

# “Near-miss” obstetric events and maternal deaths in Sagamu, Nigeria: a retrospective study

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## **ABSTRACT**

**Aim:** To determine the frequency of near miss (severe acute maternal morbidity), the nature of near miss events and the ratio of maternal deaths to near miss among pregnant women managed over a 3-year period in a Nigerian tertiary centre.

**Methods:** Retrospective facility-based reviews of medical records of women admitted for obstetric complications between 1 January 2002 and 31 December 2004. Case definition was based on validated disease-specific criteria, comprising of five diagnostic categories: haemorrhage, hypertensive disorders in pregnancy, dystocia, infections and anaemia. The prevalence of near miss morbidity was calculated and analysed according to timing of near miss events relative to hospital admission. The death to near miss ratios for the three years were compared to assess the trend of the quality of obstetric care.

**Results:** There were 1501 deliveries, 211 near miss cases and 44 maternal deaths. The total near miss events were 242 with a decreasing trend from 2002 to 2004. Hypertensive disorders in pregnancy (31.4%) and haemorrhage (30.2%) were the most common types of near miss morbidity. Haemorrhage due to abortion was not responsible for any near miss complication. Most (84.8%) of the patients arrived at the hospital with near miss morbidity while 15.6% occurred while on admission in the hospital. Almost a quarter of the near miss events due to haemorrhage occurred in already hospitalised patients. Organ-system failure and intensive care unit admission were recorded in 9.0% and 4.3% of near miss cases respectively. Maternal mortality ratio for the period was 3193 per 100,000 live births. Maternal death to near miss ratio was 1: 4.8 and this remained relatively constant throughout the three years.

**Conclusion:** The quality of care received by women with life-threatening obstetric complications in this centre is suboptimal with no evident changes between 2002 and 2004. Reduction of the present maternal mortality ratio should focus on developing protocols for managing severe morbidities due to hypertension and haemorrhage in the context of the

review findings. Tertiary hospitals in Nigeria could also benefit from evaluation of their standard of obstetric care by conducting near miss audit.

## **BACKGROUND**

For many years, evaluation of maternal healthcare services aimed at improving the quality of obstetric care has traditionally relied on enquiries into maternal deaths. More recently, review of cases at the very severe end of the maternal morbidity spectrum, described as “near miss” (those who nearly died), has been found to be a useful complement to investigation of maternal mortality [1]. Review of near miss cases has the potential to highlight the deficiencies as well as the positive elements in the provision of obstetric services in any health facility. Unlike in the developed countries, there is limited experience with the use of near miss reviews as a tool for monitoring the quality of maternity services in developing countries. This is probably as a result of the persistently high levels of maternal mortality that has overshadowed other severe obstetric complications, from which lessons could equally be learned. In spite of the high maternal mortality ratios in many of the centres in resource-poor settings, the actual number of maternal deaths per centre may not allow detailed quantification of associated risk factors and determinants that are locally important. Because near misses occur much more frequently than maternal deaths, more comprehensive and statistically reliable quantitative analysis that are of value to clinical audit can be rapidly conducted [1,2,3].

At Olabisi Onabanjo University Teaching Hospital, Sagamu, a state-owned referral centre in southwest Nigeria, maternal mortality ratio is close to 2000 per 100,000 live births [4]. Majority of these maternal deaths are largely unpreventable as they occur in unbooked emergencies who present too late to the hospital and die shortly after admission. Therefore, isolated enquiry into maternal deaths in this centre is unlikely to yield adequate information when the focus of investigation is on the standard of in-hospital care. Previous studies in African settings have established the extent to which the magnitude of near miss cases and the ratio of maternal deaths to near miss can inform the quality of obstetric care at different levels of healthcare delivery [5,6].

In order to provide an insight into the quality of maternal care provided in our institution, we embarked on a retrospective study to determine the frequency of the near-miss morbidity, the nature of near-miss events, and the ratio of maternal deaths to near miss among pregnant women managed in this centre over a 3-year period. The review is expected to serve as an alternative but equally useful entry point for auditing the quality of maternal healthcare in this centre.

