MATERNAL MORTALITY AUDIT IN A TERTIARY HEALTH INSTITUTION IN NIGERIA: LESSONS FROM DIRECT CAUSES AND ITS DRIVERS

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ABSTRACT

INTRODUCTION
Nigeria has the second highest number of maternal deaths in the world.The study aimed at determining the causes of and non-obstetric contributors to maternal mortality at a tertiary referral hospital.

MATERIALSAND METHODS
It was a prospective audit of all consecutive maternal deaths in the hospital over a three-year period. Immediately after the death, information was retrieved via a data collection form. Data were analysed with SPSS-20.

RESULTS
Seventy deaths were examined over the study period. Maternal mortality ratio was 1,265/100,000 live births. The annual ratio decreased steadily over the study period. Most of the deaths were of multiparous women who had not received any antenatal care, and were mostly postpartum, within 24 hours of delivery. Most of them were critically ill on admission to the hospital. Major causes of death were haemorrhage (36%), sepsis (17%) and hypertensive disorders (16%). Delays were identified in 34.3% of cases; most (70.1%) were Phase III delays.

DISCUSSION
Direct causes of maternal mortality are consistent with those found in literature. Steps which the centre has been taken to counter direct and non-obstetric causes are discussed. Possible strategies to improve health financing and referral system are proffered.

KEY WORDS: Maternal mortality, delays

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INTRODUCTION

Maternal mortality is always more devastating than death from illness, as it results from a physiological process that is not expected to end in demise. The statistics in Nigeria have remained high, and little has changed over time in the culture, socio-economic status, infrastructure or policies guiding women's health care. The global trend has shown a welcome decline from 546,000 deaths in 1990 to 289,000 in 2013.[1] This, however, is only a 45% declinehardly commensurate to the 75% reduction that the fifth Millennium Developmental Goal aims to achieve by 2015. In 2013, Nigeria had 40,000 maternal deaths (14% of global deaths) and was second only to India (17%); these two countries accounted for one-third of all maternal deaths that year.[1]

Global maternal mortality ratio (MMR) has fallen from 380 per 100,000 live births in 1990 to 210 in 2013.[1] The most recent Nigerian Demographic and Health Survey estimated the country's average MMR to be 576 per 100,000 live births and the lifetime risk of maternal death to be 1:30.[2] MMR in Nigeria has reduced from 1,200 in 1990 to 560 in 2013; corresponding to a 52% decline, with an average annual decline of 3.1%.[1] An annual decline of 5.5% is required to achieve the MDG target of 75% reduction by 2015, showing that the improvement is far behind what is expected.

In Nigeria, different health facilities have reported widely varying MMRs: 2096 in Lagos;[3] 963 in a state hospital in Ibadan;[4] 430 in Maiduguri,[5] and 825 in

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Ilorin.[6] A community assessment which employed the indirect sisterhood method carried out in Ibadan reported an MMR of 6,525.[7]

The major direct causes of maternal mortality are fairly constant.[8] The leading cause of maternal death in Africa is obstetric haemorrhage; it is estimated that 34% is attributable to it.[9] Indirect causes such as HIV / AIDS, anaemia, malaria, poor nutrition and poverty often potentiated the effects of the direct causes of maternal mortality. The contribution of other non-obstetric factors that cause delays in accessing and receiving emergency obstetric care have also been described in detail.[10]

As the MDG's limit is reached this year and possibly new targets are set, the study aimed to determine the causes of maternal mortality in a tertiary referral hospital in South-West Nigeria, and to enumerate possible contributing non-obstetric factors to these deaths. It is hoped that an audit of practice will help to show gaps in patient care and suggest improvement.

MATERIALS AND METHODS

This was a prospective audit of maternal deaths at a tertiary referral hospital in South-West Nigeria over a three-year period. The hospital is an 850-bedded tertiary health facility with an annual delivery rate of 2500.

