

What Are the Factors That Interplay From Normal Pregnancy to Near Miss Maternal Morbidity in a Nigerian Tertiary Health Care Facility?

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Researchers in Nigeria examined the epidemiological characteristics and factors associated with maternal outcomes using a mixed method approach: a prospective case control study design involving 375 pregnant women who received maternal care from a tertiary facility and in-depth interviews reporting the experience of near-miss survivors. A generalized ordered logit model was used to generate the estimates of partial proportional odds ratios (and 95% confidence intervals) across categories of the outcome variable. Factors strongly associated with maternal morbidity were late referral of women, presence of complications at booking antenatal visits, low birth weight, and severe birth asphyxia. The nearmiss women were further characterized, and a low proportion (25%) had organ dysfunction or failure. The challenge of such diagnoses in

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resource-constrained settings raises questions about the appropriateness of using organ dysfunction criteria in developing countries.

BACKGROUND

Maternal health issues in Nigeria are of global concern as the country records the second highest number of annual maternal deaths in the world after India: Nigeria contributes 14% of the total global maternal deaths figure of 287,000), while India contributes 19% (World Health Organization [WHO], 2012). Improving maternal health is one of the eight Millennium Development Goals (MDGs) with the target of reducing maternal mortality ratio by three-quarters between 1990 and 2015. According to the WHO, considerable progress has been made toward the reduction of maternal mortality over the last two decades although the challenge still persists (WHO, 2012). Unfortunately, for each maternal death that occurs, another 20 women are likely to suffer serious health sequelae (Chowdhury, Ahmed, Kalim, & Koblinsky, 2009). As many as 15 million women are estimated to be affected by maternal morbidities worldwide (Koblinsky, Chowdhury, Moran, & Ronsmans, 2012). Hence, while maternal mortality has been described as the “tip of the iceberg,” maternal morbidity constitutes the “base” but has not received adequate attention (Fortney & Smith, 1996; Hardee, Gay, & Blanc, 2012). As such, maternal morbidity and disability and their consequences have recently been described as the “neglected agenda in maternal health” (Koblinsky et al., 2012, p. 124).

Maternal morbidity refers to the health problems that women encounter during pregnancy, delivery, or in the postpartum period. Unlike maternal mortality, which is a singular and distinct event, however, maternal morbidity is often more complex, resulting from many conditions of varying duration and severity. The lack of a uniform, standardized, and reproducible definition of maternal morbidity as well as the difficulty associated with ascertaining and measuring maternal morbidity has been a major challenge in research (Firoz et al., 2013; Say, Souza, & Pattinson, 2009). As in the case of maternal mortality, developing countries disproportionately bear the burden of maternal morbidity. Maternal health occurs along a spectrum, with the two extremes as normal health and death, and maternal morbidity exists within these extremes. Across the spectrum of maternal health, pregnancy and childbirth can move from normal pregnancy to being complicated (acute maternal morbidity) and to becoming life threatening, otherwise referred to as “near-miss” cases (WHO, 2004).

A near miss is defined as a woman who nearly died but survived a complication that occurred during pregnancy, childbirth, or within 42 days of termination of pregnancy. Three different approaches have generally been reported in literature for identifying near misses: (a) disease-specific criteria; (b) intervention criteria such as emergency hysterectomy to control

hemorrhage; and (c) organ system based criteria which is based on the dysfunction or failure of a major organ such as the occurrence of pulmonary edema or disseminated intravascular coagulopathy, which are markers of cardiac and coagulation systems, respectively (Mantel, Buchmann, Rees, & Pattinson, 1998; Souza, Cecatti, Hardy, Serruya, & Amaral, 2007). In addition to near-miss events being useful in assessing the quality of services, it has a special advantage in that the woman who survived a life-threatening condition is able to recount her experience: such narratives can contribute to a deeper understanding of the social factors that are associated with maternal morbidity (WHO, 2012). Studies reporting the experiences of the survivors of near miss events, however, are very few (Souza, Cecatti, Parpinelli, Krupa, & Osis, 2009; Tuncalp, Huldin, Kwame, & Adamu, 2012).

