



Obstetric Hemorrhage and adverse Maternal outcomes: Experience of a Private Teaching Hospital in Southwestern Nigeria

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Summary

Background: Obstetric hemorrhage (OH) has remained the leading cause of maternal mortality, despite concerted National efforts. This audit was conducted to determine its contribution to Adverse Maternal Outcomes and determinants of survival at a private Teaching Hospital, which had provided comprehensive essential obstetric care for 3 years.

Methods: A retrospective review of all Severe Maternal Outcomes (SMO) due to OH using the Near–Miss approach.

Results: There were 682 deliveries, 101 (14.8%) were SMOs; composed of 97 Maternal Near Misses (MNM) and 4 Maternal Deaths (MD). OH accounted for 37/101(36.6%) of the total SMO and 33/97 (34.0%) of the total MNM observed. All MD were due to Obstetric hemorrhage, n=4(100%), with a Case Fatality Rate (CFR) of 3.3%. Coagulopathy (CFR=25%) and ruptured uterus (CFR=20%) were major causes of MD. Most of the MNM 19/33 (57.6%) and MD 3/4 (75%) were unbooked referrals; with MD more likely when a referred patient lived >5km from the hospital (OR=3.53). Significantly more MD (p=0.021, OR= 1.36, CI=1.005–1.850), were associated with deviations from standard management protocol.

Conclusion: Obstetric Hemorrhage, caused most of the Adverse Maternal Outcomes. Survival however depended on the quality of antenatal care, pre-referral care and adherence to standard management protocol for definitive care.

Key words: Pregnancy, hemorrhage, maternal, near-miss, Nigeria

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Introduction

Obstetric hemorrhage (OH) has continually held the leading position among the causes of maternal death and near miss globally.[1] This trend persists despite increasing availability of scientifically–proven effective inventions to tackle this scourge. 2–4 Obstetric hemorrhage contributes up to 60% of maternal deaths and between 34 and 51% of near misses.5–8 It is the

commonest cause of maternal death in several Nigerian towns [9,10] while in some others it is next only to hypertensive disorders of pregnancy.[11,12] Life–threatening hemorrhage occurs in about 1 of every 1000 deliveries.[13]

Poor utilisation of antenatal care services and inadequate birth preparedness on the parts of both the patients and health workers are recognised factors



responsible for the large numbers of deaths from obstetric hemorrhage.[5,14,15] Delay in recognition of danger signs and late presentation to centres with comprehensive essential obstetric care services are the main consequences of defective antenatal care uptake.[14] Although blood transfusion services, advanced life support services such as intensive care, dialysis and surgical techniques for obstetric hemorrhage management are increasingly being made available in developing countries, studies have consistently shown that these services are poorly utilised, especially in areas with high maternal mortality. [5,14]According to the National Demographic Health Survey report, of 2008, 62% of births in Nigeria occurred at home, only 35% of births occurred in a health facility; 20% of these deliveries took place in public sector facilities while 15% occurred in private sector facilities. [16] Cause-specific case fatality rates for obstetric haemorrhage as high as 12.5%, have been recorded in some parts of North Central Nigeria.[15]

Postpartum hemorrhage as reported in many studies is responsible for most cases of life-threatening obstetric hemorrhage.[17–19] Rupture of the gravid uterus has become an important cause of OH and its incidence is rising with the global increasing number of caesarean sections, especially in developing countries, where there is poor uptake of antenatal care services and a large number of booked patients do not return for delivery or postpartum care even after having had caesarean section.[20]

The governments of the developing nations have played major roles in the provision of obstetric services; many of them giving free or highly subsidised services. These services are mostly under-utilised by the target population who often prefer unskilled care, usually from Traditional Birth attendants (TBAs). The WHO excludes

them (trained or untrained) from the list of skilled health care providers.[16]

The major challenges to accessing emergency obstetric services in Nigeria include; the bureaucracy involved and poor logistics, hindering patient transport. Incessant industrial actions, political unrest and terrorist activities have made obstetric care services in most of the government-run hospitals largely unavailable.²¹ Unpredictable electricity power supply services resulting in inefficient blood banking and intensive care services have adversely affected the capability of many of these government owned hospitals in Nigeria to tackle the issue of obstetric haemorrhage effectively. An early audit of this nature may be beneficial in assessing the challenge that obstetric haemorrhage poses to a new private teaching hospital, in order, to re-position itself adequately as a tertiary level comprehensive essential obstetric care provider in a developing country.

