

ORIGINAL RESEARCH ARTICLE

A facility-based assessment of maternal mortality among all deaths in reproductive-aged women in Mzimba South District, Malawi

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Abstract

Accurate reporting of maternal mortality is essential for effective health policy planning and achieving maternal death reduction in Sustainable Development Goals Target 3 (SDGs). This study aimed to identify gaps between facility-based maternal death reviews and the hospital Health Management Information System (HMIS) reports in Mzimba South District, Malawi from July 2013 to June 2018. A retrospective hospital-based medical record review was conducted to identify maternal deaths among women aged 15 to 49 years with all death causes. Out of 447 mortality records identified from the hospital wards, 89 maternal mortality cases were identified by the study review compared to 83 cases in the HMIS report. The HMIS report showed an underreporting rate of 6.7% (6/89) and a misclassification rate of 13.5% (12/89) within five years. These findings highlight the need for establishing mechanisms for the verification and monitoring of maternal mortality data reporting in health facilities. Improving the quality of maternal death reporting could help inform evidence-based interventions and policies that address the root causes of maternal mortality, and achieve SDGs in Malawi. (*Afr J Reprod Health* 2023; 27 [4]: 77-83).

Keywords: Maternal death, women of reproductive age, gaps, underreporting rate, Malawi

La notification précise de la mortalité maternelle est essentielle pour une planification efficace des politiques de santé et la réduction de la mortalité maternelle dans la cible 3 des objectifs de développement durable (ODD). Cette étude visait à identifier les écarts entre les examens des décès maternels en établissement et les rapports du système d'information sur la gestion de la santé (HMIS) de l'hôpital dans le district sud de Mzimba, au Malawi, de juillet 2013 à juin 2018. Un examen rétrospectif des dossiers médicaux en milieu hospitalier a été mené pour identifier décès chez les femmes âgées de 15 à 49 ans toutes causes confondues. Sur 447 dossiers de mortalité identifiés dans les services hospitaliers, 89 cas de mortalité maternelle ont été identifiés par l'examen de l'étude, contre 83 cas dans le rapport HMIS. Le rapport HMIS a montré un taux de sous-déclaration de 6,7 % (6/89) et un taux d'erreur de classification de 13,5 % (12/89) en cinq ans. Ces résultats soulignent la nécessité de mettre en place des mécanismes de vérification et de suivi de la notification des données de mortalité maternelle dans les formations sanitaires. L'amélioration de la qualité des rapports sur les décès maternels pourrait aider à éclairer les interventions et les politiques fondées sur des données probantes qui s'attaquent aux causes profondes de la mortalité maternelle et à atteindre les ODD au Malawi. (*Afr J Reprod Health* 2023; 27 [4]: 77-83).

Mots-clés: Décès maternel, femmes en âge de procréer, écarts, taux de sous-déclaration, Malawi

Introduction

The maternal mortality ratio (MMR) remains a vital health outcome indicator for the nation due to inequalities in maternal healthcare access and the health system's performance in terms of quality of care¹. Compared to other regions, the sub-Saharan Africa (SSA) region has experienced a slow decline in MMR from 878 to 542 deaths per 100 000 live births between 2000 and 2017². The slow

decline in MMR might be partly due to defects of under-reported cases of maternal deaths, which misled the health policy planning and resource allocation^{2,3}. Literature shows that gaps in reporting maternal deaths from developed and developing countries are a global challenge as hospital data is often under or over-reported⁴. One study in Sweden showed that 64% of maternal deaths were underestimated and missing compared to the data reported to World Health Organization

(WHO)⁵. A review indicated the huge gap in Kenya between the estimated maternal deaths of 8000 based on an MMR of 510 and 945 maternal deaths in facilities reported by official data in 2014⁶.