## **METHODS**

### *Hospital Setting*

The study was conducted at the obstetric unit of Olabisi Onabanjo University Teaching Hospital (OOUTH), Sagamu, a publicly funded tertiary care institution, which serves as the major referral centre for other public and private hospitals within Ogun State, in southwest Nigeria. In addition to providing emergency obstetric services to women referred from other centres, the hospital also provides antenatal care and delivery services for both unreferral low and high-risk pregnant women from Sagamu community and neighbouring towns. The centre provides emergency obstetric and gynaecological care 24 hours a day. Patients are expected to pay for their services though in emergency situations, they are managed within the means of existing resources before funds are made available. Nine consultant obstetricians and an average of 15 registrars and 30 midwives ran the three obstetric units of the hospital during the period under review. The hospital runs a limited blood banking services and relatives of patients are required to donate blood when transfusion is indicated, at times in cases of emergency. The intensive care unit (ICU) of the hospital is within the main surgical theatre though patients requiring critical care are admitted from other units within the hospital. The number of deliveries has reduced drastically in recent years with an average of 40-45 deliveries per month out of which 10-15 are unbooked.

### *Definition of cases*

Near miss events were defined as acute obstetric complications that immediately threaten a woman's survival but do not result in her death either by chance or because of

hospital care she receives, during pregnancy, labour or within 6 weeks after termination of pregnancy or delivery [1] while a near miss case is a woman with at least one near miss event. For identifying near miss events, we applied the disease-specific criteria that was employed by Filippi et al [5] in similar hospital settings in West Africa, which is based on five main diagnostic groups. These were haemorrhage (leading to shock, emergency hysterectomy and blood transfusion); hypertensive disorders of pregnancy (notably eclampsia and severe pre-eclampsia); dystocias (uterine rupture and impending rupture); infections (hyperthermia or hypothermia or a clear source of infection and clinical signs of shock) and anaemia (low haemoglobin level: haematocrit <6g/dl) or clinical signs of severe anaemia in women without severe haemorrhage. The details of this classification are presented elsewhere [1,7].

#### *Study design and identification of cases*

Cases were retrospectively identified among women with pregnancy related complications admitted into the obstetric units of the hospital between 1 January 2002 and 31 December 2004. Using the provisional and discharge diagnoses documented in the admission-discharge register of the hospital, case files of women whose diagnoses met the above pre-defined criteria as well as those with the possibility of being associated with severe acute maternal complications were retrieved for scrutiny by the Near Miss Audit Committee comprising of three Consultants Obstetricians and three Specialist Registrars. Therefore, all cases of caesarean sections and operative vaginal deliveries were reviewed in addition to other complications. Overall, five hundred and twenty cases were retrieved for scrutiny. For each case of near miss, data were collected on demographic characteristics including booking status, nature of obstetric complications responsible, presence of organ-system failure or dysfunction, ICU admission, timing of near miss event with respect to admission, fetal outcome in those associated with labour and length of hospital stay. Data on the number of deliveries and maternal deaths during the period of study were also obtained from the labour and delivery registers.

### *Data analysis*

Data were entered into a computer database using Microsoft Excel spreadsheet and statistical analysis was performed with Epi Info 2002 software (CDC and WHO, 2002)[8]. Results were presented in frequencies, percentages and summary statistics. We presented the prevalence of near miss cases defined as the number of near miss cases divided by the number of deliveries in the hospital. The frequencies of near miss events are reported according to the clinical condition responsible, referral status of the patients and whether the complications were present upon arrival or occurred while on admission at the hospital.

## **RESULTS**

Table 1 shows the age and parity distribution of women who sustained near miss complications. The age ranged between 16 and 44 years with a mean of  $28.1 \pm 6.1$  years and it conforms to a normal distribution (not shown). More than half of affected women are within the 21 and 30-year age group. Over one-third of them were nulliparae, in keeping with the parity demographics of our obstetric population. Majority (76.8%) of the women were from the Yoruba ethnic background, forty-five (21.3%) belong to other Nigerian tribes while 3 (1.4%) were foreigners. Only 37 (17.5%) of the patients were booked for antenatal care and delivery at OOUTH.

