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FACILITY-BASED MATERNAL DEATH REVIEW IN THREE DISTRICTS IN THE CENTRAL REGION OF MALAWI
An Analysis of Causes and Characteristics of Maternal Deaths

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Purpose. **We sought to determine the causes and characteristics maternal deaths that occur in health facilities in Malawi.**

Methods. **Forty-three maternal deaths were reviewed in 9 hospitals in 3 districts in Central Malawi over a 1-year period. Causes and avoidable factors of maternal deaths were identified during the review, and recommendations made and implemented.**

Main Findings. **There were 28 (65.1%) direct obstetric deaths and 15 (34.9%) indirect obstetric deaths. The major causes of maternal deaths were postpartum hemorrhage (25.6%), postpartum sepsis (16.3%), HIV/AIDS (16.3%), ruptured uterus (7.0%), complications of abortion (7.0%), anemia (7.0%), antepartum hemorrhage (4.7), and eclampsia (4.7). Two thirds of the women were referred either from another health facility (51.2%) or by a traditional birth attendant (TBA; 11.6%), and up to 79.1% were critically ill on admission. Four groups of factors that contributed to maternal deaths were identified: 1) health worker factors, 2) administrative factors, 3) patient/family factors, and 4) TBA factors. The major health worker factors were inadequate resuscitation (69.8%), lack of obstetric life-saving skills (60.5%), inadequate monitoring (55.8%), initial assessment incomplete (46.5%), and delay in starting treatment (46.5%). The most common administrative factor was lack of blood for transfusion (20.9%). The major problems encountered include shortage of staff and other resources, difficulty in maintaining anonymity, poor quality of data, and difficulty in implementing recommendations.**

Conclusion. **Adequate training on obstetric life-saving skills, addressing HIV/AIDS, and raising community awareness could be important factors for reducing maternal mortality in Malawi and countries with similar socioeconomic profiles.**

Introduction

The World Health Organization (WHO) estimates that of the half million women who die of pregnancy-related deaths each year, >99% are found in low- and middle-income countries (WHO, 2007). More than 80% of these deaths can be prevented by improving the availability, utilization, and quality of skilled birth attendance, and emergency obstetric care (WHO, 2005). One way of improving the quality of obstetric care is through auditing of maternal deaths. There are 3 approaches to maternal death audit, namely, confidential enquiry into maternal deaths (CEMD), facility-based death reviews, and community-based death reviews (also called verbal autopsy).

CEMD was established in the United Kingdom in 1952 to identify the causes of maternal death and avoidable factors contributing to the death of women during pregnancy and childbirth (Papworth & Cartridge, 2005). CEMD has subsequently been carried out in a number of countries, including Australia, the

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United States, and certain European countries (WHO, 2004). More recently, CEMD has been introduced in Malaysia, Israel, Kenya, Indonesia, Malawi, and the Republic of South Africa using an adapted UK CEMD methodology (Supratikto, Wirth, Achadi, Cohen, & Ronsman, 2002; Malaysia Ministry of Health, 1988; Ratsma, 2002). Confidential enquiries are carried out at a regional (state) or national level, usually by the country's Ministry of Health.

It is now considered good clinical practice to review each case of maternal death that occurs in the health facility so that the lessons learned from the management of the case could be used to improve future clinical practice (WHO, 2004; Bullough et al., 2005). This is called facility-based maternal death review, and is an educational process for health care professionals providing care to the woman during pregnancy, childbirth, and postpartum. In settings where many maternal deaths occur in the community, community-based maternal death review is a useful complement to facility-based maternal death review (Hofman & Sibande, 2005). Both facility-based and community-based maternal death reviews are strongly supported by expert opinion and have received recently been endorsed by the WHO (Bullough et al., 2005).

