Short Communication

Maternal Mortality Determinants in Rural Kenya: An Audit of Three Hospitals

Abstract

Background: Global health agencies advocate that no mother should die while giving life, more so from preventable causes. However, there are persistently high maternal mortalities in various regions with a current global maternal mortality ratio of 211/100,000 live births. This study sought to investigate the causes and determinants of maternal mortality. **Materials and Methods:** A four-year retrospective, cross-sectional study was conducted in three tertiary hospitals within Migori county in Kenya. Data were extracted from 101 maternal mortality records from January 1, 2016 to December 31, 2019. **Results:** Leading complications were hemorrhage 34.70%, eclampsia 20.80%, and sepsis 15.80%. Mothers who were unmonitored using partograph, had reactive HIV status, were in the postpartum period, were referred from periphery facilities, and low socioeconomic levels were most vulnerable. **Conclusions:** Improvement in healthcare systems to enable optimal care to mothers diagnosed with leading complications and socioeconomically empowering women in Migori county is urgently needed.

Keywords: *Hospitals, humans, Kenya, maternal mortality, rural population*

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Introduction

Motherhood is something that many women aspire to at some point in their lives.[1] Yet the normal, life-affirming process of pregnancy and delivery carries with it serious risks of death and disability.[1] A woman dies every minute in childbirth around the globe and almost half of these deaths occur in sub-Saharan Africa.[2] According to WHO global trends, the global estimates for the year 2017 indicate that there were 295 000 maternal deaths.[3] Currently, sub-Saharan Africa is the only region with very high Maternal Mortality Ratio (MMR) for 2017, estimated at 542/100,000.[4] Three countries are estimated to have had extremely high MMR in 2017 (defined as over 1000 maternal deaths per 100 000 live births): South Sudan (1150), Chad (1140), and Sierra Leone (1120).[4] Kenya was among eighteen countries, all in sub-Saharan Africa, categorized with very high MMR in 2015, with a decline from 999 to 500 deaths per 100,000 live births.[3] Currently, Kenya's MMR is 362/100,000 live births.[5] The UNDP[6] notes that, in 2015, world leaders envisioned reducing maternal mortality through Sustainable Development Goals (SDG). SDG 3.1 calls for countries to reduce the global MMR to less than 70/100,000 live births by the year 2030.[6] The current global MMR is 210/100,000.[6] In order for Kenya to meet the MMR target of 140/100,000 by 2030 an annual rate reduction of at least 8.60% is needed.[7]

Causes of maternal deaths can be divided into direct causes that are related to obstetric complications during pregnancy, labor or the postpartum period, and indirect causes.[8] A triad of hemorrhage, hypertensive disorders, and sepsis are the most common direct causes of maternal deaths.[9] Some indirect causes include HIV, malaria, tuberculosis, diabetes, and cardiovascular disease.[10] According to Ibrahim's[11] and Yego *et al*.[10] study on social-economic determinants of maternal mortality in rural communities of Oyo State, Nigeria, and Kenya, respectively, low access to health facilities, level of income, purchasing power, and educational status determine maternal mortality.[11] Further, the limited availability of basic emergency obstetric care which can save women's lives in the event of serious

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medical complications, weak referral systems, and limited national commitment to resources for maternal health add to the failure to reduce the MMR.[12-15] UNICEF[16] holds that no mother should die during pregnancy or during childbirth. In 2018, the Kenya Demographic and Health Survey (KDHS)[17] revealed that Migori county is among the 15 Counties out of 47 that account for over 60% of maternal deaths in Kenya.[17] Moreover, the estimate of the County's MMR is 673/100,000 live births.[8] The purpose of the study was to investigate the causes and determinants of maternal mortality in Migori Kenya.