Improving maternal mortality reporting has a significant impact on the design and implementation of maternal health interventions in the sub-Saharan African (SSA) region. Accurate data is crucial in identifying the most effective strategies to improve maternal health outcomes, and reliable report of maternal deaths is essential to achieving this goal. A study conducted in Tanzania showed that enhancing maternal death reporting and analysis resulted in the development of more targeted interventions to address specific causes of maternal deaths, such as hemorrhage and sepsis. The study also revealed that improved reporting led to increased accountability among healthcare providers and improved quality of care for pregnant and postpartum women⁷. Therefore, it is imperative to prioritize and invest in improving maternal mortality reporting systems in the SSA region to ensure that accurate data is collected, analyzed, and used to inform evidence-based programs and policies for reducing maternal mortality. In 2012, WHO launched Maternal Death Surveillance and Response (MDSR) which included the identification, notification, and review of all maternal deaths to provide real-time actionable data for the prevention of future similar deaths^{8,9}. Malawi is among the eighteen countries rated to have a high MMR between 500 and 900 per 100 000 live births in the SSA region^{10,11}. Reporting defects of maternal deaths might be caused by poor hospital record management, poor classification of deaths, and lack the disclosure of pregnancy status in developing countries such as Malawi¹². In Malawi, a maternal death review is conducted monthly by each hospital facility. To standardize the process, the Ministry of Health developed forms for maternal death review. Within seven days of maternal death, the Maternal Death Notification Form must be completed to notify the District Health Office. During the review process, the Maternal Death Review Form is filled out and analyzed to identify the factors that contributed to the death and the actions to be taken. However, it was reported that there was generally a lack of proper record-keeping and documentation, and a lack of knowledge and skill when conducting maternal death audits in Malawi^{12,13}. The gaps in

health facilities' reports of under or overestimated cases of maternal deaths might deviate the estimates of national MMR from the true level, thus sparking debates on the quality of maternal death data at such facilities. However, there is inadequate information about the disparity between the actual maternal death and official reported data in Malawi. Therefore, we proposed this study to determine the extent (rate and type) to which gaps of facility-based maternal death reports occurred compared to the official reported data in the health facilities in one district of Malawi.

Methods

Design, setting and population

Malawi is divided into three regions, including northern, central, and southern, with a total of 28 districts. The northern region has six districts with a population of 2,289,780¹⁴. Mzimba is the largest district in the northern part of Malawi, with a population of 157,522 and 5,818 villages, further divided into two-the north and south districts¹⁴. This study was carried out in Mzimba South District. The study was conducted in two referral hospitals in Mzimba South District, providing comprehensive emergency management of obstetric complications namely Mzimba District Hospital and Mzuzu Central Hospital. Mzimba District Hospital is based in Mzimba South District covering an area of about 10,430 square kilometres with a population of 688,301¹⁴. Women with severe health conditions, from the northern region (Mzimba District Hospital inclusive), are further referred to Mzuzu Central Hospital which is located in Mzuzu City and the only referral hospital in the northern region of Malawi¹⁵.

The facility based maternal death review is commonly used to identify and classify maternal deaths occurring in health facilities¹⁶. The review relied on detailed information from women's medical records to provide a comprehensive understanding of the events leading to the death. In this study, a retrospective medical record review was conducted to identify gaps and accurately determine the number of facility-based maternal deaths among women of reproductive age (15 to 49 years) from Mzimba South District at Mzuzu Central Hospital and Mzimba District Hospital. The review covered all eligible death records from

July 2013 to June 2018. Medical review data were obtained from several wards, including Maternity, Internal Medicine, Surgical, and Gynecological wards. Women's data were available in paper-based registers during their hospitalization. The official hospital Health Management Information System (HMIS) reported 83 maternal deaths out of a total of 447 death records for women aged 15 to 49 years.

Inclusion and exclusion criteria

A census of all available death records of women aged between 15 and 49 years from Mzimba South District admitted at the Mzimba District Hospital (secondary hospital) and Mzuzu Central hospital (tertiary hospital) from July 2013 to June 2018 was eligible for inclusion (census). Confirmation of Mzimba South district maternal deaths was further checked with HMIS and home address of the deceased women on the records. We thus excluded all the death reports for women outside the age range from 15 to 49 years old; not residing in Mzimba South District and those who did not die from pregnancy-related deaths.