This study was thus aimed at determining the contribution of hemorrhage to life-threatening obstetric complications; the factors responsible for its occurrence, patterns of presentation and the associated severe maternal outcomes, among women managed or referred to the Babcock University Teaching Hospital, Ilishan-Remo.

Materials and Methods

This retrospective review was conducted at the Babcock University Teaching Hospital (BUTH), a private Teaching Hospital and provider of comprehensive essential obstetric services; located within Ikenne Local Government Area (LGA) of Ogun State, South Western Nigeria. Reports from the Federal bureau of statistics in Nigeria revealed that Ikenne LGA recorded 127,244 deliveries in 2008, which steadily increased to 140,486 deliveries in 2011.[22] Another study however reports that consistently less than 50% of deliveries in Ikenne



LGA occurred in government owned health facilities, in that time period.[23]

The obstetric care service providers within the LGA include 1 Comprehensive Emergency Obstetric Care provider (CEOC); Babcock University Teaching Hospital at Ilishan, 2 centres that provide caesarean section as the only component of CEOC; State General Hospital, Ikenne and State Hospital at Iperu. The others provide Basic Essential Obstetric Care (BEOC) only and they include; Community Hospital at Ilishan and 10 Primary Health Care (PHC) Centres in wards distributed between the five towns in the LGA. There are also eight registered Private Hospitals/Clinics, several Traditional Birth Attendants (TBA) and Religious Healthcare Centres (RHC) within the Local Government Area. [23] BUTH is a referral centre for pregnancy complications from all of the other healthcare providers and facilities in Ikenne LGA.

The study was a retrospective analysis of all cases of obstetric haemorrhage complications that were managed at BUTH, in the 3 years from its inception i.e. from June 2012 to May 2015.

The near miss approach was applied with the use of a modified structured proforma designed by Oladapo et al and used for the 2012–2013, national data on near miss and maternal mortality study in Nigeria.[24] This proforma contained sections on the socioeconomic bio-data of the patients as well as near miss and mortality criteria which included; clinical, organ system dysfunction, laboratory markers and intervention-based criteria. Data were obtained from the case-files of the patients who had severe maternal outcome related to hemorrhage. These case files were retrieved from the records department after searching through the health records database, the delivery register, operating theatre register and the admissions and discharge registers of the emergency room and obstetric units.

Modifications to the Oladapo et al proforma included the primary and secondary sources of patient referral to BUTH.

Severe maternal complications were defined as “Potentially Life-Threatening Conditions” (PLTC); which were an extensive category of clinical conditions, including diseases that threatened a woman’s life during pregnancy and labour and after termination of pregnancy.[25] Near-miss cases were defined based on disease-specific criteria including: haemorrhage, hypertensive disorders in pregnancy, dystocia, infection and anaemia.[26] Maternal Near Miss (MNM) was defined as an acute obstetric complication that immediately threatened a woman’s survival but did not result in her death by chance or because of hospital care she received during pregnancy, labour or within 6 weeks after termination of pregnancy or delivery.[25,27] A woman was considered a Near Miss if she had at least one MNM event. To identify women who had a near miss; the Say et al criteria for MNM used by the WHO working group on maternal mortality and morbidity was employed.28 Severe Maternal Outcomes (SMO) included all maternal near miss cases and maternal deaths.

Maternal death was defined as the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management, but not from accidental or incidental causes (ICD-10).[27] Rupture of the uterus was defined as one occurring during labour, confirmed by laparotomy, or post-mortem examination. A patient was considered as being “booked” for antenatal care if she had registered at BUTH and had at least one additional visit in which her antenatal investigations and records were reviewed. Patients who did not meet these criteria were considered in this study



as 'unbooked'. The term 'TBA' was defined as traditional, independent, informally trained and community-based providers of care during pregnancy, childbirth, and the postnatal period.¹⁶ The immediate source of referral was considered as the last location, health facility or place from where the woman with life threatening obstetric complication was brought to BUTH, while the primary source of referral was the first point, location, place or health facility where the complication was first recognized and decision for referral taken. Definitive treatment or intervention was regarded as the most crucial intervention (or combination of interventions) required to actually end or reverse the underlying pathological process and avert death.