Materials and Methods

Study design: A retrospective, cross-sectional study design was utilized. Data were extracted from medical records of deceased women due to pregnancy and childbirth complications in the selected health facilities in Migori county from January 1, 2016 to December 31, 2019. Study setting: The study was conducted in three purposively sampled hospitals within Migori county in Kenya. The hospitals included two county referral hospitals and one private referral hospital. Only tertiary referral facilities in Migori county were selected for the study.[17] Study Population: The study's population was a retrospective document analysis of medical records of all deceased women during pregnancy, childbirth and puerperium from January 1, 2016 to December 31, 2019 at the three hospitals in Migori County. Sample Size: Through census sampling, the entire population was used to calculate the sample size for the quantitative research component as follows: Calculation of sample size: According to KDHS estimates, there were 101 maternal mortalities in the 3 selected hospitals from January 1, 2016 to December 31, 2019.[17] The researchers first enumerated all 101 estimated deceased women using medical registers. An inclusion criterion was adopted as follows: medical records of deceased women during hospitalization due to pregnancy and childbirth complications in the selected health facilities in Migori County, Kenya from January 1, 2016 to December 31, 2019. A death occurred in pregnancy or within 42 days of its termination. Data collection tool development: The researchers developed a checklist that was used to extract data from the medical records. The tool included the following sections. Section A: Demographic data (Religion, Age, Employment, Residence, Education, and Marital-status). Section B: Maternal's details and reproductive health status (Gestational age, ANC-Visits, History of Previous C/S, Gravidity and HIV status). Section C: Intervention data (Referral – case status, Place of delivery, Mode of delivery, Person who Conducted Delivery, Cause of death, Stage of labor at point of death, Duration before death, Status of baby, Partograph use, and Type of delay). Data collection process: A pilot study was conducted in a hospital within Migori county that was not among the three sampled in the main study; hence, its data were excluded from the main study. For both pretest and main study, the researchers used the medical registers to identify the files from which to collect data from the targeted facilities. The maternal mortality register was used to identify deceased women. All the deceased women within the register who met the study criteria were selected. A checklist was used to collect data from the selected files. Using the admission numbers from the medical register, files were retrieved from shelves in the health record department. Only the researchers accessed the private room while wearing surgical masks. The researchers also washed hands before and after entering the room. With all permissions granted, the researchers utilized a study checklist to collect data from the medical health records department of the sampled hospitals. The study's checklist used was in soft copy format (excel spreadsheet). The collected data were entered into an Excel spreadsheet after a close scrutiny of completeness and possible errors by the researchers. Data collected were then documented (information recorded) and kept safe in locked cupboards for confidentiality purposes to await quantitative data analysis processes. Data analysis procedure: The quantitative data were entered into a statistical package for IBM manufactured Statistical Package for the Social Sciences 23 version. Using descriptive statistics by percentage distribution tables, the sociodemographic variables were analyzed. Validity and reliability of the instrument: The research tools (questionnaires) were assessed by maternal health experts on whether the tool's items measure the objectives of the study. The questionnaires were regarded as valid if they well measured the independent variables in the study. Further, the questionnaire was tested on reliability using analysis of the pilot study results. To ascertain the reliability of the research instrument, a reliability analysis test was conducted and a Cronbach's alpha was determined.[18] A Cronbach's alpha value of +0.8 or greater indicated that the tool was consistent enough. Although reliability was important for the study, it was not sufficient unless combined with validity.[18] In other words, for a test to be reliable, it also needed to be valid.[18]

Ethical considerations

The researchers were granted permission (Registration code: Rec-240816-052) to conduct the study from the University of South Africa (UNISA) Institutional Ethics Review Committee, and administrative heads of the respective sampled hospitals in the study. The three primary ethical principles: Beneficence, respect for human dignity, and justice were ensured.

Results

Table 1 presents a summary of the three hospitals' maternal mortality trends from January 1, 2016 to December 31, 2019 in Migori County. Most maternal deaths (74) were recorded in AA-County Hospital, followed by BB-Private Hospital[18] and CC-County Hospital.[8] The table further

revealed an increase in the trend of maternal deaths in the 3 hospitals from 15 in 2016 to 32 in 2019 with a persistently high institutional maternal mortality ratio (iMMR). Tables 2 and 3 demonstrated that the key determinants of maternal mortality in the study were as follows: Cause of death, the nonuse of partograph for women in labor (67%), postpartum (64%), referral case (66%), and residence (68%). This indicated that mothers most at risk were those who were diagnosed with hemorrhage and eclampsia, who had their labor poorly monitored during hospitalization, who were in the postpartum period, were referred from periphery facilities, and resided in rural areas.