Nigeria is making progress toward the achievement of MDG 5: from an estimated 1,100 maternal deaths per 100,000 in 1990, the country's maternal mortality ratio reduced to 820 maternal deaths per 100,000 in 2005, and to 630 per 100,000 in 2010 (WHO, 2012). Maternal mortality remains a substantial challenge in the country, with about 40,000 maternal deaths recorded annually. Besides, many important maternal health indices with implications for maternal and newborn outcomes are still poor, and they suggest that the level of maternal morbidity may be quite high. For instance, while 58.9% of mothers received antenatal care services from skilled service providers, only 38.9% had skilled attendance during delivery (National Population Commission [NPC] & ICF Macro, 2009). Social and community factors, in addition to health facility factors, have been strongly implicated in maternal health outcomes in Nigeria (Babalola & Fatusi, 2009; Wall, 1998) and many other low- and middle-income countries (Gabrysch & Campbell, 2009; Thaddeus & Maine, 1994). Overall, maternal morbidity has been inadequately researched in Nigeria, and there is a need to determine its current pattern as well as to investigate associated factors.

In this study, we investigated the spectrum of maternal events from uncomplicated pregnancy (normal) to complicated (acute maternal morbidity) and life-threatening cases (near misses) by examining their characteristics and the associated factors in the Ife-Ijesa zone of Osun State, southwest Nigeria. We also explored some factors associated with the occurrence of severe maternal morbidities through the lens of near-miss cases by reviewing their narratives. Finally, we examined and characterized women who had experienced organ dysfunction or organ failures among women with life-threatening complications.

METHODS

This study provides a further analysis of a prospective case control study that was carried out at the Obafemi Awolowo University Teaching Hospitals Complex (OAUTHC), Ile-Ife, southwest Nigeria from July 2006 to June

2007. The study was carried out simultaneously at two maternity hospitals under OAUTHC, which are situated in two separate local government areas (LGAs) of Osun State (Wesley Guild Hospital, Ilesa in Ilesa East LGA, and Ife Hospital Unit in Ife Central LGA). The study participants were pregnant women who sought maternal care at the hospitals during the antenatal (third trimester) or intrapartum period or within 42 days after delivery. Four unmatched controls were selected for every near-miss event. The details of the methodology (namely, study setting, population, sample size, and selection) have been described in an earlier publication (Adeoye, Onayade, & Fatusi, 2013). Here, we present fresh perspectives from the quantitative data and also include findings from qualitative aspects of the study based on a collection of narratives from near-miss survivors and subsequent narrative analysis (Hancock, Windridge, & Ockleford, 2007). The qualitative findings were used to put the quantitative data into a social context.

Trained research assistants carried out a narrative interview with each of the 75 women who had experienced a near miss. The interview started with a “generative narrative question” whereby each woman was requested to relate her experience of the near-miss event and the associated events/factors. This was then followed by relevant questions from the data collector, drawing from a study guide, to gain better perspectives of the associated social and community factors. Where necessary, the information from the interview of the affected woman was supplemented with information from another adult, usually a woman and a close relative who was caring for the woman at the time of the near-miss event. The initial theme was based on the content of the interview guide. The interviews, on the whole, provided an opportunity to obtain a verbatim account of the pregnancy and the delivery experience as well as information on related maternal health issues including the use of birth preparedness plans, knowledge of warning signs, types of delays encountered, male involvement, access to funds, and perception of the quality of care. The interviews were performed by the bedside when patients became clinically stable enough to respond to the questions. The responses were documented in writing and not recorded because some of the study participants were not comfortable with the use of a tape recorder and did not give consent to that effect. The narrative analysis was carried out manually. The study protocol was approved by the Ethics and Research Committee of the hospital.

Operational Variable Definitions

Dependent variable. Dependent variables included maternal outcome categorized into three groups: normal pregnancy, acute maternal morbidities, and near misses:

- *Normal pregnancy* describes a pregnant woman who had spontaneous vertex delivery of a live infant, without any obstetric complication and

did not require any health intervention like caesarian section, induction of labor, and manual removal of placenta to facilitate or complete the birth process.

- *Acute maternal morbidities*: Women who had non-life-threatening complication in current pregnancy, during delivery, and puerperium that could adversely affect maternal and perinatal outcomes as well as those that required any health intervention like caesarian section, induction of labor, or manual removal of placenta to facilitate or complete the birth process. This category also included women who have had complications in their previous pregnancies that influenced obstetric management in the current pregnancy.
- *Near misses* were based on the disease-specific criteria described by Filippi and colleagues (2005): (a) hemorrhage (leading to shock, emergency hysterectomy, coagulation defects, and/or blood transfusion of 2 or more liters of blood); (b) hypertensive disorders in pregnancy—eclampsia and severe preeclampsia with clinical or laboratory indication for termination of pregnancy to save the woman's life; (c) dystocia—uterine rupture and impending rupture, such as prolonged obstructed labor with previous caesarian section; (d) infection—septicemia from any cause; and (e) severe anemia (hemoglobin <6 g/dl).

