Original Article

Maternal "near miss" and maternal mortality at a tertiary health facility in Delta State, South-South Nigeria

Williams Obukohwo Odunvbun,[1] Jerry Kunle Isogun ,[1] Amos Ekoh,[1] Felix Eseoghene Ogbeh [2]

[1]Department of Obstetrics and Gynaecology, College of Health Sciences, Delta State University, Abraka.
[2]Department of Obstetrics and Gynaecology, Delta State University Teaching Hospital Oghara, Delta State.

Abstract

Background: Maternal mortality and morbidity statistics serve as important indicators of the quality of healthcare delivery in a country or health facility.
Aims: To determine the institutional maternal mortality ratio (MMR), maternal near miss incidence ratio (MNMR), maternal near miss to maternal mortality ratio, mortality index, and factors that contributed to maternal outcome, at the Delta State University Teaching Hospital (DELSUTH), Oghara, Delta State.
Methods: This was a retrospective study, conducted at the Department of Obstetrics and Gynaecology, DELSUTH, Oghara. The medical records of maternal deaths and maternal "near miss", from June 1, 2019, to June 30, 2024, were retrieved. The data analysis was with SPSS version 25. Statistical level of significance was set at P< 0.05.
Results: The study recorded 1,037 live births, 54 maternal deaths, and 129 maternal near miss events. The maternal mortality ratio was 5,200 / 100,000 live births, during the study period. The maternal near miss incidence ratio was 124.3 /1000, while the maternal near miss to mortality ratio was 2.4, and the mortality index was 29.5%. The leading cause of mortality and morbidity was hypertensive disorders of pregnancy, which accounted for 59.3% and 73.6%, respectively.
Conclusion: The findings indicate that the maternal health indices are consistent with those of an over-strained healthcare facility, reflecting the consequences of delayed presentation of complicated obstetric cases. These highlight systemic challenges in timely access to obstetric care and emphasize the importance of strengthening antenatal care and referral services.

Keywords: Near miss, maternal mortality, maternal mortality ratio, mortality index, maternal near miss incidence ratio

Address for correspondence: Dr. Williams Obukohwo Odunvbun, Department of Obstetrics and Gynaecology, College of Health Sciences, Delta State University, Abraka, Delta State. Nigeria.
Email: willymeg1@gmail.com
Phone: +2348033722401
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INTRODUCTION

The quality of health services offered to pregnant women by a country, or a health institution is not only defined by maternal mortality statistics, but to a greater extent, by the morbidities suffered in the course of pregnancy and during the puerperium. Thus, the concept of severe acute maternal morbidity (SAMM), or near miss, is considered more apt for the health care system.[1,2]

While the United Nations Development Fund for population reported a maternal mortality ratio of 243/100,000 livebirths for Nigeria in 2014,[3] the Nigeria Demographic and Health Survey (NDHS) estimated the mortality ratio to be 576/100,000 livebirths during the same period.[4] The World population review,[5] estimated Nigeria's maternal mortality ratio to be 1,047/100,000 livebirths, in 2025. However, the challenge inherent in collecting vital statistics in developing countries makes the

above figures mere estimates, as the actual figures may be much higher. Mortality figures are a negative closure, irrespective of the number of interventions and this is why the concept of maternal near miss is a better assessment of health system performance.

The World Health Organization (WHO) defines a maternal near miss as "a woman who nearly died but survived a complication that occurred during pregnancy, childbirth or within 42 days of termination of pregnancy."[6] The near miss indices and tools provide a useful assessment of the quality of obstetric care and reveal the sequence of events that could have led to maternal death. It assists in the development of preventive and educational programmes with improved resource - allocation for the reduction of maternal morbidity and mortality.[7] By leveraging on this information, the health system can be strengthened.