At the study hospital, three different antenatal clinics (ANCs) are conducted weekly with an average of 120 patients per clinic session. At each ANC, the routine care involves registration, vital signs measurement and group health talk before consultation by doctors. The labour ward has an admission room, a first-stage bay, two delivery suites, two operating rooms and a post-partum bay. A team of a consultant, 3 resident doctors, 2 house officers and at least 5 nurse / midwives of different cadres cover the labour ward. In addition, there is a resident anaesthetist on 24-hour coverage of the labour ward, and a paediatrician who covers the labour ward and the special care baby unit. A separate team (comprising of another consultant obstetrician and resident doctors) offers 24-hour first-contact obstetric care in the emergency room. A junior resident is the first point of contact and after his / her review; a senior resident will see the patient and review with the consultant for a final decision on management plan, which may include transfer to the labour ward team. A departmental review meeting labelled 'Morning Review' is held every morning to discuss the cases managed in the emergency room and labour ward in the preceding 24 hours.

During the period being audited, as part of cost recovery measures, the hospital operated revolving fund committees and a pay-before-use policy. The funds were usually out-of-pocket for the patients. The patients who were indigent were provided the opportunity to temporarily waive the payment of funds till a later time, before discharge. Thus, services available in the hospital would be accessible to patients. These services included grouping and cross-matching of blood, laboratory investigations, consumables, medication and surgery. However, when some of these services (such as compatible blood) were not available in the hospital, it became necessary for the clients to purchase them from facilities outside the hospital.

Study protocol: 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.*[11]

Ethical approval for the study was secured from the State's ethical committee. All procedures followed were in accordance with the Helsinki Declaration. Prior to the commencement, a data collection form was designed. The data form comprised of the following sections; the socio-biological data, past obstetric history, history of index pregnancy and delivery, diagnosis on admission, probable cause of death (including post-mortem for those that were performed), and identified non-medical contributory factors and delays (time of presentation, non-medical challenges, time within and between treatment decision and implementations). These delays were documented by a checklist and by an open-ended section for describing other delays or missed opportunity noted. Training was conducted for resident doctors and consultants that filled the data collection form to ensure uniform categorisation and coding of information recorded.

Immediately after a maternal death, one of the trained doctors retrieved the medical records of the deceased (usually no more than a few hours from the event) and the required information was entered into the data collection form. When necessary, clarification was sought from the managing team to ensure that correct and adequate information was recorded. Any other important details gleaned from the following Morning Review discussion (referred to above) were included. Thereafter, a member of the research team reviewed the data and ensured that it was properly filled.

The hospital's delivery summary is routinely prepared by a designated member of the nursing staff. The total

number of live births and maternal deaths during the period were retrieved from these records.

Data management: The authors reviewed data manually. All identified contributory cause of the maternal death were categorised into the three-delay model[10] by consensus of the authors. Thereafter, the assigned types of delay were entered for each case of maternal death. Descriptive analysis of sociobiological variables, diagnosis on admission, and type of delay that contributed to the maternal death were performed. Data analysis was done with SPSS version 20.

RESULTS

Of the 75 maternal deaths within the audit period, 70 (93.3%) mortalities were identified and audited by the researchers. The mean age of women that died was 29.01±5.0 years. Their socio-biological data are summarized in Table 1. Majority were semi-skilled workers (mostly traders) who had not received any antenatal care at UCH prior to presentation. About two-thirds had previous childbirth experience and majority had at least 2 previous parous experiences. Most deaths occurred postnatal, usually within the first 24 hours. Most of the mortalities (45.5%) were women whose pregnancies were term; 27.3% were pre-viable pregnancies, while 25.5% were preterm. The women referred to as 'unbooked' either had no antenatal care, or were registered with unskilled providers (faith-based 'mission' homes, traditional birth attendants or auxiliary nurses). This group of women constituted over half (55.7%) of the mortalities.