Independent variables. Independent variables included sociodemographics (maternal age, maternal education, marital status), obstetric (parity, gestational age at delivery, antenatal care attendance, complications noted during booking visit, referral status, fetal presentation during labor), and perinatal characteristics (low birth weight, birth asphyxia, stillbirth).

Statistical Analysis

Statistical analysis for the quantitative aspect was performed using STATA version 12. The differences in the proportion of women with normal pregnancy, acute maternal morbidities, and near misses with specific characteristics were compared using a chi-square test at a 5% level of statistical significance. Multivariate analysis was done using a generalized ordered logit model with maternal event—normal pregnancy, acute maternal morbidity, and near miss—as the outcome. This was used to generate the estimates of partial proportional odds ratios across the categories of the outcome variable: (a) any maternal morbidity (acute maternal morbidity and near misses) versus normal pregnancy and (b) near misses versus other pregnancy outcomes (acute maternal morbidity and normal pregnancy). The generalized ordered logit model works well in situations where the proportionality or parallel slopes assumption of ordinal logistic regression is violated (Williams, 2005). This assumption was assessed during the preliminary analysis using the omodel test. The test showed a violation of the proportionality assumption

of odds across response categories ($\chi^2 = 80.42, p < .001$): hence, ordinal logistic regression could not be used for the analysis. The “gologit2” command was used in STATA to fit the generalized ordered logit model. The partial proportional odds ratios and 95% confidence intervals are reported.

RESULTS

Sociodemographic, Maternal, and Perinatal Characteristics

A total of 375 parturient women were analyzed in this study, consisting of 130 women with normal pregnancy (34.7%), 170 women with acute maternal morbidities (45.3%), and 75 women with near misses (20.0%). There was no significant difference between the mean age of the groups ($p = .554$): 29.5 (± 5) years for women who had normal pregnancy (NP), 30.0 (± 5) for those with acute maternal morbidity (AMM) and 28.6n (± 6) for those with near misses (NM). As Table 1 shows, there were significant differences between the three groups of women with respect to maternal education ($p = .044$) and marital status ($p < .001$) but not with parity ($p = .685$).

The three groups of women differ significantly with respect to the maternal experiences at delivery ($p < .001$ in each case): gestational age at delivery, proportion with complications noted during booking visit, proportion referred to tertiary facility, and proportion with emergency caesarean section. For each variable, the proportion was highest among women with near miss and lowest among those with normal pregnancy. Similarly, the three groups of women differed significantly ($p < .001$) with respect to the following perinatal outcomes: low birth weight, birth asphyxia, and stillbirth rate, with the near-miss group recording the highest proportion for each of these negative outcomes.

Maternal/Fetal Conditions Among Acute Maternal Morbidities

Figure 1 shows the rate of occurrence of various complications experienced by the women who had acute maternal morbidities. Prolonged labor was the most common cause of maternal morbidity, accounting for about a third (32.4%) of all the morbidities. The other leading causes were abnormal presentation (14.6%), fetal distress (11.6%), and hemorrhage (11.0%).

Specific Clinical, Laboratory, and Health Care Features of Near Misses

Table 2 shows the specific clinical, laboratory and health care features of near misses. Of the 75 women who had near-miss events, 61 (81.0%) had developed their complications prior to their arrival at the hospital, while 14 (19%) developed life-threatening complications while on admission at the tertiary health facility. The major causes of near-miss events were severe hemorrhage

TABLE 1 A Comparison of Sociodemographic, Obstetric, and Perinatal Characteristics in Women With Normal Pregnancies, Acute Maternal Morbidity, and Near Miss Events