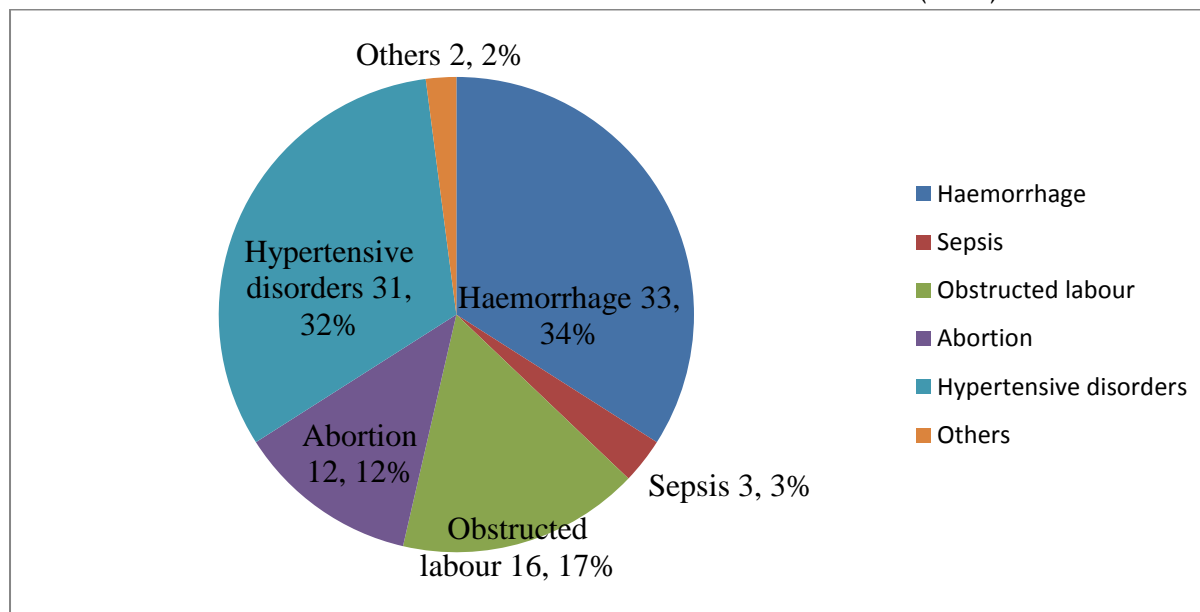
The information obtained at the end of this study was processed using the computer Software Package for Social Sciences (SPSS), version 21. Univariate analysis was done, expressing frequencies as means and standard deviations. Bivariate analysis was done with the Chi-square test for categorical variables. Multiple logistic regression analysis was done to determine the factors responsible for survival from life

threatening obstetric complications. A level of 95% confidence interval was used and statistical significance set at p-value of <0.05.

Results

A total of 682 deliveries occurred in the review period, 9 twin deliveries and 1 triplet delivery were recorded, resulting in 693 total births; 672 of these were live births. One hundred and one (101) of the mothers met the criteria for Severe Maternal Outcome (SMO); 97 of these were Maternal Near Misses (MNM) while 4 Maternal Deaths (MD) occurred. The calculated Maternal Near Miss Incidence Ratio (MNM:IR) was thus 144.3/1000 live births. Obstetric Hemorrhage (OH) accounted for 37/101 (36.6%) of the SMO and 33/97 (34.0%) of the MNM observed. All of the Maternal Deaths (MD) n=4 (100%) recorded in the review period were due to obstetric hemorrhage. Hypertensive disorders of pregnancy was the next most important cause of MNM accounting for 31/97 (32.0%) of the total MNM from obstetric complications (Figure 1).

Figure.1 Contribution of Obstetric haemorrhage to Maternal Near Miss (MNM) at BUTH





The calculated Maternal Mortality Ratio (MMR), for OH was 595.2 per 100,000 live births, while the estimated Case Fatality Rate was 3.3%. Table 1 shows that the Severe Maternal Outcome Ratio (SMOR) for OH was 55.1 per 1000 live births, while the MNM Incidence Ratio (MNM:IR) was 49.1 per 1000 live births. A Mortality Index (MI) of 0.1 was also observed for OH at BUTH.