Until a decade and half ago there were no set criteria for identification of near miss cases, in order to facilitate the routine implementation, and wider application of this concept.[8] Epidemiological parameters, such as incidence ratios, mortality index, maternal near miss-mortality ratio, vary from country to country, and within the same country, vary from region to region. In 2017, Mbachu et al,[9] in a cross-sectional study examined, maternal near miss at a rural private tertiary health facility in the southern part of Nigeria, using the adapted WHO Near Miss protocol.[6,10] Their study showed a maternal mortality ratio of 1908/100,000 livebirths, and a maternal near miss mortality ratio of 11.4:1. [9]
This study aimed to determine institutional maternal mortality ratio (MMR), maternal near miss incidence ratio (MNMR), maternal near miss to maternal mortality ratio; mortality index, the aetiological, and other factors that contributed to maternal outcome, at the Delta State University Teaching Hospital (DELSUTH), Oghara, Delta State. There has been no recent study on obstetric "near miss" parameters at the study facility. The findings from the study may assist in revealing weakness in service delivery, improve resource allocation and deployment, with resultant improvement in the overall quality of maternal health service at the facility and public health facilities in Delta State, in general.

METHODOLOGY

This was a retrospective study, conducted at the DELSUTH, Oghara, Delta State. It involved the retrieval and analysis of data from the medical records of patients who died and those who satisfied the adapted inclusion criteria of WHO for maternal near-miss [5,9] at the study facility, from June 1, 2019 to June 30, 2024.

Exclusion Criteria: All pregnant women who were managed at the facility and did not satisfy the selection criteria for near-miss and maternal mortality were excluded from the study.

Operational Definitions:[11]

Maternal mortality ratio (MMR): The number of maternal deaths per 100,000 live births during a defined period.

Maternal near miss incidence ratio (MNMIR): (Number of Maternal Near cases/ Number of live births) x 1,000.

Maternal near miss to mortality ratio (MNM:MD) : It is the ratio of maternal near miss cases to maternal deaths

Mortality index (MI) = {Maternal Deaths (MD)/(Maternal Near Miss (MNM) + Maternal Deaths} X100

Study Setting: The Delta State University Teaching Hospital was established in 2010, in the Suburban community of Oghara, Delta State. The facility has a central ICU with 8 beds, and full complements of specialists in the different departments. The Department of Obstetrics and Gynaecology has a bed capacity of 24, with 15 Consultant Obstetrician and Gynecologist. It is a training centre for resident doctors, for which it maintains a memorandum of understanding with two other public health facilities in the State, Central

Hospital Warri (CHW) and Central Hospital Sapele (CHS). While CHW and CHS offer free maternity services, through the contributory Health Insurance of the State Government, the study facility offers out-of-pocket treatment for patients. Majority of the obstetric complications managed at the study facility are referrals from other public, private, missionary hospitals, maternity homes and traditional birth attendants.

WHO's inclusion criteria for maternal near miss [5,9]

CRITERIA	COMPONENTS
Severe maternal complications	Severe postpartum haemorrhage, Severe Preeclampsia, Eclampsia Sepsis or severe systemic infection, Ruptured uterus, Obstructed labour, Severe complications of abortion.
Critical interventions or Intensive care unit	Admission into ICU, Interventional radiology, Laparotomy for severe obstetric conditions, Use of blood products (FFP, etc)
Life-threatening conditions.	Cardiovascular dysfunction (Shock, Cardiac arrest: absence of pulse/heartbeat, and loss of consciousness). Use of continuous vasoactive drugs. Cardiopulmonary resuscitation. Severe hypoperfusion (lactate >5mmol/L or >45mg/dl), Severe acidosis(pH<7.1).
Respiratory dysfunction	Acute cyanosis, Gasping, Severe tachypnoea (respiratory rate > 40 bpm) Severe bradypnoea (RR < 6 Bpm), Intubation and ventilation are not related to anaesthesia, Severe hypoxaemia (O_2 saturation < 90% for 60 min or PAO_2 /FiO_2 < 200)
Renal dysfunction	Oliguria non-responsive to fluids or diuretics, Dialysis for acute renal failure (AKI), Severe acute azotaemia (creatinine ≥ 300 µmol/ml or ≥3.5 mg/ dl)
Coagulation/haematological dysfunction	Failure to form clots, Massive transfusion of blood or red cells (≥ 5 units), Severe acute thrombocytopaenia (< 50,000 platelets/ml).
Hepatic dysfunction	Jaundice in the presence of preeclampsia, Severe hyperbilirubinaemia (bilirubin >100 µmol/l or > 6.0mg/dl)