Ethics statement

Ethical approval was obtained before commencement of the study from two review boards the Institutional Review Board (IRB), School of Public Health, Fudan University, China (IRB#2018-01-0657), and National Committee on Research Ethics in the Social Sciences and Humanities (NCRSH), Malawi (NCST/RTT/2/6). Permission to conduct the study at the study sites was obtained from the District Health Office of Mzimba South District and the director of Mzuzu Central Hospital, Malawi. Precisely, all ethical considerations including confidentiality clauses were adhered to.

Data collection and analysis

Data from July 2013 to June 2018 of reproductive-age women (15-49 years) were reviewed to identify the deaths related to pregnancy using the Rapid Ascertainment Process for Institutional Deaths (RAPID) tool¹⁷. RAPID tool retrospectively identifies pregnancy-related deaths occurring in health facilities that may be missed by routine surveillance to assess gaps in reporting maternal deaths. We used this tool to establish the true

numbers of pregnancy-related deaths in study sites by reviewing all deaths of women aged between 15 and 49 years¹⁷. Two nurses/midwives reviewed death reports of the women of reproductive age group from ward registers and medical records in each study site.

Data were collected by two trained nurses/midwives and were supervised by the first author (PF), an expert nurse/midwife. Data were captured in a rapid register sheet, including demographic details of women, admission time, admission diagnosis, the timing of death, causes of death etc., and then entered into an excel sheet. To determine a pregnancy related death, documentation of pregnancy status or termination of pregnancy within 42 days of death was sought first. If no pregnancy status was explicitly documented in the register, the medical record was then reviewed. If no pregnancy status was explicitly documented in the medical record, the death was finally categorized as undetermined and hence not reviewed. If there was documentation of the death occurring during pregnancy, delivery, or within 42 days after termination of the pregnancy, the death was categorized as pregnancy related.

The collected data in excel sheets was cleaned and imported into Statistical Package for Social Sciences (SPSS) Version 20. Data analysis was examined through descriptive statistics which included frequencies and percentages. We compared the study findings with the hospitals' HMIS reported maternal deaths of each year and described the variations between them. The definitions of underreporting, over reporting and misclassified maternal deaths of this study were identified as follows:

- Underreporting maternal deaths = The maternal deaths by facility-based review – maternal deaths reported by health institute.
- Underreporting rate by the health institute = $(\text{The maternal deaths by facility-based review} - \text{Maternal deaths reported by health institute}) / \text{Total maternal death identified by facility-based review}$.
- Overreporting maternal deaths = The maternal deaths by facility-based review – Maternal deaths reported by health institute.
- Misclassified maternal deaths = The maternal deaths by facility-based review missed in the year of occurrence but were included in the subsequent year.

Results

Identification of maternal death via facility-based death record review among women of reproductive age

The study identified 447 mortality records among women of reproductive age (15 to 49 years) from July 2013 to June 2018 of the two referral hospitals wards (Table 1). About 80% (N=358) of the mortality records among women of reproductive age did not indicate the pregnancy status from the two referral hospitals hence they were excluded. The central hospital had 36% (N=20) maternal death cases out of 56 total deaths among women of reproductive age. The maternal death cases had occurred in the maternity and gynecological wards. Likewise, Mzimba District Hospital had 18% (N=69) maternal cases identified out of 391 death cases among women of reproductive age. These maternal mortality cases were from the maternity and surgical wards. In total, the study identified 89 maternal mortality cases from 447 mortality records of women of reproductive age (15 to 49 years) while the hospital HMIS reported 83 maternal mortality cases.

There was a difference in numbers between the hospital HMIS reported maternal mortality cases (N=83) and from the study review maternal mortality cases (N=89). Both the official report and the study review results for Mzuzu Central Hospital showed similarities in numbers of

maternal mortality cases (N=20) during the study period. There were sixty-three (63) maternal mortality cases reported by the HMIS from Mzimba District Hospital. However, the review findings identified six cases more than what the official data had reported in the same period. The additional identified maternal mortality cases were from the surgical ward (N=2) and postnatal maternity ward (N=4). Hence, during the study period, the total number of maternal mortality cases identified increased to sixty-nine (69) for Mzimba District hospital (Table 2).