Rupture of the gravid uterus was the commonest cause of maternal death, accounting for 2/4 (50%) of the MD (table 1). Coagulopathy contributed significantly to maternal death as the highest CFR (25%) recorded in this study was for this condition. Although retained placenta contributed among the least to obstetric haemorrhage SMO, 1/37 (2.7%), this condition however had the highest mortality index (MI) of 1.

Table .1 Obstetric haemorrhage complications, SMO and Near Miss Indicators

All Complications	haemorrhage	Frequency	SMO	MNM	MD	MNM IR/1000 LB	SMOR /1000 LB	MI MD/SMO	MMR /100,000 LB	CFR (%)
Placenta praevia		20	8	8	0	11.9	11.9	0	0	0
Abruptio placentae		13	10	10	0	14.9	14.9	0	0	0
Uterine atony		21	5	5	0	7.4	7.4	0	0	0
Genital laceration		16	1	1	0	1.5	1.5	0	0	0
Retained placenta		7	1	0	1	0	1.5	1	148.8	14.3
Ruptured uterus		10	7	5	2	7.4	10.4	0.3	297.6	20.0
Coagulopathy		4	3	2	1	3.0	4.5	0.3	148.8	25.0
Other obstetric haemorrhage		11	2	2	0	3.0	3.0	0	0	0
Total	Obstetric haemorrhage	102	37	33	4	49.1	55.1	0.1	595.2	3.9

MI=Mortality Index, LB=Live Birth, SMOR=Severe Maternal Outcome Ratio, MNM:IR /1000 LB= Maternal Near Miss Incidence Ratio per 1000 Live Births
CFR=Case Fatality Rate

There was no statistically significant difference in the occurrence of MNM or MD with respect to maternal age ($p=0.20$), educational level attained ($p=1.00$), maternal occupation ($p=0.72$), religion ($p=1.00$), social class ($p=1.00$) and source of referral ($p=0.44$). MD was

however more likely if a woman lived >5km from BUTH (OR=3.53, CI=0.40–30.87) (table 2). Most of the SMO, 22/37 (59.5%) and MD 3/4 (75%) were unbooked referrals to BUTH.



Table .2 Socio-economic characteristics of Obstetric Haemorrhage SMOs at BUTH

Variable	MD n = 4	MNM n = 33	SMO n =37	p-value	95% CI
Age (mean)	34.1±4.9	31.0±5.0	31.4±5.0	0.20	-8.84 – 1.91
Educational level					
Primary (%)	1(9.1)	10(90.9)	11(100)	1.00	1.00–1.00
Secondary (%)	2(13.3)	13(86.7)	15(100)		
Tertiary (%)	1(9.)	10(90.9)	11(100)		
Occupation					
Unemployed (%)	0(0)	1(100)	1(100)	0.72	0.71–0.73
Unskilled (%)	1(5.9)	16(95.1)	17(100)		
Skilled (%)	3(17.7)	14(82.3)	17(100)		
Professional (%)	0(0)	2(100)	2(100)		
Religion					
Islam (%)	1(10.0)	9(90.0)	10(100)	1.00	
Christianity (%)	3(11.1)	24(88.9)	27(100)		
Marital status	4(10.8)	33(89.2)	37(100)	Constant	
Social Class					
Low (%)	3(12.5)	21(87.5)	24(100)	1.00	
Middle (%)	1(9.1)	10(90.9)	11(100)		
High (%)	0(0)	2(100)	2(100)		
Place of residence					
>5km	3(17.7)	14(82.3)	17(100)	0.32	0.40 – 30.87
<5km	1(5.0)	19(95.0)	20(100)	OR=3.53	
Immediate source of referral					
PHC	0(0)	5(100)	5(100)	0.44	0.43–0.45
Private hospital	1(25.0)	3(75.0)	4(100)		
TBA	1(10.0)	9(90.0)	10(100)		
Church	1(25.0)	3(75.0)	4(100)		
Primary source of referral					
PHC	0(0)	1(100)	1(100)	0.69	0.68–0.70
Private hospital	0(0)	2(100)	2(100)		
TBA	2(12.5)	14(87.5)	16(100)		
Church	1(25.0)	3(75.0)	4(100)		