Neurological dysfunction	Prolonged unconsciousness (lasting ≥ 12h) /Coma (including metabolic coma), Stroke, Uncontrollable fits/ status epilepticus, Total paralysis
Uterine dysfunction	Uterine haemorrhage or infection leading to hysterectomy

Study tools and procedure: The names and hospital number of the patients who satisfied the inclusion criteria were copied by the researchers from the admission records in the Labour ward, Departmental triage, high dependency unit (HDU), and the intensive care unit (ICU).
The medical records of the patients were retrieved from the records department by staff of the department. Only file-content that satisfied the selection criteria for the study were transferred to the study proforma, after subjecting them to content validity. The information on the proforma was subsequently transferred to a computer-based data sheet for analysis.

Data processing and analysis: The data set was cleaned up before analysis with the Statistical Package for the Social Sciences, version 25.0 (IBM Inc, Chicago, IL, USA). The data set is presented in frequencies and percentages. Statistical associations between categorical variables were analyzed with Chi-square. The statistical level of significance was set at a p-value of < 0.05.

Ethical considerations: Ethical approval was obtained from the Research and Ethics Committee of Delta State University Teaching Hospital, with approval number: HREC/PAN/2024/053/0667.

RESULTS

During the study period of five years, there were a total of 1,101 deliveries, including 64 stillbirths and 1,037 livebirths. Out of the 194 patients who presented at the study facility with obstetric complications, 183(94.3%) patients had adequate data for analysis: of which 129/183 (70.5%) were obstetric “near miss,” and 54/183 (29.5%) maternal death.
The MNMIR was 124.3/1000, MNM:MD Ratio was 2.4, and MI was 29.5 %.

Shown in Table 1 are the socio-demographic and clinical characteristics of the patients. There were no significant differences between near miss and women who died, in their age, educational level, occupation, parity, booking status and referral status. However, 72.2% of maternal deaths occurred among patients that presented postpartum, compared to 26.4% near miss (p <00.1).

Table 2 shows the admission diagnosis and the maternal outcome of the patients. Hypertensive disorders of pregnancy were by far, the most common diagnosis at admission for both near miss and maternal death (73.6% versus 59.3% respectively). Obstetric haemorrhage was the next most common diagnosis at presentation, accounting for 12.4 % of patients with near miss and 25.9% of maternal death. One patient (0.8%) with near miss had anaesthetic complication, due to laryngeal oedema and difficult intubation.

Table 3 shows the administrative, financial and clinical difficulties in patients’ care. Of the administrative, financial and clinical difficulties encountered in the course of patients’ care, late presentation occurred more frequently constituting 48.8% for near miss and 53.7% for maternal death, followed by delay to make payment which constituted 11.6% and 20.4% for near miss and maternal death, respectively.

Table 4 shows that patients who died had relatively more special interventions compared to the near miss. Patients who had serial haemodialysis constituted 29.6% and 13.2%, for maternal death and near miss respectively. More (51.9%) patients who died were mechanically ventilated. These outcomes reflected the severity of organ dysfunctions at presentation.