There were 1501 deliveries, 211 near miss cases and 44 maternal deaths during the period under review. A total of 242 near miss events were identified with frequencies decreasing from 95 in 2002 to 65 in 2004 (Table 2). This implies that 31 women had more than one near miss complication, giving an average of 1.2 near miss diagnoses per case. As shown in Table 2, the most common types of near miss events were under the diagnostic categories of hypertensive disorders in pregnancy and haemorrhage both of which were responsible for 61.4 % of all near miss events. Most events of near miss due to haemorrhage developed in the later part of pregnancy with 41% occurring postpartum. Haemorrhage due to abortion did not cause any near miss complication over the three-year period. Near miss events related to infections and anaemia were the least common.

Table 3 shows that majority of the near miss cases (80.6%) were referred from other facilities namely Traditional Birth Attendant Homes, Primary and Secondary Healthcare Units and private hospitals within Ogun state and beyond. Most of them (84.8%), both referred and non-referred, were already in critical condition upon arrival at OOUTH. Only 15.6% of the patients experienced near miss complications while on admission. The relationship between those who were already in critical condition upon arrival and those who became near miss cases while on admission is graphically demonstrated in Figure 1. A few women were critical on arrival and after averting maternal death following intervention still experienced another near miss complication during their stay in the hospital. The overall prevalence of near miss cases was 140.6 per 1000 deliveries, though it showed a decreasing trend between 2002 and 2004. The proportion of near miss events in hospitalised patients varied between diagnostic categories; haemorrhage (23.3%), hypertensive disorders (15.8%), dystocia (8.5%), infection (10.0%) and anaemia (11.5%). This is further elaborated in Figure 2, which shows the timing of near miss event relative to admission for each diagnostic category. Organ-system failure/dysfunction occurred in 19 (9.0%) of the near miss cases while only 9 (4.3%) of them were managed in the ICU. Thirty-five (16.6%) of the women required the intervention of Specialists from other units in the hospital.

Total live births during the period of review were 433, 502 and 443 for 2002, 2003 and 2004 respectively. Thus, the maternal mortality ratios were 3926, 3187 and 2483 per 100,000 live births for 2002, 2003 and 2004 respectively with an overall ratio of 3193 per 100,000 live births. Among the 167 near miss cases that were associated with labour, 37.7% and 6.5% resulted in stillbirths and early neonatal deaths respectively. The overall maternal death to near miss ratio was 1: 4.8 with no significant difference in this relationship between the years of study. Duration of hospital stay ranged between 2 and 74 days (median 11 days, interquartile range: 8-15 days).

## DISCUSSION

The need to assess the quality of obstetric care in any centre is paramount to understanding the improvement resulting from investment in its maternity services. Up till now, evaluation of obstetric performance in many Nigerian hospitals is limited to investigations of maternal deaths, an indicator that is vulnerable to many flaws in this environment. To the best of our knowledge, ours is the first review in this country that quantitatively examined the quality of obstetric care using alternative indices.

The study shows that severe acute maternal morbidities occur in a considerable percentage of women managed in this obstetric unit. Life-threatening obstetric conditions, including those that resulted in deaths complicated up to 17% of all deliveries during the reviewed period (211 near miss cases + 44 maternal deaths). This implies that obstetricians in this centre were confronted with life-saving emergency situations in almost 1 out of every 6 women who utilised their delivery services. While this prevalence of near miss cases shows some degree of consistency with the reports from other teaching hospitals in West Africa [5], it is several-folds higher than those published from the developed countries [9,10]. It is possible that this disparity is due to differences in definition of cases, which is a major limitation in comparison of near miss data across institutions [11,12]. Studies in industrialised countries commonly use organ-system failure/dysfunction or ICU admission as their criteria for case selection [9,13]. Though organ-system based criteria is regarded as the most specific and least vulnerable to bias [11], we adopted a tested case definition that best fits the circumstances in our environment to allow local improvement in services and comparison of studies in our setting. We conclude that the wide difference in the magnitude of our cases compared to those quoted in high-resource settings is unlikely to be due to overestimation of our near miss cases since what constitutes near miss morbidity in any centre is dependent on contextual factors and the figures only depicted the number of women at risk of dying in their respective prevailing circumstances.