95%CI= 95% Confidence Interval

Although no statistically significant differences existed in the occurrence of MD and MNM with respect to obstetric factors such as gestational age at presentation

($p=0.17$), previous Caesarean Section ($p=0.58$), previous stillbirth (1.00) and newborn outcome ($p=1.00$); the risk of MD occurring was however higher



when the SMO was unbooked (OR=2.05, CI=0.23–17.84), has had a previous Caesarean Section (OR=2.08, CI= 0.33–13.05), had vaginal delivery in index pregnancy (p=6.25, CI= 0.72–53.98) or if her baby died in the process (OR=1.5, CI=0.15–14.64) (table 3). While most life-threatening haemorrhage happened in the late third trimester (mean GA for MNM=36.1±3.2), ‘life-taking’ haemorrhage occurred mostly at term (mean GA for MD=38.7±1.5). A woman

who had a stillbirth in a previous pregnancy was more likely to be a near miss (OR=1.30, CI=0.12–14.11, MNM>MD). Patients who were brought to BUTH during working hours had over a 4-fold risk of dying (OR= 4.93, CI=0.56–42.88). The maternal deaths were noted to have spent shorter time in BUTH (median duration of hospitalization for MD=1.5 hours) than the near misses (192.0 hours). (table 4)

Table .3 Obstetric factors and associated outcomes of women with life-threatening haemorrhage at BUTH

Variable	MD n=4	MNM n =33	SMO n = 37	p-Value	95% CI
Booking status					
Unbooked (%)	3(13.6)	19(86.4)	22(100)	0.63	
Booked (%)	1(6.7)	14(93.3)	15(100)	OR = 2.05	0.23–17.84
Parity (mean)	3.5±1.9	3.2±1.6	3.3±3.0	0.76	-1.99– 1.48
Stage at admission					
Antepartum (%)	1(5.3)	18(94.7)	19(100)	0.52	0.51–0.53
During labour (%)	1(11.1)	8(88.9)	9(100)		
Postpartum (%)	2(22.2)	7(87.8)	9(100)		
Time of occurrence of LTC					
Antepartum (%)	3(13.0)	20(87.0)	23(100)	1.00	0.21–15.89
Postpartum (%)	1(7.1)	13(92.9)	14(100)	OR=1.83	
GA at presentation	38.7±1.5	36.1±3.2	36.3±3.1	0.17	-5.54–0.33
Previous CS					
Yes (%)	2(16.7)	10(83.3)	12(100)	0.58	0.33–13.05
No (%)	2(8.0)	23(92.0)	25(100)	OR=2.08	
Previous Stillbirth					
Yes (%)	1(9.1)	10(90.9)	11(100)	1.00	0.12–14.11
No (%)	3(11.5)	23(88.5)	26(100)	OR=1.30(MNM)	
Mode of delivery					
SVD (%)	3(25.0)	9(75.0)	12(100)	0.09	0.72–53.97
CS (%)	1(4.0)	24(96.0)	25(100)	OR=6.25	
Newborn outcome					
Dead (%)	1(11.1)	8(88.9)	9(100)	1.00	0.15–14.65
Alive (%)	2(11.8)	25(88.2)	27(100)	OR=1.50	

LTC=Life Threatening Complication, GA=Gestational Age, SVD= Spontaneous Vaginal Delivery, CS=Caesarean section



Table .4 Health system (BUTH) determinants of outcome of life-threatening OH at BUTH