Characteristics	Spectrum of maternal health			<i>p</i> value
	Normal pregnancy (<i>n</i> = 130)	Acute maternal morbidity (<i>n</i> = 170)	Near misses (<i>n</i> = 75)	
Maternal age (years)				
<35 years	102(78.5)	127(74.7)	53(77.3)	.554
≥35 years	28(21.5)	43(25.3)	17(22.7)	
Maternal education				
≤Secondary	76(58.5)	76(44.7)	42(56.0)	.044
≥Postsecondary	54(41.5)	94(55.3)	33(44.0)	
Marital status				
Married	123(94.6)	151(88.8)	55(73.3)	<.001
Not married	7(5.4)	19(11.2)	20(26.7)	
Parity				
Primipara	55(42.3)	67(39.4)	35(46.7)	.685
2nd–3rd deliveries	50(38.5)	75(44.1)	30(40.0)	
>3 deliveries	25(19.2)	28(16.5)	10(13.3)	
Gestational age at delivery				
<38 weeks	14(10.8)	26(15.8)	26(35.6)	<.001
≥38 weeks	116(89.2)	139(84.2)	47(64.8)	
Antenatal care				
OAUTHC	101(77.7)	119(70.0)	21(28.0)	<.001
Not OAUTHC	29(22.3)	51(30.0)	54(72.0)	
Complications noted during booking visit				
Yes	13(10.0)	35(20.6)	23(30.7)	<.001
No	117(90.0)	124(79.4)	52(69.3)	
Referred				
Yes	21(16.1)	44(25.9)	28(37.3)	<.001
No	109(83.9)	126(74.1)	47(62.7)	
Cephalic presentation				
Yes	130(100.0)	136(80.5)	71(96.0)	<.001
No	0(0.00)	33(19.5)	3(4.0)	
Emergency and caesarean section				
Yes	0(0.0)	97(57.4)	41(57.7)	<.001
No	123(100.0)	72(42.6)	30(42.3)	
Low birth weight				
Yes	14(12.0)	24(14.5)	28(44.4)	<.001
No	103(88.5)	141(85.5)	35(55.6)	
Birth asphyxia				
Yes	3(2.6)	13(8.70)	10(22.2)	<.001
No	113(97.4)	137(91.3)	35(77.8)	
Stillbirth				
Yes	0(0.00)	12(7.45)	17(27.0)	<.001
No	117(100.0)	149(92.7)	46(73.0)	

(41.3%), hypertensive disorders of pregnancy (37.3%), prolonged obstructed labor (18.6%), severe septicemia (14.6%), and severe anemia (13.3%). Severe hemorrhage was mostly secondary to retained placenta and uterine atony and was associated with hypovolemic shock in the majority of women who experienced severe hemorrhage (77.4%). The estimated mean blood loss

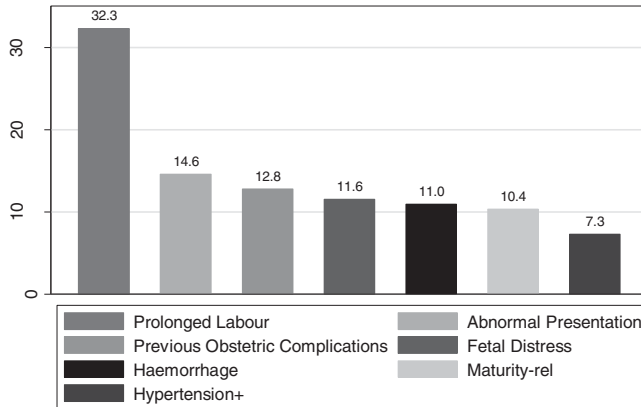


FIGURE 1 Distribution of acute maternal morbidities by specific causes.

was 1.21 (± 0.76 liters). Emergency hysterectomies were performed in four women, consisting of two who had ruptured uterus, one woman with morbidly adherent placenta, and another with uncontrolled hemorrhage. Among women who had pregnancy-induced hypertension (PIH), the mean systolic and mean diastolic blood pressures were 194.3 (± 23.3) and 126.3 (± 23.8), respectively. The associated clinical features were severe headache (24.0%), hypochondria pain (18.6%), and convulsions (12.0%). The electrolytes evaluated included serum sodium [132 ± 5.3], serum potassium [132 ± 5.3], and serum urea [5.7 ± 3.2] levels. Chorioamnionitis and wound infections were causes of septicemia in 27.2% and 73.3% of cases, respectively. The mean body temperature measured was 39.0 ± 0.6 degrees Celsius.

Nineteen of the near misses (25.0%) had identifiable organ dysfunction. Acute pulmonary edema (10.6%) was the most common cause of organ dysfunction followed by acute renal failure (8.0%), intractable uterine atony warranting hysterectomy (5.3%), and disseminated intravascular dissemination (1.3%) (see Figure 2).

Multivariate Analysis

In Table 3 we display the result of the generalized ordered logit estimates that are expressed as partial proportional odds ratios (POR) with their 95% confidence intervals. In the first set of comparisons, women who had any form of maternal morbidity (acute morbidity or near misses) were assessed against those who had normal pregnancies. The following were the significant risk factors for maternal morbidity: the presence of complications during booking visit [POR = 2.94; 95% CI = 1.53 – 5.63]; referral to the tertiary facility [POR = 3.84; 95% CI = 1.1 – 13.26]; and, severe asphyxia [POR = 3.14; 95% CI = 1.36 – 8.52].