At Mzimba District Hospital, from July 2013 to June 2014, no official report on maternal mortality was indicated. However, the study identified six maternal mortality cases from Gynecology ward contributing to an underreporting rate of 66.67% (6/9). From July 2014 to June 2015, the official report had one less maternal mortality cases (N=11) than the maternal deaths by study review (N=12). This additional case was however counted in the July 2015 to June 2016 official report and contributed to a misclassification rate of 9.09% (1/11). From July 2016 to June 2017, the official report had 17 maternal mortality cases out of which 18% (3/17) cases were repeated in the following year. From July 2017 to June 2018, the official report had 23 maternal mortality cases while the study had identified 24 maternal mortality cases which indicated an underreporting rate of 4.17% (1/24) in official data.

Table 1: Location of maternal death cases in facilities by study review

Facility Ward	Mzimba District Hospital (Secondary hospital)		Mzuzu Central Hospital (Tertiary hospital)	
	All death among women of reproductive age (N)	Maternal death (N)	All death among women of reproductive age (N)	Maternal death (N)
Internal Medicine	268	0	26	0
Surgical	56	2	10	0
Maternity	67	67	14	14
Gynecology*	–	–	6	6
Total	391	69	56	20

*The secondary hospital did not have a separate gynecology ward.

Therefore, from July 2013 to June 2018, a total of 12 maternal mortality cases from the secondary hospital were misclassified in the official report. Briefly, the difference between the study review and the hospital official report showed that

the underreporting rate was 6.7% (6/89) and the misclassified reporting rate was 13.5% (12/89) through the facility-based mortality record review among women of reproductive age in Mzimba South District (Table 2).

Table 2: Comparison between the study review and official report on the maternal death in two referral hospitals from July 2013 to June 2018

Calendar year (July-June)	Maternal deaths from the hospital HMIS data			Maternal death by the review on medical records				Identified gap (total reviewed official deaths-total reported)
	Central hospital ward	District hospital ward	Total reported	Central hospital ward	District wards	hospital	Total identified	
	OBGY	OBGY		OBGY	OBGY	Surgical		
2013-2014	3	#	3	3	6	0	9	6 ^a
2014-2015	3	11	14	3	12	1	16	2 ^a
2015-2016	3	12	15	3	11	0	14	-1 ^b
2016-2017	6	17	23	6	14	1	21	-2 ^b
2017-2018	5	23	28	5	24	0	29	1 ^a
Total	20	63	83	20	67	2 ^c	89	6

Data available but not official document available at HMIS

a Official results were underreported

b Official results were over reported

c Misclassified maternal deaths in the surgical department

Discussion

Our findings showed that 80% death records for women of reproductive age did not indicate any pregnancy status. This implies lack of capturing the history of the pregnancy from women in the non-obstetric wards by health providers. Lack of hospital registers with relevant information about pregnancy status of women might lead to missed reporting of pregnancy-related deaths in the non-obstetric departments. Since our study utilized the paper-based registers, the missed pregnancy information might have led to the missed opportunities to identify maternal deaths and misclassify them as general adult death. This suggests that there is an urgent need to modify the hospital patient registration system to capture the pregnancy status as well as other obstetric information so as to improve maternal death identification and reporting. Introduction of pregnancy status on each and every medical record of a woman of reproductive age could help in the identification and accurate numbers of maternal deaths. Lin's study has shown that introduction of a pregnancy check box on the death certificates helped to identify more maternal deaths¹⁸. Studies in Malawi and Tanzania found that lack of proper documentation has led to challenges when conducting maternal death audit^{12,19}. The poor documentation could be to the fact that hospitals do not have a standardized work flow or process of collecting patients' information which could easily miss out important patient information. On the other hand, complexity of the disease could lead to

misclassification of the cause into a general death despite the death qualifying as an obstetric death^{20,21}. These results imply that it is necessary to orient health care providers on the definition of maternal death and the need for indicating the pregnancy status in medical records so that maternal death can be correctly identified and reported. Summarized documentation of referral slips also affects audit of maternal death which could lead to wrong diagnosis especially at tertiary hospitals. There is a need to devise a mechanism where patients records are accompanied by patient to the referral facility for continuity of care and maternal death review purposes.