Similar to the findings in many previous studies [5,9,13], hypertensive disorders and haemorrhage were the leading causes of near miss morbidities accounting for almost two-thirds of all cases. This was not surprising, as they also constitute the main causes of maternal mortality in this centre [4] and indeed in the entire world. Reduction of maternal deaths in this centre therefore requires channelling of resources towards the prevention and combating of haemorrhage particularly those occurring postpartum as well as improvement in the emergency management of complications related to hypertension. The management of haemorrhage due to abortion in the centre during the period of review is commendable as none of such cases constituted near miss morbidity. This is probably related to the frequent training of members of staff in manual vacuum aspiration and incorporation of postabortal care into the existing management protocol of abortion five years previously.

It is interesting to note that in spite of the high prevalence of anaemia in pregnancy in this centre [14], severe anaemia in women without significant haemorrhage was responsible for one-tenth of near miss events. Though malaria remains a major problem, hookworm infestation and nutritional deficiencies resulting in severe anaemia are less common within this community probably because ingestion of haematinics during pregnancy is generally acceptable among the obstetric population. In keeping with the findings in previous series [5], infectious morbidity did not constitute a major threat to the survival of pregnant women managed in this centre. While this may be ascribed to the availability of antibiotics that has kept abreast of the changing microbiological sensitivity pattern within the hospital, it is also probable that most cases of infections either did not survive to reach the hospital or died while on admission and therefore did not form part of our near miss data. This is supported by the fact that septic abortion, which could have contributed significantly to near miss due to infection, has been reported to be a major cause of maternal death in this centre [4,15].

The study shows that majority of the women with near miss morbidity arrived at the hospital in critical condition having being referred from both orthodox and unorthodox facilities. Though some authors suggest that near miss upon arrival at the hospital should not

be used to assess the quality of care at the admitting facility, we believe that the larger proportion of referred near miss cases to this obstetric units indicates its ability to prevent maternal deaths, even in previously unanticipated situations. What is worrisome however, is the recorded maternal death to near miss ratio, a useful indicator of the quality of care received by near miss cases irrespective of their primary source of antenatal or labour care [11]. Maternal deaths to near miss ratio of approximately 1: 5 indicates that for every 5 women who survived life-threatening complication in this centre, one maternal death was also recorded. This ratio, which reflects the overall standard of obstetric care, is poorer than 1: 11-22 reported from similar centres in Niger [16], Cote d'Ivoire and Benin [5] respectively and a far cry from the 1: 117-223 reported in Europe [10,11,12] using the same criteria for case definition.

It is unlikely that the level of care in this centre is attributable to the higher prevalence of near miss cases compared to other centres. This is because with the present delivery rate, the near miss prevalence translates to an average of 6 life-threatening complications per month (211 near miss cases/36 months) and a maternal death to near miss ratio of 1: 5 is unjustifiable with the present human resources. Although this level of care could be attributed to other extraneous factors ranging from cost of obstetric services, mismanagement at sources of referral to lapses in the referral chain, it is the duty of a referral hospital to maintain a good standard of care if the utilisation of obstetric services among the population is to be encouraged. In spite of the decreasing trend in the frequency of near miss events over the three years, the similarity in the death to near miss ratios indicates that there was little or no improvement in the level of care over these years.

Although the occurrence of near miss morbidity in smaller fraction among patients already on admission may suggest a good quality of in-hospital obstetric services in this centre, the proportion of near misses due to haemorrhage among patients while on admission raises questions about the level of care rendered in this clinical situation. Attempts to

improve the standard of obstetric in-hospital care therefore needs to focus on this clinical condition considering its contribution to near miss morbidity and maternal mortality.

This review also demonstrates that identification of cases based on organ-system failure/dysfunction or ICU admission as conducted in some studies is likely to underestimate the frequency of life-threatening complications in developing settings since they occurred in only 9.0% and 4.3 % of all near miss cases respectively. This disparity may be due to the non-availability of ICU in our labour unit and the deficiencies in laboratory diagnostic facilities that are necessary to confirm clinical suspicion of organ failure or dysfunction.

A major limitation of this study is its retrospective nature, which could have lead to underestimation of the near miss cases since incomplete documentation is not unlikely in emergency situations. The study also failed to evaluate individual life-threatening complications that eventually resulted in maternal deaths in order to provide an insight into the level of care rendered for specific clinical situation. This aspect needs to be incorporated into subsequent reviews in this institution.