Discussion

The average iMMR in the four-year period of the three hospitals was 376.2/100,000 live births [Table 1]. The present study's iMMR is higher when compared to Central Kenya region trends. MMRs in Central Kenya were: 127/100,000 live births in 2008/09; 124/100,000 live births in 2009/2010; 129/100,000 live births in 2010/2011, and 111/100,000 live births in 2011/2012.[9]

Present findings reveal that deceased mothers diagnosed with hemorrhage, eclampsia, and sepsis faced high mortality risk in the study. It can also imply that there was inadequate care in the three preventable maternal conditions within the study's hospitals. In regard to three delays model, most maternal deaths were contributed by the third delay. This can imply that the deceased mothers in the study were exposed to the failure of health systems. Third delay is a delay in receiving appropriate care after arriving at the health facility.[10] Similar trends were observed in a study conducted in Georgia.[19] However, in Mozambique, delay type II was observed in 40.40% of maternal deaths and delay type III in 14.20% and 13.90% had both delays.[12]

Table 1: Number of the reviewed maternal mortality records of three hospitals from 2016 to 2019 (*n*=101)

		2016	2017	2018	2019	Total
Total	Maternal deaths	15	25	29	32	101
	Live births	7371	4741	8183	7623	27, 918
iMMR		203.50	527.31	354.39	419.78	Av. 376.2

**iMMR, Institutional Maternal Mortality Ratio. **Av, Average

Table 2: Percentage distribution of cause of death of the reviewed maternal mortality records (*n*=101)

Cause of Death	*n* (%)
Hemorrhage	35 (34.70)
Eclampsia/Hypertension	21 (20.80)
Sepsis	16 (15.80)
Ruptured uterus	7 (6.90)
Anemia	6 (5.90)
Heart disease	1 (1.00)
Any other	15 (14.90)
Total	101 (100.00)

A partograph is an essential labor observation tool that has relevant measurements to include cervical dilation, uterine contractions, and vital signs. However, in the present study, in the majority of the maternal death records analyzed the tool was not utilized. This illustrates inadequate assessment and monitoring of most cases as were admitted while in labor. Also noted, the majority of the maternal death records indicated for Caesarian sections were infrequently monitored using the partograph. Across the maternal care continuum from antenatal to postpartum care, most mortalities were noted during the postpartum care. One can also conclude that the majority of deceased mothers faced inadequate care during the postpartum period.

The findings revealed that most deceased mothers had been referred from peripheral facilities. This can imply that the deceased mothers had delays in receiving care while in transit to the referral facilities. On the other hand, indecision of referral of the facilities under study is noted in 33.70% nonreferred deceased mothers. The present findings are similar to a Ugandan study conducted to estimate the risk of Maternal Death at admission.[13] Ugandan researchers noted that women who were referred from other health centers and hospitals were at a higher risk of dying than nonreferred patients.[13]

The study's findings suggest a direct relationship of mortality risk with unemployment. This can also imply that the majority of unemployed deceased mothers (44.60%) faced challenges to afford direct and indirect costs associated with pregnancy complications. It is argued that the fear of cost and lack of money can deter mothers from seeking treatment from higher-level hospitals or reaching there on time.[14] In regard to the level of education, deceased mothers with primary and none were more vulnerable when compared to those with tertiary level attainment. One can also conclude that more educated mothers are likely to have better knowledge in understanding danger signs and birth preparedness, hence prompt in seeking care compared to their counterparts (10). In the present study, the 26.70% who delivered below 20 years were more vulnerable as they had not attained recommended reproductive maturity age. Additionally, age 40–49 is associated with higher maternal complications, which 2.90% of the cases might have faced during pregnancy. The study's findings illustrate that the two ends of the gravidity continuum face higher mortality risk. Women in their first pregnancies have longer duration of labor, while women with multiple pregnancies are more likely to suffer postpartum hemorrhage.[15]