Second, women who had life-threatening complications were compared with other maternal outcomes (acute maternal morbidity or normal

TABLE 2 Specific Clinical, Laboratory, Health Care Features of Near Misses

Types of near miss	Frequency (%) (<i>n</i> = 75)	Mean (+ <i>SD</i> or IOR)
Severe hemorrhage	31(41.3%)	
Specific causes		
Retained placenta	11/31(35.5%)	
Uterine atony	9/31(29.0%)	
Antepartum hemorrhage	11/31(35.5%)	
Mean blood loss (mL)		1208.2 ± 760
Hypovolemia shock	24/31(77.4%)	
Emergency hysterectomy	4/31(12.9%)	
Hypertensive disorders of pregnancy	28(37.3%)	
Mean systolic blood pressure		194.3 ± 23.3
Mean diastolic blood pressure		126.3 ± 23.8
+ Convulsion	9/28(32.1%)	
Associated features		
Severe headache	18/28(64.3%)	
Hypochondria pain	14/28(50.0%)	
Pulmonary Edema	5/28(17.9%)	
Electrolytes		
Mean sodium		132 ± 5.3
Mean potassium		3.65 ± 0.6
Mean urea		5.7 ± 3.2
Prolonged obstructed labor	14/75(18.6%)	
Mean duration of labor		36.93 ± 20.1
Comorbidities	8/14(57.1%)	
Severe septicemia	11/75(14.6%)	
Causes		
Chorioamnionitis	3/11(27.2%)	
Wound infection	8/11(72.3%)	
Mean temperature		39.0 ± 0.6
Specimen for culture	5/11(45.5%)	
Severe anemia	10/75(13.3%)	
Median PCV		13.5(IQR 12–15)
Median pints of blood transfusion		4(IQR 3–6)
Proportion with organ dysfunction	19/75(25.0%)	

pregnancy). The presence of complications during booking visit [POR = 2.94; 95% CI = 1.53–5.63], referral to the tertiary facility [POR = 3.84; 95% CI = 1.1–13.26], and, severe asphyxia [POR = 3.14; 95% CI = 1.36–8.52] remained significant factors. In addition, having a low birth weight baby was also a significant factor associated with the near-misses experience [POR = 3.31; 95% CI = 1.43–7.63].

Qualitative Data Findings

We present illustrative narratives from our study to highlight the interplay of these factors within our study context based on the classical three-delay model of Thaddeus and Maine (1994), as well as the four-pronged classification of Gabrysch and Campbell (2009) on factors associated with adverse

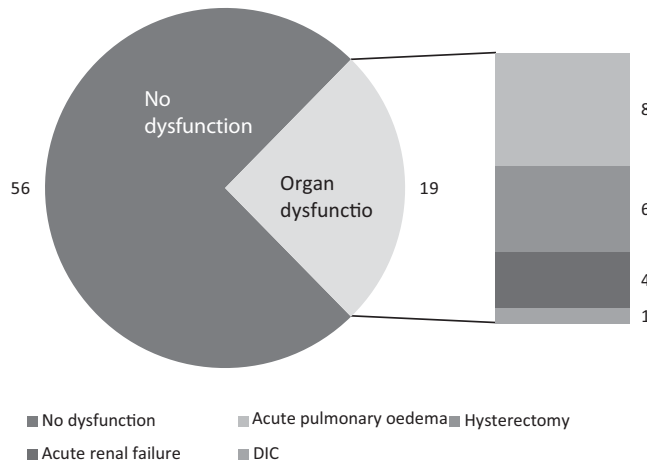


FIGURE 2 Percentage distribution of women with near miss by presence and type of organ dysfunction.

maternal outcomes: (a) sociocultural factors, (b) perceived benefit or need of skilled attendance, (c) economic accessibility, and (d) physical accessibility.

Delay in presenting at the health facility. Some women had been experiencing serious pregnancy-related problems (warning signs in pregnancy) but underestimated their significance and did not respond appropriately due to poor maternal health knowledge. Thus there was a delay in accessing and obtaining appropriate health care:

I was having headache for over more than a week and I used Panadol (a pain reliever). Later on the headache became very serious and I began to have swollen feet and poor vision. It was then I went to the comprehensive health center at Iloko Ijesa where I had registered for antenatal care. The nurses told me my blood pressure was very high so they referred me here. (30 year old secondary school teacher with imminent eclampsia)

I started passing fluid from my private part (vagina) about 10 days ago. At that time my baby was still moving. I went to the maternity center in my area. There I was told to go home that there was no problem. But the fluid never stopped coming. After a week, the baby movement stopped. One of my relatives advised me to go to the teaching hospital. (27 year-old unbooked para 3, i.e., woman that has had her third birth, who had a macerated stillbirth and anemia complicated by septicemia. She also had gram negative septicemia shock.)