Malawi has a Maternal Mortality Ratio of 1,100 per 100,000 live births, which is among the highest in the world (WHO, 2007). First visit antenatal care coverage is 93%, health facility delivery rate is 57%, and postnatal care coverage is 31% (National Statistics, 2005). Malawi has 1.8 comprehensive emergency obstetric care facilities per 500,000 population (greater than the recommended minimum of 1 comprehensive emergency obstetric care facility per 500,000 population), and only 2% of the recommended number of basic emergency care facilities (Leigh, Mwale, Lazaro, & Lunguzi, 2008). The met need for emergency obstetric care is only 18.5%, population-based caesarean section rate is 2.8% and the case fatality rate for emergency obstetric complications is 3.4% (Leigh et al., 2008). Three major barriers to accessing maternal health have been identified in Malawi: 1) suboptimal quality of care, which includes communication, attitudes, and cooperation, 2) cultural barriers such as traditional view of pregnancy and perception of danger signs, and 2) unsatisfactory availability and accessibility of skilled delivery care in terms of transport, distance, costs, and critical shortage of skilled attendants (Seljeskog, Sundby, & Chimango, 2006).

Malawi is one of the countries that have adopted the WHO recommendation of combining community-based and facility-based maternal death reviews to improve professional practice and reduce maternal mortality (Hofman & Sibande, 2005; Ratsma, 2002). The Malawi Ministry of Health developed 3 forms currently used for maternal death review: 1) The Maternal Death Notification Form contains the particulars of the deceased notifies the District Health Office within seven days of the maternal death; 2) The Maternal Death Review Form is filled during maternal death review meetings and contains details of the causes of maternal death, factors that contributed to the death, and recommendations made during maternal death review; and 3) The Maternal Death Follow-up Form is used to follow up the implementation of recommendations made during the maternal death reviews.

Previous studies on facility-based maternal death reviews in Malawi have been carried out in the southern region (Ratsma, 2002; Lema, Changole, Kanyighe, & Malunga, 2005). A recent study found that the facility-based delivery rate in 3 districts in the Central Region was 40.6%, which is lower the national average of 56% (Kongnyuy, Hofman, Mlava, Mhango, & van den Broek, 2008; National Statistics Office, 2005). This suggests that characteristics of maternal deaths in the central region might differ from those previously reported in the south.

The aim of the current study was to determine the causes and characteristics maternal deaths that occur in health facilities in 3 districts in the Central Region of Malawi. The study reports summary data on the causes of maternal deaths, avoidable factors, recommendations made, and problems encountered during the maternal death review process.

Methods

Study design

This cross-sectional study described the implementation of facility-based maternal death reviews in 3 districts (Salima, Kasungu, and Lilongwe) in Central Malawi. All 43 maternal deaths that occurred in 9 hospitals in the 3 districts between January and December 2007 were audited. Maternal deaths that occurred before arrival to the hospitals were not included in this analysis.

Study setting

There are a total of 9 hospitals in the 3 districts and all these hospitals were involved in the maternal death audit. The Salima and Kasungu districts have 1 hospital each (a district hospital); the other 7 hospitals are located in Lilongwe district. Lilongwe is a larger district where the capital city is located and has a tertiary referral hospital, 4 Christian Health Association of Malawi hospitals, and 2 community hospitals. Maternity care is free in all government facilities in Malawi, but CHAM facilities charge user fees, which may limit access to their services. The population of the 3 districts is estimated at 2,812,183 and there are 127,000 deliveries per year, of which 40% take place in the health facilities. The facility-based maternal death reviews were conducted as part of an international collaborative

program to improve the quality of maternity care and reduce maternal and neonatal mortality and morbidity in the 3 districts. The study was approved by the Malawi Ethical Committee and the Ministry of Health in Malawi.

The intervention

The purpose of this intervention was to support the Malawi Road Map (developed by Ministry of Health in 2005) for the reduction of maternal and perinatal morbidity and mortality. The intervention consisted of facility-based maternal death audit and we used the classic maternal death review cycle which is made up of 5 steps (WHO, 2004): 1) identification of maternal deaths in facilities, 2) data collection, 3) qualitative analysis of findings during maternal death review meetings, 4) recommendations, and 5) evaluation of adherence to recommendations.