Variable	MD n=4	MNM n =33	SMO n = 37	p-Value	95% CI
Time of presentation					
Working hours (%)	3(21.4)	11(78.6)	14(100)	0.14	0.56-42.88
Call hours (%)	1(4.3)	22(95.7)	23(100)	OR =4.93	
Median length of hospitalization (hours)	1.47 (R= 15.72)	192.00 (R=456.00)	144.00 (R=527.72)		
Mean Diagnosis- definitive treatment interval(minutes)	540.0(n=1)	348.2±665.7	355.0±654.3	0.78	-1585-1201
Most senior definitive care giver					
Registrar/Medical Officer (%)	0(0)	2(100)	2(100)	0.79	1.00-1.27
Consultant (%)	4(11.4)	31(88.6)	35(100)	OR=1.13	(MNM)
Deviation from protocol (%)					
Yes	4(26.7)	11(73.3)	15(100)	0.02	1.00-1.85
No	0(0)	22(100)	22(100)	OR=1.36	
Reasons for protocol deviation					
Administrative reason	2(40.0)	3(60.0)	5(100)	constant	
Lack of blood/blood products (%)					
Medical personnel problems					
Delay in correct diagnosis (%)	1(50.0)	1(50.0)	2(100)	0.60	0.22-17.89
Delay in treatment (%)	1(25.0)	3(75.0)	4(100)	OR=2.00	
Patient-oriented problems					
Delay in presentation (%)	3(42.9)	4(57.1)	7(100)	0.53	0.26-11.47
Refusal of treatment (%)	1(25.0)	3(75.0)	4(100)	OR=1.71	

Multiple reasons for protocol deviation were possible

Only one of the MD commenced definitive treatment, this patient had a diagnosis-treatment interval (540 minutes) much longer than the mean for MNM (348.2±665.7 minutes), although not statistically significant (p=0.78). This delay was due to initial refusal by the patient and her relatives to consent for treatment, and later return in a very poor clinical state. Significantly more maternal deaths (p=0.02, OR= 1.36, CI=1.01-1.85), were associated with deviations from standard management protocol for obstetric hemorrhage

SMO. Refusal of treatment was one of the major patient-oriented reasons for these deviations from standard management protocol. MD was however more likely if a woman had a delay in presentation to BUTH (OR=1.71, CI=0.26-11.47) (table 5). Assessment of medical personnel-oriented problems reveals that; delay in making correct diagnosis was associated with higher risk for maternal death (OR=2.00, CI=0.22-17.89) than a delay in instituting definitive treatment of the hemorrhage.

Table .5 Critical interventions for OH SMOs at BUTH



Variable	MD n=4	MNM n =33	SMO n = 37	p-Value	95% CI
Admission to ICU					
Yes (%)	0(0)	2(100)	2(100)	0.79	
No (%)	4(11.4)	31(88.6)	35(100)	OR=1.13(MNM)	1.00–1.27
Life-saving surgery					
Yes (%)	0(0)	7(100)	7(100)	0.42	1.00–1.32
No (%)	4(13.3)	26(86.7)	30(100)	OR=1.15(MNM)	
Transfusion of blood products					
Yes (%)	0(0)	4(100)	4(100)	0.62	
No (%)	4(12.1)	29(81.9)	33(100)	OR=1.14(MNM)	1.00–1.29
Dialysis					
Yes (%)	0(0)	2(100)	2(100)	0.79	1.00–1.27
No (%)	4(11.4)	31(88.6)	35(100)	OR=1.13(MNM)	

ICU=Intensive Care Unit

None of the maternal deaths completed critical life-saving interventions. Table 5 shows that survival (MNM) was more likely if a woman had any of these interventions; admission into the intensive care unit (OR=1.13, CI=1.00–1.27, MNM>MD), hysterectomy (OR=1.15, CI=1.00–1.32, MNM>MD), transfusion of blood products (OR=1.14, CI=1.00–1.29, MNM>MD) and dialysis (OR=1.13, CI=1.00–1.27, MNM>MD).

Discussion

Patients referred for potentially life threatening obstetric complications accounted for a significant proportion 101/682 (14.8%) of the deliveries in the first 3 years of existence of BUTH, this occurrence may be because it is a new hospital and the only fully CEOC provider in Ikenne LGA. It is also closer than the government-owned teaching hospital, in Sagamu LGA, for referral of pregnancy complications. TBA and other unskilled birth attendant activity is also very high in Ikenne LGA, with its resultant referral of patients in poor clinical conditions, for care at BUTH. A recent survey in Ogun

state, South Western Nigeria, revealed that almost two-thirds (63.6%) of those surveyed had been attended by TBAs in previous deliveries, with 61.9% of these previous TBA users indicating their intention to continue doing so, for maternal and child health services; including supervision of delivery in their subsequent pregnancies.²⁹ The MNM incidence ratio (MNM:IR) of 144.3 per 1000 live births (14.4%) is much higher than the 4–8% estimated for pregnant women in resource poor settings and the 1% estimated for the developed world in a systematic review.²⁸ The MNM:IR obtained in our study is also much higher than obtained for private hospitals (7.5 per 1000 live births) in reports from an earlier study in Iran, those private hospitals however, unlike BUTH were not referral centres for obstetric complications. It is still much higher when compared to the 105 per 1000 live births calculated for Iranian public tertiary hospitals in that same study.^{29,31} A recent nationwide cross sectional survey of maternal deaths and near misses in Nigerian public tertiary hospitals revealed a near miss incidence ratio of