Table 1: Socio-biological variables of the study population

Variables	Frequency	Percentages
Ethnicity		
Yoruba	61	87.1
Ibo	3	4.3
Hausa	2	2.9
Others	4	5.7
Occupation		
Unemployed/student	14	20.0
Artisan/Semi-skilled worker	48	68.6
Skilled worker/professional	8	11.4
Antenatal booking status		
Booked in UCH	5	7.1
Booked in other facilities	25	35.7
Unbooked	40	57.2
Parity		
Nullipara	28	40.0
Primipara	10	14.2
Multipara	29	41.5
Grandmultipara	3	4.3
Condition at admission		
Clinically stable	7	10.0
Ill	11	15.7
Critically ill	52	74.3
State at death (not necessarily state at admission)		
Antenatal (including 1st trimester abortion & ectopic pregnancy)	17	24.3
Intrapartum	7	10.0
Postpartum	46	65.7

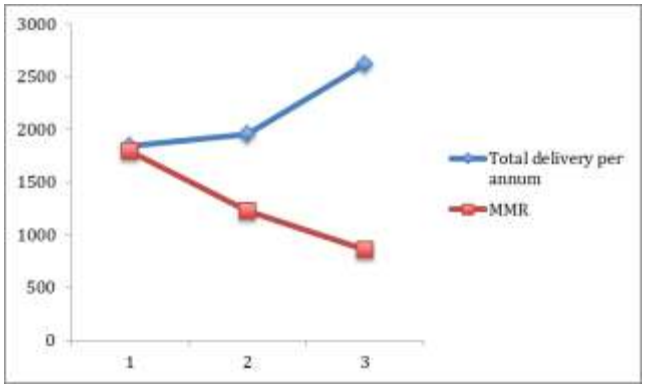
There were 5,925 live births in the hospital during the study period, giving a facility maternal mortality ratio (MMR) of 1,265 per 100,000 live births. The annual trend is depicted in Table 2, and is seen to fall over the study period in Figure 1.

Table 2: Distribution of live birth, maternal death and maternal mortality ratio

Year	Live Birth	Maternal Death	MMR*
1	1673	30	1,793
2	1818	24	1320
3	2434	21	863

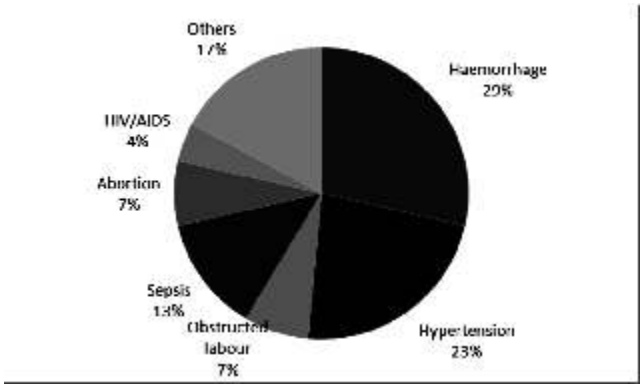
*MMR: maternal deaths per 100,000 live births

Figure 1: Trend of MMR over the study period



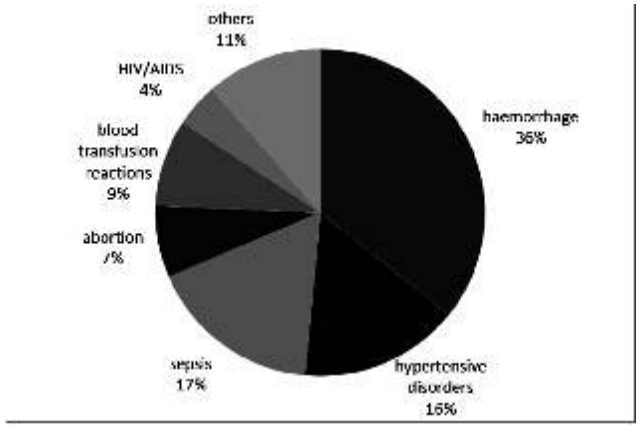
A third (23) of the patients had antenatal risk factors, including hypertension, anaemia, proteinuria, glycosuria, abnormal lie and previous Caesarean section. The HIV status of 17 women were known; of these 7 (10% of total population) were reactive to HIV screening. The commonest admission diagnoses were obstetric haemorrhage (20; 29%) and hypertensive disorders (16; 21%) (Figure 2) .