In September 2006, facility-based maternal death review was introduced in 9 hospitals in 3 districts located in the central region of Malawi. Maternal death reviews were conducted using the forms developed by the Ministry of Health. A maternal death review meeting was held in the hospital where the maternal death occurred. Attempts were made to conduct the review as soon as possible after the death, generally within 1 month, and all reviews were conducted within 2 months after the maternal death. The maternal death review meetings were attended by nurses, midwives, and doctors working in the maternity as well as public health nurses, laboratory staff, and administrative staff, including the senior management. On the average, the meetings were usually attended by 10–20 people depending on the size of the hospital. These meetings were sometimes attended by 1 or 2 external, UK-based facilitators with several years of experience in developing countries, especially during the initial phase when maternal death reviews was being introduced.

Before each maternal death review meeting, information was collected about the circumstances surrounding the maternal death. Sources of information include hospital registers, referral letters, medical records, and interview of family members for additional information as required. Maternal death review meetings started with a review of the recommendations made during the previous maternal death reviews. Any recommendations that had not been implemented were identified and reasons discussed as well as ways to promote the implementation of such recommendations. Each case of maternal death was then presented to the entire team (Maternal Death Review Committee) based on data collected from the different sources. The team then asked question to clarify any doubts they might have. The Maternal Death Review Committee then discussed and agreed on the primary cause of death and the factors that contributed to maternal deaths. Recommendations were made, a timeline set for their implementation, and 1 person nominated to oversee the implementation.

The Maternal Death Review Form was filled out during the Maternal Death Review meetings by 1 person nominated by the team to carry out this function at the beginning of the meeting. At the end of each meeting, this person summarized the main points to ensure that everyone agreed with what had been written down.

Statistical analyses

Data were entered and analyzed using SPSS version 15.0 for Windows. Values for categorical variables were expressed as absolute numbers (proportions). Values for continuous variables were presented as means (± standard deviation), or range (± median) if the distribution was skewed.

Results

Pregnancy-related characteristics

A total of 43 maternal deaths were reviewed. The mean age was 28.6 years (standard deviation [SD], 7.3). The median parity was 2 (range, 0–11) and median gestational age was 38.0 weeks (range, 8–42). The median length of hospital stay was 2 days (range, 0–24). Four fifths (79.1%) of women were critically ill at the time of admission and two thirds were referred either from another health facility (51.2%) or by a traditional birth attendant (TBA; 11.6%). A majority (69.8%) of these women died during the postpartum period. Table 1 presents the details of pregnancy-related characteristics of the 43 cases of maternal deaths.

Classification of cause of maternal deaths

Two thirds (65.1%) of the maternal deaths were a result of a direct obstetric cause and one third (34.9%) were due to an indirect obstetric cause (Table 2). The 6 major direct causes of maternal deaths were postpartum hemorrhage (25.6%), postpartum sepsis (16.3%), ruptured uterus (7.0%), complications of abortion (7.0%), antepartum hemorrhage (4.7%), and eclampsia (4.7%). Indirect obstetric deaths were dominated by HIV/AIDS (16.3%) and anemia (7.0%). One indirect obstetric death was caused by sepsis during a pregnancy of 28 weeks in a woman who was clinically anemic. Her HIV status was not tested and the sepsis was thought to be typhoid fever.

Of the 30 maternal deaths that occurred in the postpartum period, 12 (40.0%) occurred during the first 24 hours, 7 (23.3%) occurred between >1 and 2 days, 6 (20.0%) occurred between >2 and 5 days, 2 (6.7%) occurred between >5 and 7 days, and 3 (10.0%) occurred after 1 week.

Table 1. Pregnancy-Related Characteristics of Maternal Deaths in 3 Districts (Salima, Kasungu, and Lilongwe) in Malawi (January to December 2007)