Of interest is that the majority of cases attended Antenatal Care (ANC) visits. However, 17.80% who did not attend were more vulnerable as they missed ANC opportunities for early danger sign detection and management. The cases whose ANC schedule was unknown can also imply that they had no ANC-related empowerment *(that is if they*

Table 3: Percentage distribution of sociodemographics of reviewed maternal mortality records (*n*=101)

Variable	*n* (%)	Variable	*n* (%)	Variable	*n* (%)
Religion		Marital status		Place of delivery	
Christian	94 (93.10)	Married	72 (71.30)	Home	8 (7.90)
Muslim	5 (5.00)	Single	22 (21.80)	Hospital	93 (92.10)
Not Recorded	2 (2.00)	Divorced	7 (6.90)	Mode of delivery	
Maternal age		Gestational age		C/S	45 (44.60)
21–29	47 (46.50)	37–42 weeks	57 (56.40)	No delivery	16 (15.80)
Below 20	27 (26.70)	Below 37 weeks	42 (41.60)	SVD	39 (38.60)
30–39	24 (23.70)	Above 42 weeks	2 (2.00)	Vacuum	1 (1)
40–49	3 (2.90)	Previous C/S		Personnel	
Employment status		Yes	15 (14.90)	Doctor	45 (44.60)
Formal	18 (17.80)	No	84 (83.20)	Nurse	49 (48.50)
Informal	38 (37.60)	Not recorded	2 (2)	Traditional Birth Attendants (TBA)	7 (6.90)
Not working	45 (44.60)	Gravidity		Stage of care	
Residence		1–2	44 (43.60)	Antenatal	17 (16.80)
Urban	22 (21.80)	3–4	15 (14.90)	Intra-partum	19 (18.80)
Informal -	10 (9.90)	5–6	19 (18.80)	Postpartum	65 (64.40)
Rural	69 (68.30)	Above 7	23 (22.80)	Use partograph	
Level of education		HIV status		Yes	33 (32.70)
Primary	45 (44.60)	Nonreactive	66 (65.30)	No	68 (67.30)
Secondary	33 (32.70)	Not tested	19 (18.80)	Type of delay	
Tertiary	10 (9.90)	Reactive	16 (15.8)	First	19 (18.80)
No education	13 (12.90)	Referral case		Second	5 (5)
ANC visits		Yes	67 (66.30)	Third	47 (46.50)
Yes	76 (75.20)	No	34 (33.70)	All delays	22 (21.80)
No	18 (17.80)	Baby outcome		Not recorded	8 (7.90)
Hospital stay		Alive	54 (53.50)		
Less than 24 h	48 (47.50)	Dead	47 (46.50)		
More than 24 h	53 (52.50)				

attended ANC) that demands mothers to be visiting the hospital with their clinic booklets. One can also conclude that the majority of cases attended the ANC visits because it is a free service in the study setting.[20] The study was conducted in only one county (Migori) out of the 47 counties in Kenya. It could be difficult to generalize the present findings to other counties. The study was hospital based, which implies that maternal mortality cases under Traditional Birth Attendants (TBA) at the community level were unaccounted for. A possible reason is that TBA-related maternal mortality cases were not recorded or captured in the hospital maternal mortality registers utilized in the present study. However, the study design of census sampling utilized a large sample size of cases that enriched the presented data.

Conclusion

It is noted that maternal mothers most at risk are those who are diagnosed with hemorrhage, eclampsia, and sepsis. This implies that more institutional efforts are needed to provide optimal care to mothers diagnosed with these pregnancy-related complications. The study proposes regional blood campaigns to ensure constant blood availability in hospitals. Strategies to improve obstetrics emergency care through refresher training of staffs, provision of emergency equipments, and essential drugs in hospitals are highly needed. Further, the study indicates that maternal mothers whose labor is unmonitored during hospitalization using partograph, in the postpartum period, are referred from periphery facilities and those that reside in rural areas are most vulnerable. Improvement in health system concerns highlighted and socioeconomically empowering women in Migori county might also increase maternal survival.

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Conflicts of interest

Nothing to declare.

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