Table 1: Socio-demographic and clinical characteristics of patients

		Near misses n = 129 N (%)	Mortality n = 54 N (%)	Chi-square	p-value
Age in years	<35	86(66.7)	39(72.2)	0.54	0.46
	≥35	43(33.3)	15(27.8)		
Educational level	None	2(1.6)	0(0.00)	7.31	0.06
	Primary	18(14.0)	2(3.7)		
	Secondary	59(45.7)	33(61.1)		
	Post-secondary	50(38.7)	19(35.2)		
Occupation	Unemployed	28(21.7)	10(18.5)	4.71	0.45
	Unskilled	10(7.8)	5(9.3)		
	Artisan	24(18.6)	13(24.1)		
	Trader	52(40.3)	19(35.2)		
	Farmer	5(3.9)	0(0.00)		
	Professional **	10(7.8)	7(13.0)		
Parity	<2	58(45.0)	25(46.3)	0.93	0.62
	2-4	52(40.3)	24(44.4)		
	≥5	19(14.7)	5(9.3)		
Booking status	Booked at DELSUTH	11(8.5)	0(0.00)	7.41	0.06
	Booked at other facilities	76(58.9)	28(51.9)		
	Unbooked	42(32.5)	26(48.1)		
Referral status	Referred from central hospital Sapele	18(14.0)	10(18.5)	2.84	0.24
	Referred from other facilities	105(81.4)	42(77.8)		
	Self-referral from home/TBA	6(4.7)	2(3.7)		
Pregnancy status at presentation	First trimester	3(2.3)	4(7.4)	39.96	0.00*
	Second trimester	7(5.4)	1(1.9)		
	Third trimester	69(53.5)	8(14.8)		
	Intra-partum	16(12.4)	2(3.7)		
	Post-partum	34(26.4)	39(72.2)		

*Significant; p<0.05.
**Teachers, Lawyers, health professionals, bankers.

Table 2: Admission diagnosis and maternal outcome of the patients

Primary diagnosis*	Near Miss n = 129		Maternal Death n = 54	
	Frequency	%	Frequency	%
*Hypertensive disorders in preg.	95	73.6	32	59.3
Obstetric haemorrhage	16	12.4	14	25.9
Puerperal sepsis	10	7.8	6	11.1
Obstructed labour	4	3.1	1	1.9
Surgical complication	1	0.8	1	1.9
Ruptured uterus	1	0.8	0	0.0
Abortion complications	1	0.8	0	0.0
Anaesthetic complication	1	0.8	0	0.0

***Hypertensive disorders in pregnancy (95):** Severe pre-eclampsia=**56**, Eclampsia=**29**, HELLP (Haemolysis, Elevated Liver enzymes and low Platelet count)=**10**

Table 3: Administrative , financial, and clinical difficulties in patients’ care

Items	Near Miss (n= 129)		Maternal Death (n=54)	
	Frequency	%	Frequency	%
Problem with health personnel				
None	122	94.6	52	96.3
Delay in starting treatment	7	5.4	2	3.7
Patients’ related problems				
Delay in presentation	63	48.8	29	53.7
Delay in making payment	15	11.6	11	20.4
Refusal of surgery	8	6.2	1	1.9
None	43	33.3	13	24.1
Logistical/ equipment problems				
Lack of bed space	6	4.7	2	3.7
Inadequate ventilators	2	1.6	6	11.1
Inadequate supply of blood from the blood bank.	1	0.8	3	5.6
None	120	93.0	43	79.6

Table 4: Interventions in patients’ management

Interventions	Near misses n = 129 N(%)	Mortality n = 54 N(%)	Chi-square	p-value
None	43(33.3)	4(7.4)	38.13	0.00*
Serial haemodialysis	17(13.2)	16(29.6)		
Multiple surgeries	2(1.6)	1(1.9)		
Echocardiography	8(6.2)	1(1.9)		
Mechanical ventilation	20(15.5)	28(51.9)		
Hysterectomy	1(0.8)	1(1.9)		
Massive blood transfusion	1(0.8)	1(1.9)		
Other special intervention*	37(28.7)	2(3.7)		

*Other special interventions for the patients included: Cardioversion, Central venous pressure monitoring, High flow nasal oxygen, Enteral nutrition, management of intravascular coagulopathy

DISCUSSION

This study examined the various indicators of the quality of obstetric services at the Delta State University Teaching Hospital, Oghara, Delta State. The need to synchronize global parameters for defining quality of obstetric care, resulted in the WHO introducing “near miss” criteria to replace maternal mortality ratio, in 2009.[12]

The metric of maternal health services at the DELSUTH, Oghara, as defined by the WHO, showed the following: MMR of 5,200 per 100,000; MNMIR of 124.3/1000; MNM:MD Ratio was 2.4 MI was 29.5 %.