	Direct Obstetric Deaths ($n = 28$)	Indirect Obstetric Deaths ($n = 15$)	Total ($n = 43$)
Total	28	15	43
Age (yrs)			
17–29	17 (60.7)	6 (40.0)	23 (53.5)
30–41	11 (39.3)	7 (46.7)	18 (41.9)
Missing	0 (0.0)	2 (13.3)	2 (4.7)
Parity			
Primipara	8 (28.6)	2 (13.3)	10 (23.3)
Para 2–4	9 (32.1)	3 (20.0)	12 (27.9)
Para ≥5	9 (32.1)	6 (40.0)	15 (34.9)
Missing	2 (7.1)	4 (26.7)	6 (14.0)
Gestational age			
Abortion	3 (10.7)	0 (0.0)	3 (7.0)
Preterm (24–26 wks)	5 (17.9)	8 (53.3)	13 (30.2)
Term (≥37 wks)	20 (71.4)	5 (33.3)	25 (58.1)
Missing	0 (0.0)	2 (13.3)	2 (4.7)
Condition on admission			
Critically ill	21 (75.0)	13 (86.7)	34 (79.1)
Stable	7 (25.0)	2 (13.3)	9 (20.9)
Referral status			
Patient not referred	8 (28.6)	7 (46.7)	15 (34.9)
Referred from another health facility	17 (60.7)	5 (33.3)	22 (51.2)
Referred by a TBA	3 (10.7)	2 (13.3)	5 (11.6)
Condition at the time of death			
Antenatal	1 (3.6)	5 (33.3)	6 (14.0)
Intrapartum	4 (14.3)	0 (0.0)	4 (9.3)
Postpartum	20 (71.4)	10 (66.7)	30 (69.8)
Abortion	3 (10.7)	0 (0.0)	3 (7.0)

Abbreviation: TBA, traditional birth attendant.

Factors that contributed to maternal deaths

Associated factors that contributed to maternal deaths were classified into 4 main groups: 1) health worker factors, 2) administrative factors, 3) patient/family factors, and 4) TBA factors (Table 3). The major health worker factors were inadequate resuscitation (69.8%), lack of obstetric life-saving skills (60.5%), inadequate monitoring (55.8%), initial assessment incomplete (46.5%), and delay in starting treatment (46.5%). The most commonly encountered administrative factor was lack of blood for transfusion (20.9%). The major patient/family factors were delay in decision making (32.6%), delay in reporting to health facility (25.6%), use of traditional medicine/practices (23.3%), failure to recognize danger signs (20.9%), and lack of transport from home to the health care facility (16.3%). TBA factors include failure to accept limitations (11.6%), delay in deciding to refer (11.6%), and use of traditional medicine (9.3%). None of the deaths occurred as a result of communication problems between health facilities, transport between health facilities, lack of essential equipment, or lack of laboratory facilities.

Table 2. Classification of Cause of Maternal Deaths in 3 Districts (Salima, Kasungu, and Lilongwe) in Malawi From January to December 2007

Primary Cause of Death	Total ($n = 43$)	%
Total maternal deaths	43	100.0
Direct obstetric deaths	28	65.1
Postpartum hemorrhage	11	25.6
Postpartum sepsis	7	16.3
Ruptured uterus	3	7.0
Complications of abortion	3	7.0
Antepartum hemorrhage	2	4.7
Eclampsia	2	4.7
Indirect obstetric deaths	15	34.9
HIV/AIDS	7	16.3
Anemia	3	7.0
Cardiogenic shock from congenital heart malformation	1	2.3
Anesthetic complications	1	2.3
Pulmonary embolism	1	2.3
Pneumonia	1	2.3
Sepsis during pregnancy	1	2.3

Recommendations made and implemented during maternal death reviews

All hospitals had similar problems and therefore there was significant overlap of recommendations made by hospitals across the 3 districts. Table 4 presents the key recommendations made and implemented by hospitals in the 3 districts. Maternity staff were trained on obstetric life-saving skills (3-day course) and workshops were organized to improve the technical skills and foster positive behaviors with regard to the importance of data recording in maternity registers and completeness of case notes. All 60 health care centers in the 3 districts were linked to district hospitals by short-wave radios, and about half of these radios (all in Lilongwe district) were nonfunctional. All nonfunctioning short-wave radios were repaired to facilitate communication between health care facilities. All hospitals reviewed their work schedules and ensure staff were available at night to handle obstetric emergencies quickly and properly. Postoperative monitoring was intensified in all hospitals and blood banks made improvements on stock inventory and management. Antenatal clients received health education on the identification of danger signs and outreach community health talks were organized to raise awareness and promote early decision making. All TBA coordinators across the 3 districts intensified TBA supervision to make sure TBAs refer all patients at the right time.