Figure 2: Clinical diagnosis on admission



Forty-six births (of which 24 were delivered in the study centre) occurred amongst the study population; there were 23 (50%) stillbirths and one (2.2%) neonatal death. Twenty-three babies were alive (including a pair of twins). Haemorrhage accounted for 25 (36%) maternal deaths (Figure 3), followed by sepsis (12; 17%) and complications of hypertensive disorders (11; 16%).

Figure 3: Primary cause of maternal death

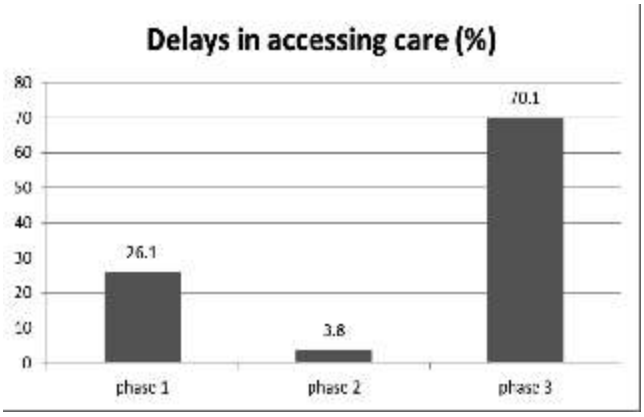


Delays were identified in 24 (34.3%) of the patients. The distribution of identified delays is shown in Figure 4. Multiple delays could often be identified in the same patient's care. Table 3 shows the causes of delay that were identified. Delay in referring the patient to the appropriate level of care made the highest contribution to mortality, followed by lack of funds (which contributed to both Phases I and III delays).

Table 3: Delays identified in the maternal mortality cases

Delay	Frequency	Total
Phase 1		
Delay in decision to seek help	18	
Lack of funds for care	23	41
Phase 2		
Lack of transport from home to health facilities	2	
Lack of transport between health care facilities	4	6
Phase 3		
Unavailability of services at referring centre	18	
Lack of skilled staff at referring centre	13	
Inappropriate management by health care staff	20	
Delay in referring patient to appropriate care level	25	
Lack of funds for care at health facilities	18	
Delay in health care delivery at study centre (e.g. unavailability of theatre space, blood units for transfusion)	16	110

Figure 4: The contributory pattern of delay for the observed maternal mortality during the study period.



DISCUSSION

Seventy mortalities were identified and audited in this study. Five cases were inadvertently missed out from the review. On discovering this from the annual summary, the authors chose not to retrospectively include these cases, as all the required parameters would be difficult to determine from case notes only. It also would have contradicted the prospective study design that had been employed. It is expected that the lessons learnt from the audited 93% of all mortalities will be sufficiently generalizable. The prospective nature of the study will doubtless bring richer insight than a retrospective audit of patients' records.

The MMR calculated from this study is much higher than the national ratio, as is the trend in many facility-based studies.[3, 12, 13] The MMR may be expected to exceed that of the general populace's, as it is a hospital where other facilities refer their critically ill patients to. This is evidenced by only a tenth of the mortalities being in women who had received antenatal care in the study hospital. Many of the studied cases were already critically ill on arrival at the centre; only a tenth were stable on admission. A search did not yield any published documentation of previous MMR in the study centre for comparison. Nonetheless, a significant downward trend in the mortality over the study period was noted. It is apparent that the lessons being learnt were being put to immediate use.

Obstetric haemorrhage was the commonest cause of mortality in this series. The WHO states that post-partum haemorrhage remains the commonest direct cause of mortality in the developing world, despite progress being made to curb it; it consistently publishes updates of its recommendations to prevent and treat post-partum haemorrhage.[14] The hospital at which this study was carried out also updates its protocol regularly to reflect these recommendations. Eclampsia was also a major cause found in several Nigerian centres.[5, 6, 12, 15] It appears that despite advances and availability of treatment, eclampsia remains formidable in this environment. This was also apparent in the study, as the current prevalence rose from 9% of maternal deaths reported in a previous series about two decades before.[16] This apparent rise may however also be relative; due to a reduction in other causes of mortality. Sepsis is an unexpected major cause in this series. In the period following the study, reconstruction and redesign of the labour ward and further restriction of access to the suite has been put in place to reduce the risk of sepsis. The noticeable influence of blood transfusion reactions on the results have contributed to a review of existing blood transfusion protocol, dissemination of information by the relevant units to end-users, and the identification of a responsible physician whom blood transfusion reactions are immediately reported to, so that prompt specialist action can be taken.