The WHO emphasizes that data must be reported timely in a well functional HMIS in the health facility²². This study revealed some gaps in the yearly recordings of maternal deaths between the study review and the HMIS reports. The presence of multiple paper-based registers in the maternity ward, and the late compiling of the maternal deaths data could have contributed to missing or duplication for counting maternal deaths, which may consequently lead to underreporting and/or over-reporting of maternal deaths. This finding is consistent with another study in Malawi that showed inaccuracy of reported data from registers and reports^{12,23}. Since most hospitals in low-income countries such as Malawi report the occurrence of maternal deaths through their HMIS, identification of the accurate number, causes, and the contributing factors of the death could be effective through the use of RAPID tool²⁴. Our study shows identification of maternal

deaths using such a tool in the health facilities has the feasibility in all departments of hospitals to provide a true reflection of facility-based maternal deaths.

Valid information on the magnitude of the maternal death problem and its causes are paramount for effective planning, implementation and evaluation of maternity services. Inadequate data have mostly affected health policy decision-making, provision, and resource allocation to improve health service in many countries which could also explain the slow progress Malawi has made towards the attainment of the SDG three²⁵. This highlights the importance of ongoing monitoring and evaluation of health information systems to ensure accurate reporting of maternal mortality and other health indicators. Therefore, strict verification and reporting mechanisms should be established and implemented in the maternal death reporting system for the paper-based information system. A digital health information system could also be the solution specially to catch the change of health utilization and status under public health emergencies such as COVID-19^{24,26}. Further, maternal near-miss review is also suggested to be initiated to summarize the lessons and improve the quality of care²⁵.

Findings of this study informs evidence-based practice on reporting gaps that need to be addressed to improve the accuracy of maternal mortality measures in Malawi, and to fast track the progress of ending preventable maternal deaths towards the SDG three²⁷. The study findings also demonstrated a wide variation on the degree of under-reporting between the two study hospitals. The central hospital in this study appeared to implement a much stricter quality control mechanism for HMIS than the district hospital. Accordingly, we suggest that hospitals should embrace the spirit of sharing experiences for them to improve their identification and reporting mechanism for maternal deaths.

To our knowledge, this study is one of the very few studies in Africa exploring the gap that exists between the reported official data and the true facility-based maternal death in Mzimba South District in Malawi. The study identified reporting defect situations in the referral facilities of the area, which provided valuable information for understanding the reliability of the official data of

maternal death and the reference for calibration of true MMR.

However, our study is limited in scope to two hospitals in a single district, and it is unclear how generalizable the findings are to other settings. Due to the huge workload of reviewing maternal mortality records of five years, the limited number of referral facilities involved in the study could also affect generalizability of the study findings. Further studies therefore are needed to examine a more comprehensive situation in the northern part of Malawi in order to understand the reporting defects in the region. It would be valuable to replicate this study in other areas to assess the consistency of these findings across different contexts. In addition, since in most cases, the pregnancy status was not indicated in the registers, our study might have potentially underestimated the number of maternal deaths in the area. Finally, the study did not explore the reasons for underreporting and misclassification of maternal mortality cases, which could provide further insight how to address these issues. Future research could aim to identify the underlying factors contributing to inaccurate reporting and develop targeted interventions to improve reporting accuracy.

Conclusion

The study revealed missed opportunities in the identification of pregnancy related deaths and gaps in the official reports. Non-obstetric departments should be oriented on how to identify and distinguish maternal deaths from general female deaths at reproductive age. Strict verifying and monitoring mechanisms should be established on maternal deaths reporting for hospital registers and records to improve the documentation process of maternal deaths.

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