Discussion

This paper describes the causes of maternal deaths, avoidable factors, and recommendations made during facility-based maternal death reviews in 3 districts in Malawi. During the process of maternal death review in the 3 districts, several problems were encountered, including inadequate staff, confidentiality and

Table 3. Factors That Contributed to Maternal Deaths in 3 Districts in Malawi (Salima, Kasungu, and Lilongwe)

	Direct Obstetric Death, *n* (%; *N* = 28)	Indirect Obstetric Death, *n* (%; *N* = 15)	Total, *n* (%; *N* = 43)
Health worker factors			
Initial assessment incomplete	11 (60.7)	9 (60.0)	20 (46.5)
Wrong diagnosis	3 (10.7)	4 (26.7)	7 (16.3)
Delay in starting treatment	11 (39.3)	9 (60.0)	20 (46.5)
No treatment	3 (10.7)	3 (20.0)	6 (14.0)
Inadequate resuscitation	20 (71.4)	10 (66.7)	30 (69.8)
Delay in deciding to refer	7 (25.0)	2 (13.3)	9 (20.9)
Inadequate monitoring	17 (960.7)	7 (46.7)	24 (55.8)
Prolonged abnormal observation without action	8 (28.6)	6 (40.0)	14 (32.6)
Lack of obstetric life-saving skills	20 (71.4)	6 (40.0)	26 (60.5)
Administrative factors			
Lack of antibiotics	1 (3.6)	0 (0.0)	1 (2.3)
Lack of essential obstetric drugs	1 (3.6)	0 (0.0)	1 (2.3)
Absence of trained staff on duty	1 (3.6)	0 (0.0)	1 ((2.3)
Lack of blood for transfusion	6 (21.4)	3 (20.0)	9 (20.9)
Patient/family factors			
Failure to recognize danger signs	7 (25.0)	2 (13.3)	9 (20.9)
Delay in decision making	12 (42.9)	2 (13.3)	14 (32.6)
Use of traditional medicine/practices	8 (28.6)	2 (13.3)	10 (23.3)
Unsafe medical treatment	1 (3.6)	0 (0.0)	1 (2.3)
Delay in reporting to health facility	11 (39.3)	0 (0.0)	11 (25.6)
Lack of transport from home to health facility	7 (25.0)	0 (0.0)	7 (16.3)
Refusal of treatment	2 (7.1)	0 (0.0)	2 (4.7)
TBA factors			
Failure to accept limitations	3 (10.7)	2 (13.3)	5 (11.6)
Use of traditional medicine by TBA	2 (7.1)	2 (13.3)	4 (9.3)
Delay in deciding to refer	3 (10.7)	2 (13.3)	5 (11.6)
Lack of transport from TBA to health facility	0 (0.0)	0 (0.0)	0 (0.0)

Abbreviation: TBA, traditional birth attendant.

anonymity, quality of data, and difficulties to implement recommendations.

One of the major problems was shortage of staff, especially senior staff, to conduct maternal death reviews. It was realized that maternal death reviews conducted exclusively by junior staff could not be as effective as those conducted in the presence of senior staff because some health worker factors could be missed. Maternity staff had other competing commitments, which sometimes made it difficult to bring together a reasonable number of staff for maternal death review. Some hospitals had a high turnover of maternity staff, meaning that new staff had to go through the learning curve and be oriented on the process of maternal death review.

There is usually no need for extra staff to conduct maternal death reviews because the people actually providing the care should be actively involved in the process; this promotes change in practice, ownership, and sustainability (Weeks, Alia, Ononge, Otolorin, & Mirembe, 2005). However, extra time is required. This can be particularly difficult, especially in low-income countries where the number of staff is usually inadequate and the staff is often overworked. This is particularly true if maternal death reviews improve service quality and utilization, and the work force remains unchanged. Fortunately, maternal death reviews can promotes evidence-based medicine by sure staff abandon any established practice that is not evidence based or that is harmful. Abandoning non–evidence-based practices is a way of creating time for more useful activities, including maternal death reviews itself, and dealing with increasing number of clients.