15.8 per 1000 live births.²⁴ Obstetric Hemorrhage 33/97 (34.0%) and Hypertensive disorders 31/97 (32.0%) accounted for most of the MNM observed at BUTH. This finding is comparable to what is widely reported in similar audits and some prospective studies, where hemorrhage was also the leading cause.^{6,7,31,32} All of the Maternal Deaths n=4, (100%) recorded at BUTH in the review period were due to obstetric haemorrhage. A recent prospective study in Nigeria also implicated the duo, but hypertensive disorders were observed as the leading cause of MD (29.0%), while obstetric haemorrhage accounted for 24.4%.²⁴ Another systematic review observed a regional trend; noting that globally; Hemorrhage was the leading cause of maternal deaths in Africa (33.9%) and in Asia (30.8%) while in Latin America and the Caribbean, it was hypertensive disorders which were responsible for 25% of maternal deaths.¹⁷

The Maternal Mortality Ratio (MMR), from OH was 595 per 100,000 live births, this can be considered as the MMR for BUTH since all maternal deaths were due to haemorrhage, this value is much lower than the 1088 per 100,000 live births obtained in a recent nationwide tertiary hospital based prospective study in Nigeria.²⁴ This crude MMR of 595 per 100,000 is however, unacceptably higher than the 244 per 100,000 live births observed for OH in that same nationwide study, most 3/4 (75%) of these maternal deaths were however in unbooked patients, referred with life-threatening obstetric haemorrhage, an adjusted MMR of 146 per 100,000 was obtained after considering the booking status. BUTH is a new Teaching hospital and has had fewer number of deliveries, mainly complicated referrals from mostly unskilled attendants, this finding is however vital as it buttresses a need for re-focusing our efforts towards the institution's ability to match the nature of referrals and community engagement to improve the

patient referral system. The estimated Case Fatality Rate (CFR) for OH of 3.3% is greater than 1% expected for its level as a comprehensive essential obstetric care centre.³³ It is however within the range of 0.5–15.3% obtained for potentially life threatening complications by Oladapo et al in the nationwide survey of SMOs in government-owned tertiary hospitals.²⁴ Coagulopathy and ruptured uterus, contributed significantly to maternal death as these conditions had the highest cause-specific Case Fatality Rates of 25% and 20% respectively.

The high Severe Maternal Outcome Ratio (SMOR) of 55.1 per 1000 live births and MNM Incidence Ratio (MNM:IR) of 49.1 per 1000 live births, in addition to the relatively low Mortality Index (MI) of 0.11 (11%) observed for OH at BUTH, when compared to the low SMOR (10.4/1000 LB), MNM:IR of 7.75/1000 LB and the high MI of 25.5% obtained by Oladapo et al in 2015 suggest that less women with life-threatening obstetric haemorrhage died at BUTH.²⁴ The MI is however higher than 8.1% obtained for OH by Umbeli et al in a study done at a tertiary hospital in Sudan, a fellow developing African country.⁶ Although retained placenta contributed the least to SMO 1/37 (2.7%), this condition however accounted for the highest mortality index (MI) of 1 (10%) recorded in this study. The 2 major causes of Antepartum haemorrhage– Placental abruption 10/37 (27%) and Placenta praevia 8/37 (21.6%), contributed the largest number of SMO, but no maternal death (MD) was associated with them.