The maternal mortality ratio in this study is much higher than the most recent estimate for Nigeria of 1,047 per 100,000 live births by the World Population Review.[5] A maternal mortality ratio (MMR) of 1,908 per 100,000 livebirths was quoted by Mbachu et al.[9] in the southern part of Nigeria. Studies in developing countries show MMR of 423/100,000 live births and 324/100,000 live births.[13,14] The wide variation in the MMR is due to heterogeneity in study setting, delivery

rates, quality of data, and cost of care. The Delta State University Teaching Hospital, Oghara, is the only well-equipped public tertiary health facility, serving the Delta South and Central senatorial zones. Because of its eccentricity in location, a substantial number of referrals travel long distances on dilapidated road infrastructure to access the facility, with consequential delays. Furthermore, in contrast to the other public hospitals in Delta State that operate on the policy of free maternity services, including free caesarean section,[15] the study facility has an out-of-pocket service which sometimes resulted in type 3 delay,[16] which is the delay in receiving adequate care at a health facility. The delay factors highlighted in this study is consistent with the Nigeria near miss study.[17,18]

The near miss to mortality ratio of 2.4 in this study, means there was one maternal death for every two to three complicated obstetric cases. Higher ratios are indicative of higher quality of care. A ratio of 2.14 was documented in a prospective study conducted in the Eastern part of Nigeria.[19] Other developing countries, such as Syria and Nepal have much better indices of quality of maternal care, such as MNM:MD ratios of 60:1 and 72:1, respectively.[13,14] The factors responsible for the variation in MNM:MD are similar to those responsible for MMR,[20] which include inequitable distribution of health facilities, poor staffing of facilities, poor utilization of antenatal services, poor health seeking behaviour, socio-cultural and religious beliefs, cost of maternity services and transportation. Most of these factors were encountered in the setting for the present study.

Hypertensive disorders in pregnancy were the most common admission diagnosis in both near miss and maternal death in this study. This was followed by a fewer proportion of women, who presented with obstetric haemorrhage and puerperal sepsis. The leading contribution of pre-eclampsia in maternal morbidity and mortality is similar to the findings of other studies.[9,21,22] However, the 73.6% and 59.5%, contribution of hypertensive disorders in pregnancy to near misses and maternal death in this study is disproportionately higher than that for most other studies.[9,18] Most public health facilities in Delta State routinely administer magnesium sulphate (MgSO4); however, the lack of clear treatment protocols, inadequate dosage of the drug, delayed administration, and the absence of ICUs in most referral facilities may explain the high mortality and near miss cases from hypertensive disorders of pregnancy.

The finding of various levels of delay in the present study is in keeping with the findings in other studies.[17,18] In particular, the delay associated with the large number of referrals from other facilities, may have contributed to the high proportion of maternal deaths that occurred among patients that presented postpartum. Strategic investment in health service delivery and road infrastructure in Delta State and Nigeria as a whole is urgently required to eliminate preventable delays associated with maternal morbidity and mortality.

There is an urgent need for a shift in government policy regarding the contributory health insurance of the state, which ostensibly excluded the only well-equipped tertiary health facility in Delta South and Central Senatorial zones from secondary and tertiary levels of care. Because services at DELSUTH, Oghara are out-of-pocket, the study centre often manages complicated obstetric cases from other hospitals across the state that are unable to provide such care. In addition, some of these patients, despite the delay in presentation, are also confronted with the difficulty in raising money for various services, including special interventions. The need to upscale the quality of services at the various primary and secondary health facilities in the state benefiting from free maternity services, cannot be overemphasized, as most of them lack ICUs. The study facility is the only health facility with a functional ICU within the Delta South and Central senatorial zones.

The present study had some limitations. This was a single hospital-based study, albeit, a teaching hospital, thus making generalization difficult. The retrospective design raised the question of data completeness, as authors only made use of information in patients’ medical

records. All the limitations highlighted can be overcome by a follow-up prospective longitudinal multi-Centre study.

CONCLUSION

The findings indicate that the maternal health indices are consistent with those of an over-strained healthcare facility, reflecting the consequences of delayed presentation of complicated obstetric cases. These highlight systemic challenges in timely access to obstetric care and emphasize the importance of strengthening antenatal care and referral services.

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Nil

Conflict of Interest:

There are no conflicts of interest.

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