I had been feeling weak and dizzy for some time now, but I thought it was because I was pregnant. My husband and I decided to travel home to be cared for by my Mum in Ilesa. When we arrived home, she insisted I had to come to the hospital. Here I was told I have anemia. (26-year-old primigravida from Abuja, who had severe anemia secondary to

TABLE 3 Odds Ratios of Ordered Logistic Regression on Normal Pregnancies, Acute Maternal Morbidity, and Near Misses

Item	(Acute maternal morbidity and near misses) versus normal pregnancy		Near misses versus (acute maternal morbidity and normal pregnancy)	
	Odds ratio	95% Confidence interval	Odds Ratio	95% Confidence interval
Age				
<35 years (RC)				
≥35 years	0.90	0.49–1.62	0.90	0.49–1.62
Maternal education				
≤Secondary school (RC)				
Postsecondary	2.00	1.2–3.34	0.89	0.43–1.87
Marital status				
Not married (RC)				
Married	0.52	0.24–1.44	0.52	0.24–1.44
Parity				
Primipara				
2–3 deliveries	1.03	0.72–1.46	1.03	0.72–1.46
≥3 deliveries				
Antenatal attendance				
OA/THC				
No (RC)	1.08	0.33–3.49	1.08	0.33–3.49
Complications noted at booking				
No				
Yes	2.94	1.53–5.63	2.94	1.53–5.63
Referred				
No				
Yes	3.84	1.11–13.26	3.84	1.11–13.26
Gestational age at delivery				
<38 weeks				
≥38 weeks	0.52	0.25–1.08	0.52	0.25–1.08
Low birth weight				
Yes	1.14	0.54–2.44	3.31	1.43–7.63
No				
Severe asphyxia				
Yes	3.14	1.36–8.52	3.14	1.36–8.52
No				

HIV/AIDS. She was unaware of her HIV status until she got to the hospital. Her husband also tested HIV positive.)

Perceived benefit or need of skilled attendance and economic accessibility. These are factors that influence the perception of how a facility delivery with skilled attendance would benefit the mother and newborn, how “big” the personal need for such care is, or both. These factors affect the decision to seek care from skilled attendants and health facilities. The narratives obtained in our study showed that some categories of women opted for care from unskilled attendants largely because they do not see the value of skilled attendants and facilities largely based on their experience in

previous pregnancies. Poor financial status also interplays in this decision-making process as illustrated by the following narrative:

My two previous deliveries were without any problem. I had always received care from the mission home. However in this pregnancy, I started bleeding since the pregnancy was about 6 months. When the bleeding became very frequent, the church birth attendant asked me to do an ultrasound scan. She told me to go to the hospital but I refused because I had no money. I also believed that I was going to be fine because God is in control. As the day of delivery drew near, the bleeding became very heavy and unfortunately my husband had gone to the farm. I did not know when I got here. I was told my relatives and neighbors brought me here. *(34-year-old unbooked para 3 who had disseminated intravascular coagulopathy following severe antepartum, intrapartum, and postpartum hemorrhages secondary to placenta previa. She received 10 pints of blood.)*

Physical accessibility to emergency obstetric facilities and health system factors. The narratives from our women show two categories with respect to accessibility to emergency obstetric facilities and health system factors: (a) seeking care from health facilities that lack obstetrics emergency care capacities, largely because the accessibility to emergency obstetric care facilities is more challenging; and (b) inability to receive appropriate care from health facilities with emergency obstetric care capacities due to poor quality of care or broader health systems factor such as industrial action by health workers:

I delivered a dead baby at home. Thereafter, the placenta did not come out, so I went to a private hospital close by where the placenta was removed. Few days after I was discharged, I started bleeding heavily, so I reported back to the same hospital, but I was referred to Wesley Guild Hospital because the bleeding was just too much. *(35-year-old unbooked grand multiparous (para 6) woman with severe hemorrhage from retained placenta following stillbirth)*

I had a stillbirth in my last delivery, but I believed that all would be well this time. After I had delivered my baby at home, the placenta wouldn't come out and I also started bleeding. I was taken to a private clinic, but they refused to take me into the facility because of the seriousness of the bleeding. My husband was told to take me to Wesley Guild Hospital. *(Near miss with postpartum hemorrhage secondary to retained placenta)*