## **CONCLUSION**

In summary, our review shows that besides the 44 women who died due to pregnancy-related complications, there were 211 additional women who received critical care during the same period supporting the view that near miss appraisal is equally useful in assessing the threat to maternal life. The maternal deaths to near miss ratio however indicates that a significant proportion of near miss cases ended with maternal mortality suggesting a suboptimal level of care for life-threatening complications. Therefore, efforts geared towards improvement in the management of near miss morbidity will go a long way in reducing the present maternal mortality ratio in this centre. From the findings of this review, attempts to reduce maternal mortality may best be achieved by developing agreed protocol for the management of severe hypertension and haemorrhage especially for referred cases. In addition, facilities should be made available and training of personnel and emergency drills should be frequently conducted to combat these major causes of near miss morbidities. It is

apparent from this review that tertiary institutions in Nigeria could also benefit from evaluation of their quality of obstetric care by conducting near miss audit.

### **COMPETING INTEREST**

None declared.

### **AUTHORS' CONTRIBUTIONS**

OOT conceived and designed the study. OOT drafted the manuscript while AOS and AOO critically revised it for intellectual contents. OOT, AOS and AOO were members of the committee that collected the data. OOT and OJD analysed and interpreted the data.

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Figure 1. Legends

- Prevalence of near miss cases upon arrival at the hospital
- Prevalence of near miss cases in already hospitalised patients.

Figure 2. Legends

- The proportion of near miss events upon arrival at the hospital according to diagnostic categories.
- The proportion of near miss events in hospitalised patients according to diagnostic categories.

**Table 1: Age and parity distribution of near miss cases in Sagamu, Nigeria**

	<b>Frequency</b>	<b>Percentage</b>
	n=211	
<b>Age</b>		
<20	24	11.4
21-25	58	27.5
26-30	56	26.5
31-35	47	22.3
>35	26	12.3
<b>Parity</b>		
0	75	35.5
1-4	113	53.6
≥5	23	10.9

**Table 2: Diagnosis distribution and trend of near miss events in Sagamu, Nigeria**

<b>Criteria</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>	<b>Total</b>
<b>Haemorrhage</b>	26 (28.3)	30 (35.3)	17(26.2)	73(30.2)
<i>Early pregnancy</i>	6(6.5)	9 (10.6)	9 (13.8)	24 (9.9)
Ectopic pregnancy	6	9	9	24
Abortion	0	0	0	0
<i>Late pregnancy</i>	20 (21.7)	21 (24.7)	8 (12.3)	49 (20.2)
Placenta praevia	4	2	2	8
Abruptio placentae	5	4	2	11
Postpartum haemorrhage	11	15	4	30
Others	0	0	0	
<b>Hypertension</b>	32 (34.8)	21 (24.7)	23 (35.4)	76 (31.4)
Eclampsia	22	8	9	39
Severe preeclampsia	10	14	14	38
<b>Dystocia</b>	17 (18.5)	19 (22.4)	11 (16.9)	47 (19.4)
Uterine rupture	3	4	3	10
Impending rupture	14	15	8	37
<b>Infection</b>	9 (9.8)	5 (5.9)	6 (9.2)	20 (8.3)
<b>Anaemia</b>	8 (8.7)	10 (11.8)	8 (12.3)	26 (10.7)
All near miss events	92	85	65	242(100.0)