Non-medical contributory factors causing delays in health care delivery were observed to play a major part in this study. They were mainly Phase III delays; very few Phase II delays were identified. This pattern was somewhat similar to that recorded in the retrospective study by Okusanya et al.[12] It is apparent from this that availability and cost of transportation may not be a serious issue in this locality. This may be because commercial motorcycles can often be found all over the town at most hours of the day, even on routes that are not routinely plied by commercial vehicles. In addition, the hospital is situated in an urban area with well-developed road networks. On the other hand, one realizes that Phase III delays are easier identified by health care providers, rather than Phases I and II, which require the narrative of the patients or their relatives. Retrieval of the necessary information is limited during emergency care, and more so after the mortality.

Health financing was a big problem identified in this study. Patients referred in an emergency are mostly unable to pay, with the required tests and drugs often beyond their financial ability at the time. A few emergency and indigent fund projects are available, but they do not go far with care as they are limited. Despite the lean resources available to it, the hospital has attempted to ensure service provision by its "pay-before-service" and temporary waiving of fees. However, these services are often stretched thin. In addition, the hospital's temporary payment deferment program is often difficult to recoup, as truly indigent patients and their relatives are still unable to pay back, even after the emergency has been resolved or the patient has died. Happily, an increasing amount of patients are subscribing to the National Health Insurance Scheme (NHIS). The scheme still has significant bottlenecks in its deployment, especially in the face of direly urgent situations, but it is hopeful that this will improve over time. More options for health financing are required if the contribution of lack of funds is to be stemmed.

Recommendations for reduction of maternal mortality

Health Financing

Scaling up of the NHIS to improve coverage is an obvious requirement for better health financing.[17] New options also need to be adopted. Suggestions include the voucher system for reproductive health care, which is already in use amongst poor populations in Uganda and Kenya.[18-22] The system works by a woman purchasing a voucher which greatly subsidizes her pregnancy and delivery care fees, thus enabling

skilled care in women who would not otherwise have sought the care. The health care providers are reimbursed for the services rendered; thus, increased revenue from increased patronage enables improvement of their facilities. These programs were piloted with external assistance (the German Development Bank), then continued by the respective governments.

The World Bank-supported Abiye project has achieved significant improvement in access of reproductive care in Ondo State of Nigeria. The entire country could benefit from it, if it is scaled up, however, the free health care offered may be difficult to achieve without external funding. Nonetheless, some achievable and sustainable lessons can be adopted from it, for instance, the provision of a closed-user group service on mobile telephones to expectant mothers, which may form an emergency hotline and serve to prevent delays in accessing health care.[23] In smaller communities, thrift systems and local 'insurance' contributions may be used this however requires advocacy and enlightenment on the importance of sustaining a communal emergency fund that anyone could benefit from when needed.

Referral system

The referral system linkages need to be strengthened.[24] This may be achieved by minimally equipping the peripheral centres to achieve basic essential obstetric care, capacity-building of their staff and information dissemination. The Society of Obstetricians and Gynaecologists of Nigeria (SOGON)'s Regional Sectors may be a good platform to carry out the necessary training and, then in conjunction with the Management Teams of the local specialist hospitals, can put in place the necessary referral linkages.

Surveillance

Referral hospitals such as this study centre need to perform audits similar to this as part of their clinical governance. The outputs of these audits need to be incorporated into offered care. Qualitative data from community stakeholders need to be obtained to identify the underlying causes for delays in presentation. Community surveillance systems need to be put in place, and strengthened where they already exist.[24] Surveillance enables us to identify deaths, investigate the causes (medical and non-medical) and analyse the findings; all towards the purpose of acting on those findings.[25]

As the Millennium Developmental Goals' timeline is reached, and possibly new goals are set, health care providers are necessary stakeholders that should device ways of limiting the avoidable Phase III delays that have such an immense contribution to maternal mortality.

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