Journal.* 1994; 309:1395-1399.
33. **Esplin MS, Fausett MB, Fraser A, Kerber R, Mineau G, Carrillo J, Varner MW.** Paternal and Maternal components of the predisposition to pre-eclampsia. *N. England J. Med.* 2001; 344(12): 867-872.