Socioeconomic conditions leading to MNM and MD from obstetric haemorrhage were similar. Although most life-threatening haemorrhage happened in the late third trimester (mean GA for MNM=36.1±3.2); 'life-taking' haemorrhage however occurred mostly at term (mean GA for MD=38.7±1.5). This further buttresses the need for greater emphasis on skilled antenatal care with birth



preparedness and complication readiness as major focus. Skilled birth attendance is a major issue as most deliveries in Ogun state are attended by traditional birth attendants and religious non-medical personnel; 16/37 (43.2%) and 4/37 (10.8%) of the SMOs were primarily referrals from TBAs and churches respectively to BUTH. Early recognition of complications was probably defective as the resultant delay in presentation was a significant determinant of outcome.

The differences noted between the immediate sources of referral and the primary sources of referral (primary being larger) shows that these patients actually spent time seeking care in places where comprehensive emergency obstetric care services were not available before being brought to the tertiary hospital. Five (35.7%) of the 14 MNM and 1/2 (50%) of the MD from the TBAs were first taken elsewhere. These problems associated with the referral system were obviously hazardous as 2/4 (50%) of the maternal deaths were referrals from TBAs. Further analysis reveals that 2/16, (12.5%) of SMOs referred from the TBAs died. This calls for action by stakeholders to enhance the low cadre centres (PHCs, health posts and private hospitals and maternities) to recognise PLTC and prevent undue admission and delay. Re-training of low cadre healthcare providers on basic life support in addition to provision of referral aids such as anti-shock garments and stand-by vehicles or ambulances would greatly aid patient referral to avert catastrophe.

A woman who had a stillbirth in a previous pregnancy was more likely to be a near miss (OR=1.30, CI=0.12–14.11, MNM>MD), possibly due to referral earlier in pregnancy for skilled antenatal care. Patients who were brought to BUTH during working hours had over a 4-fold risk of death (OR= 4.93, CI=0.57–42.88), than survival. Poor utilization of hospital services and misinformation on working hours, in addition to delayed

referral from lower cadre facilities (health posts, PHCs and other private hospitals), may be responsible for patients waiting for daylight before being taken to the tertiary hospital.

Significantly more maternal deaths ($p=0.02$, OR= 1.36, CI=1.00–1.85), were associated with deviations from standard management protocol for obstetric hemorrhage SMO. Among the patients who died, only one had definitive treatment commenced for her hemorrhage, this patient had a diagnosis-definitive treatment interval of 540 minutes which was much longer than the mean of 348.2 minutes for MNM, although not statistically significant ($p=0.78$). This delay was due to initial refusal by the patient and her relatives to consent to treatment (surgery), and late return to BUTH in a very poor clinical state. Although refusal of treatment was one of the major patient-oriented reasons for deviation from standard management protocol, MD was however more likely if a woman had a delay in presentation to BUTH (OR=1.71, CI=0.256–11.470). Assessment of medical personnel-oriented problems reveals that; delay in making correct diagnosis was associated with greater risk for maternal death (OR=2.00, CI=0.22–17.89) than a delay in instituting definitive treatment of the hemorrhage.

None of the maternal deaths completed critical life-saving interventions; survival (MNM) was thus more likely if a woman had any of the life-saving interventions. These critical interventions available in comprehensive emergency obstetric care centres have been shown to be effective in preventing death from potentially life-threatening obstetric haemorrhage. Non-utilisation or delays in assessing comprehensive essential obstetric care have been consistently linked with adverse maternal outcome.²⁻⁴

The retrospective design of this study, made it impossible to assess organ dysfunction, since the



patients were not seen. Furthermore, causal relationships between risk factors and SMOs could not be established due to the retrospective nature of the study. Hence, further prospective research may help to determine these associations.

Conclusion

Obstetric hemorrhage is still the major cause of severe maternal outcomes from potentially life threatening complications. Reproductive health risk factors for death and near miss from OH were similar. Skilled birth attendance essential to survival was still low in referring communities. Deviations from standard management protocol are mostly socially determined, but they make a difference between life and death. Early access to Comprehensive Essential Obstetric Care (CEOOC) is thus life-saving.

Recommendations

Early access to CEOOC in addition to life-saving resuscitation before or during transfer could prevent deaths. Appropriate antenatal care to ensure birth preparedness and complication readiness is essential. There is need for skilled birth attendance at the lower cadres of care to ensure early diagnosis and referrals for life-threatening Obstetric hemorrhage, including training on basic life support during referral.

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Conflict of interest

The authors declare no conflict of interest

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