The man that impregnated her lives close to us; we did not realize she was pregnant for quite some time. Although he did not deny the pregnancy, he has not provided funds for her care. When she fell into labor, we took her to the primary health center here (in our community) where she was in labor for 3 days without progress. Then, she was referred to LAUTECH Teaching Hospital (which is not far from us). Unfortunately when we got

there, there was a strike. So we had to come here. (*Mother of a 20-year-old primigravida with prolonged obstructed labor with septicemia*)

On Sunday afternoon I had a sharp pain in my stomach. At that time, my baby was still moving. I was told that I was bleeding inside because of placenta separation. Eventually, I was taken to the theater, by which time my baby had stopped kicking. (*Booked but unmarried primigravida who had ruptured uterus that was mistaken for concealed abruptio placenta. She had uterine repair instead of hysterectomy because of her low parity.*)

DISCUSSION

Maternal morbidity has been aptly described as a neglected agenda in women's health as it has received scant attention in comparison with maternal mortality, though it occurs at a much higher level (Koblinsky et al., 2012). Although Nigeria, which has the second highest burden of annual maternal deaths in the world (WHO, 2012), is expected to have very high rates of maternal morbidity, scant research attention has been given to this issue. Our study examined the pattern in maternal health spectrum from normal pregnancy, to acute maternal morbidity, to near misses in a Nigerian tertiary health care facility and explored associated factors.

The most important factor associated with maternal morbidity (both acute maternal morbidity and near misses) found in our study was the referral status of women. Women who were referred from another facility to the tertiary care center had a fourfold risk (OR = 3.84) of experiencing maternal morbidity compared with women who were not referred. One probable reason for this was that referrals were mostly late, which usually resulted from delay in seeking care from the primary (referring) center. Referrals to a tertiary facility, in most cases, inadvertently meant that severe complications had already set in or were imminent. Several narratives from near-miss cases strongly suggest that the act of first approaching lower-level centers (which lack emergency obstetric care capacity) during obstetrics emergencies inadvertently lengthened the referral process. Specifically, four-fifths (81%) of the near misses were in serious condition upon arrival at the hospital. This is similar to the findings of Filippi and colleagues (2005) in their study on near misses in three African countries where most of the women (83%) were already in critical condition upon arrival at the hospital.

Evidently, strengthening the referral system in Nigeria will reduce maternal morbidity and mortality, but this needs to be complemented with efforts to overcome critical demand- and supply-side barriers to produce optimal results. Fournier and colleagues (2009) have shown, in a quasiexperimental study of maternal mortality in six rural health districts in Mali that the risk of maternal death could be reduced with appropriate constellation of services

or intervention. The risk of maternal death in that study was reduced by half (OR = 0.48) following health system improvement that involved basic and comprehensive emergency obstetric care, transportation, and a community financing scheme. The approach used in Mali showed that it is not just a question of improving the link between facilities, but that other ancillary factors, particularly finance and transportation issues, must be addressed especially in the context of low-resourced communities. For instance, lack of funds was one of the factors that did not allow some of the women in our study to take the advantage of the referral provided to them. Therefore, “active referral” rather than a passive referral of women needs to be vigorously promoted. Active referrals involve proactive participation and support of the referring facility and personnel in ensuring that the referred individuals access emergency care. The issue of absence of skilled attendants at birth is also implicated in maternal morbidity occurrence in this study because a number of our women indicated in their narratives that they used the services of traditional or faith-based birth attendants. This is an area of significant concern in the maternal health effort because the last Nigeria Demographic and Health Survey reported that more than a third of pregnant women in Nigeria still deliver outside an orthodox health facility or without the presence of skilled attendants (NPC & ICF Macro, 2009).

Identifying maternal-related complication in a woman during her first antenatal (booking) visit was also strongly associated with maternal morbidity. There was a threefold odds (OR = 2.94) of having maternal morbidity among this category of women compared with those in whom no complication was observed at their booking visit. Although obstetric complications are often unpredictable, which makes the use of the risk approach in antenatal care ineffective, our findings strongly suggest that complications during the first antenatal visit might be a risk marker. Thus, women who present with complications at first antenatal booking visit may require more intensive surveillance. Significant attention, therefore, must also be paid to counseling for possible referral, having a birth preparedness plan, regular education, and close clinical monitoring during each antenatal visit.