Fig. 1. Prevalence of near-miss in Sagamu, Nigeria

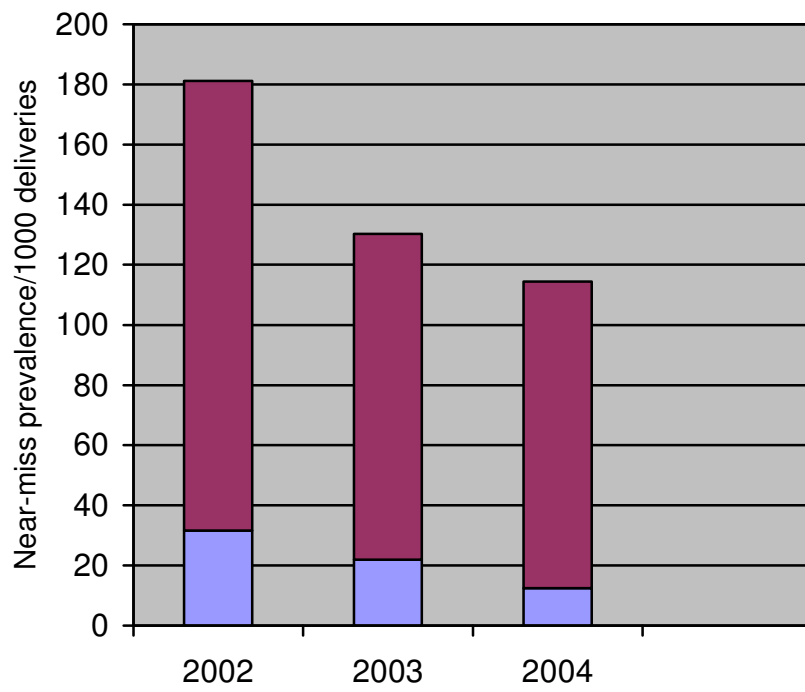
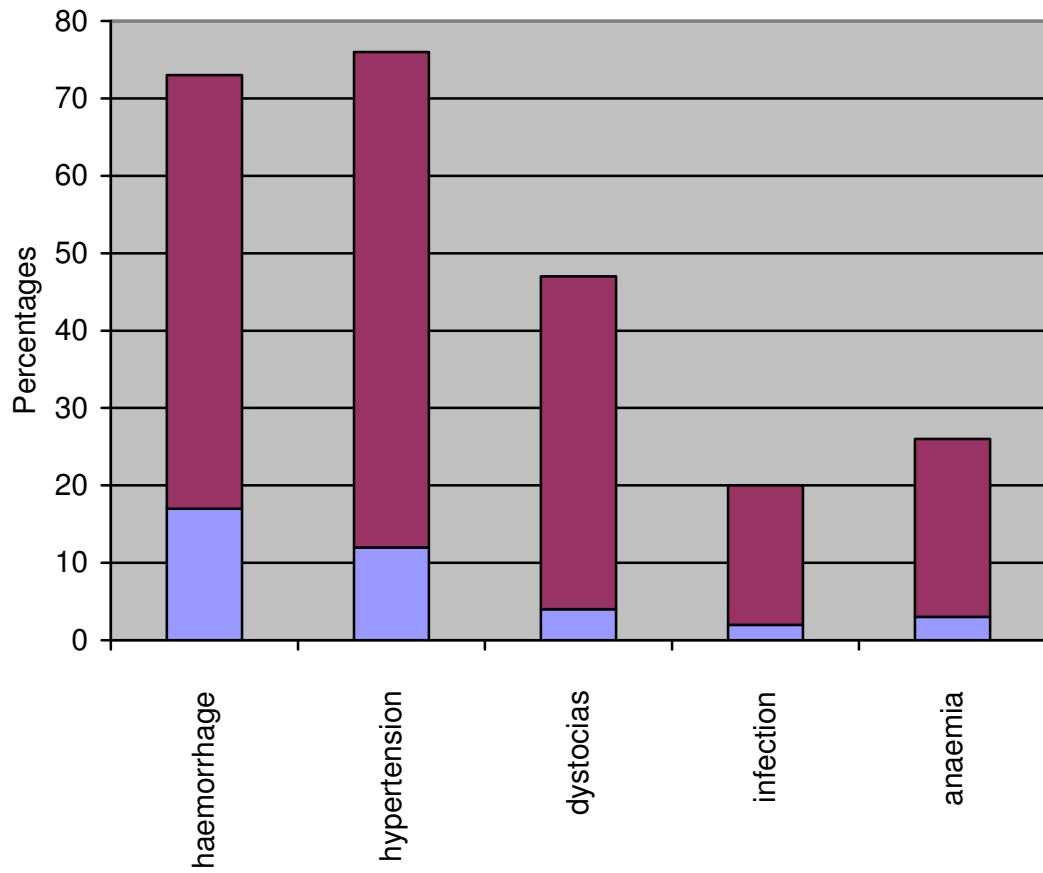


Fig. 2. Frequencies of near miss events according to diagnosis distribution



**Additional files provided with this submission:**

Additional file 1 : Table 3 for near miss.doc : 20Kb

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