We realized that in practice it was difficult to respect the "no name, no blame" principle during the maternal death review process. Although during the case presentation and discussion neither the name of the patient nor the names of health care providers were mentioned, it was easy for the carers involved to recognize the case. During the discussion, the carers involved sometimes react defensively and tried to justify all actions and inactions. Despite the fact that the moderator reiterated the principle of "no name, no blame" before each session, it was clear that complete anonymity was difficult, as has been reported by other authors (Maher, 1996; Ronsmans, 2001).

One of the major difficulties of implementing an obstetric audit program in low- and middle-income countries is the poor quality of data collected. There are many sources of errors in data recording and

Table 4. Key Recommendations Made and Implemented During Maternal Deaths Reviews in 3 Districts (Salima, Kasungu, and Lilongwe) in Malawi

- Maternity staff be trained in life-saving skills. Emergency obstetric care, especially on the diagnosis and management of common emergency obstetric complications.
- All patients admitted to the maternity/labor ward should undergo a complete initial assessment including relevant medical history and clinical examination, and all these should be clearly documented in the client file.
- Workshops to improve the technical skills and foster positive behaviors of staff with respect to data recording in maternity registers and completeness of case notes.
- Strengthen referral system by repairing nonfunctioning shortwave radios in health facilities across the 3 districts.
- Review work schedules and make sure staff are available especially at night to handle emergencies quickly and properly.
- Establish local standards for postoperative care and commitment to proper postoperative monitoring and management.
- All clients should be attended to as soon as possible (possibly within 30 minutes of arrival to the health facility) and treatment should be initiated as soon as possible.
- Safe Motherhood Protocols and standards for the management of obstetric emergency complications should pasted in the maternity and labor wards.
- Sufficient blood is made available in blood banks. Hospitals took commitment to predict properly and order blood in a timely manner from the Malawi Blood Transfusion Service, collects bloods centrally, store, and distribute to hospitals across the country.
- All women attending antenatal clinics should benefit from birth preparedness and identification of danger signs during pregnancy and childbirth.
- Outreach community health education should be carried out by public health nurses and health surveillance assistants to raise awareness, and promote facility delivery and early decision making.
- Properly supervision and follow-up of TBA by TBA coordinators.

Abbreviation: TBA, traditional birth attendant.

reporting. Some of the errors encountered that affected the quality of maternal death reviews in the 3 districts were errors of omission, errors of transcription, errors of interpretation, errors from disorganization in the patient file, and errors of tallying and reporting. Fortunately, maternal death review by itself seeks to address these problems.

Another problem encountered was the difficulty of implementing recommendations made during maternal death reviews. The major difficulties were either lack of resources to implement the recommendations or lack of commitment by the person responsible. Involving senior management in the review process promoted the implementation of some recommendations that needed decision making by the hierarchy, including allocation of resources. Although it was difficult to assess the extent to which the all recommendations were implemented, it was clear that some recommendations were only partly implemented. For example, maternity staff of the Salima and Kasungu districts were trained in life-saving skills and emergency obstetric care, but those in Lilongwe district were not trained as recommended. Furthermore, some recommendations were not implemented within the timeline set, but were delayed.

In conclusion, maternal death reviews has helped us to classify the causes of maternal deaths, identify avoidable factors, and make recommendation for changes in professional practice in the central region of Malawi. The causes and characteristics of maternal deaths are similar to those described in studies carried out in the southern region. Health worker factors were more prevalent than administrative, patient/family, or TBA factors, although all these factors contributed significantly to maternal mortality. The major problems encountered include shortage of staff and other resources, difficulty in maintaining anonymity, poor quality of data, and difficulty in implementing recommendations. Fortunately, maternal death reviews is a tool that can help us to overcome its own problems and improve the quality and utilization of maternity care. Adequate training in obstetric life-saving skills, addressing HIV/AIDS, and raising community awareness could be important factors for reducing maternal mortality in Malawi and countries with similar socioeconomic profiles. Future studies should consider assessing the causes and characteristics of maternal deaths that occurred before arrival in the health care facilities as well as those that occur in the community.

Authors' Contributions

EJK: Conception, design, drafting of the protocol, analysis, interpretation and write-up of all versions of the manuscript. GM and NVDB: Critically reviewed the manuscript for important intellectual content.

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