Low birth weight (OR = 3.31) and severe birth asphyxia (OR = 3.14) were also strongly associated with maternal morbidity, especially with near misses. This finding supports the point that the health of the mother and her child are intricately linked. Low birth weight may be a consequence of preterm delivery and could be also be an indicator of poor fetomaternal nutrition. Poor fetomaternal nutrition may result from poor nutritional status and inadequate nutritional intake during pregnancy. In addition, heavy placenta parasitemia from severe malaria infection is an important cause of low birth weight in malaria holoendemic areas like Nigeria. Low birth weight, a major determinant of mortality, morbidity, and disability in neonates, infancy, and childhood, could have a long-term impact on health outcomes in adult life (United Nations Children’s Fund (UNICEF) & WHO, 2004). Specifically,

having low birth weight can program the infant for future disease in adult life (Balci, Acikel, & Akdemir, 2010).

Furthermore, we found prolonged obstructed labor occurring in almost a fifth of women with acute maternal morbidities. Cephalopelvic disproportion, which may result from poorly developed pelvic bones of mothers, could account for most cases of prolonged labor. An inadequate pelvis is usually a sequellae of prolonged undernutrition in the mother from her childhood or adolescent years. Poor childhood nutrition and early pregnancy, both of which have fairly high rates in Nigeria, are associated with cephalopelvic disproportion. Thus, improving nutrition in childhood and adolescence, preventing early marriage and pregnancy, and reducing fertility rates may all contribute toward the reduction of maternal morbidity in our study population.

Finally, the proportion of near-miss cases with organ dysfunction or failure of a major organ system was 25%. This is comparable with the findings of Thomas van den Akker and coworkers in Malawi where only 22% of the near miss events were discovered using the organ systemic dysfunction criteria (van den Akker, Beltman, Leyten, Mwangomba, & Meguid, 2013). Near misses with organ failure, for example renal or cardiopulmonary failures, comprise the most severe forms of maternal morbidity because they faced the highest risk of death but only survived because of the quality maternal care they had received. The WHO Working Group on Maternal Mortality and Morbidity classification has proposed that the organ system dysfunction criteria might be the most promising approach compared with the disease-specific criteria (which has been widely used in developing countries) or intervention-based approach. The strong appeal of the organ dysfunction approach includes its sensitivity in capturing true near-miss events as well as its suitability for comparison across different setting. Its use may be challenging in low-income settings, however, because of the shortage of sophisticated equipment and skills required to diagnose organ dysfunction or failures (Pattison & Hall, 2003).

Not unexpectedly, our findings show that the organ failure criteria are likely to document only a subset of women with life-threatening complications: as such, this results in an underestimation of the true burden of near misses. A recent systematic review on the prevalence of maternal near misses revealed that prevalence of near misses was much lower when the identification criteria was based on organ failures or dysfunction (Tuncalp, Hindin, Souza, Chou, & Say, 2012). Furthermore, for better surveillance and timely interventions in women with life-threatening complications, concentration on those who meet the disease-specific criteria may be better than those with organ failures who have a comparatively lower likelihood of survival. Besides, the time of progression to organ failure and death may move very fast along the maternal health spectrum. Therefore, the disease-based approach might be the most suitable in low-resource settings that bear disproportionately higher burdens of maternal ill-health

and mortality. The position of the WHO Working Group in its preference for an organ-system dysfunction approach may require further research, particularly in elucidating factors that affect the time of progression to fatal or near-fatal outcomes in pregnancy and childbirth.

CONCLUSIONS

Overall, the findings from our study highlight some factors that are associated with the spectrum of maternal morbidity in a Nigerian environment. Many of these factors, interestingly, are modifiable, thus providing some directions for possible evidence-based interventions. Health systems strengthening (HSS) is an important interventional approach for improving accessibility to and quality of maternal service delivery. HSS should address factors associated with improved availability as well as geographical and financial accessibility to essential obstetrics facilities, as well as the strengthening of the referral system. Individual and household targeted interventions are also important, particularly health education for women to improve maternal health seeking behavior and the use of a birth preparedness plan. As we have indicated earlier, maternal morbidity has not received adequate research attention. Thus, this study opens a window of opportunity for better understanding of maternal morbidity challenges, its patterns, and associated factors. More studies are needed, particularly in low- and middle-income countries to improve the understanding of the factors at play in maternal morbidity and serve as platforms for effective program design and implementation.

The low proportion of the near-miss cases that had organ dysfunction in our study and the challenge of such diagnosis in a resource-constrained environment raise questions about the appropriateness of using organ dysfunction criteria in low- and middle-income countries. We advocate, instead, that a disease-based approach appears more feasible and practicable for most developing countries to identify and address the challenge of severe maternal morbidities. This issue deserves more research and consensus building between maternal health researchers and experts. In addition, we share the perspective of Van der Akker and colleagues (2013) that “by only monitoring near-miss cases and mortality, we underestimate the impact on women who will live with non-life threatening, yet serious maternal morbidities” (p. 1–5).

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