

Assessment of Maternal Mortality and its Associated Causes at Shinyanga Regional Hospital in Tanzania

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Abstract

Background: Maternal mortality remains a public health concern in low income countries particularly in sub-Saharan Africa where majority (62%) of maternal deaths occurs. In Tanzania maternal mortality ratio is as high as 432 deaths per 100,000 live births.

Objectives: This study aimed to describe pattern of maternal mortality ratio and its associated causes at Shinyanga regional referral hospital. We also assessed the availability of the comprehensive emergency obstetric care services in the study setting.

Methods: This was retrospective cross-sectional study which was conducted from April to May 2015 at Shinyanga Regional Referral Hospital. Information on demographic data, obstetric factors associated with maternal death and their causes as well as their management were extracted from the patient's record file between 2010 and 2014 by using data extraction sheet. Data analysis was performed using SPSS version 18.0 for Windows (SPSS Inc, Chicago, IL, USA). Descriptive statistical analysis were summarized.

Results: Overall maternal mortality ratio declined from 635/100,000 live births in 2010 to 449/100,000 live births in 2014. The main causes of maternal death were postpartum haemorrhage (50%) and pre-eclampsia/eclampsia (20%). Majority (77%) of the delays were encountered at hospital and at home (56%). Numerous forms of management were provided to women who experienced maternal death including C-section (35.5%) for antepartum haemorrhage and hysterectomy (17%) for postpartum haemorrhage. For pre-eclampsia/eclampsia, only 12.5% had C-section. Of all of the maternal deaths, only 2.5% had assisted vaginal delivery and 14% had puerperal sepsis.

Conclusions: The observed maternal mortality ratio in this population is higher compared to the national average. Postpartum haemorrhage and preeclampsia/eclampsia remains to be the main direct causes of maternal deaths. Delay in decision making in seeking fortreatment and provision of treatment contributed to high maternal mortality observed in this study. This requires more effort to address the direct and indirect causes of maternal death.

Keywords: Maternal Mortality, Risk Factors, Causes, Shinyanga, Tanzania

1. Background

Maternal mortality is referred to 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 (1).

Globally, maternal mortality ratio has declined by 47% from 380 in 1990 to 210 deaths per 100,000 live births in 2013 (2). However, this decline has not been reflected in low-income countries especially in sub-Saharan Africa where majority (over 62%) of the maternal deaths occurs (1, 2). Previous investigators have reported that there is a difference in mortality ratio between developing and devel-

oped countries, with the highest rate in developing countries (3). For example, in 2015, maternal mortality ratio in developing countries was 239 per 100 000 live births compared with 12 per 100, 000 live births in developed countries. Studies have shown variation in MMR in sub-Saharan Africa ranging from 53 per 100,000 live births in Mauritius to 980 per 100,000 live births in Chad (4).

In Tanzania, maternal mortality rate has remained high over the past 10 years. According to the Tanzania demographic and health surveys (TDHS) report of 2010 and 2015, maternal mortality ratio in Tanzania was estimated to be 454/100,000 live births and 432/100,000 live births respectively (5). In the same reported, Shinyanga region was reported to be among the regions in Tanzania with higher maternal mortality ratio as compared to the national aver-

age. Despite this high maternal mortality, causes and associated factors for maternal mortality in this region have not been well explored.

Causes of maternal deaths are divided into two major groups; namely direct causes which account for greater proportion of all maternal death and indirect causes (2). A systematic review by Say et al. revealed that between 2003 and 2009 about 73% of all maternal deaths globally were due to direct obstetric causes while 25.5% were accounted by indirect causes (3). The direct causes include haemorrhage (27.1%), hypertensive disorders (14.0%), and sepsis (10.7%) while indirect causes include unsafe abortion, obstructed labour, malaria, anemia and HIV/AIDS (3).

The causes of maternal deaths vary between developing and developed countries. In sub-Saharan Africa, the major causes of maternal deaths are haemorrhage (34%), infection (10%), pre-eclampsia (9%) and obstructed labour (4%), while haemorrhage accounts for only 13% of maternal deaths in developed countries (6). A study which was conducted in Malawi reported that postpartum haemorrhage, sepsis and HIV/AIDS were the leading causes of maternal death (7). According to Tanzania demographic and health survey (TDHS) report of 2010, it was found that postpartum haemorrhage, puerperal sepsis and, preeclampsia/eclampsia, obstructed labor and complications of unsafe abortion were the main causes of maternal deaths (7), a hospital-based in the rural setting in Tanzania reported that the leading causes of maternal deaths were haemorrhage (28%), eclampsia (19%) and puerperal sepsis (8%). A hospital-based in the rural setting in Tanzania reported that the leading causes of maternal deaths were haemorrhage (28%), eclampsia (19%) and puerperal sepsis (8%) (7-9). The increased mortality risk related to pregnancy and delivery calls for an urgent need for strategies to reduce these risks.

2. Objectives

This study aimed to assess the burden of maternal mortality, causes, factors associated with maternal death and emergency. Obstetric measures taken towards the particular maternal death at Shinyanga regional referral hospital. Identification of causes and risk factors contributing to maternal mortality may help to develop appropriate interventions to improve pregnancy care and prevent maternal deaths in this setting.

3. Methods

3.1. Study Design and Setting

The study was a retrospective cross sectional study, which was conducted from April to May 2015. The study

was conducted at Shinyanga regional referral hospital, which is located in Shinyanga municipal council that is among the six district councils of Shinyanga region. Shinyanga region is located in the North Western part of Tanzania at the South of lake Victoria and it is part of six lake zone regions.

3.2. Study Population

All the maternal deaths that occurred in Shinyanga regional referral hospital from the year 2010 to 2014 were evaluated. A total of 120 cases were obtained from the patients files of the maternal deaths that had occurred from 2010 to 2014 from medical records. Maternal deaths that occurred within the period of pregnancy and maternal deaths that occurred within 42 days postpartum were included in the study. We excluded maternal deaths that occurred due to accidental or incidental causes and maternal death with incomplete information on the files and clinical notes.

3.3. Study Variables and Data Collection Methods and Tools

The study used medical records data from the obstetric unit for all women who delivered at Shinyanga regional referral hospital from January 2010 through December 2014. Data was extracted from patient's files using a data extraction sheet. The information collected include socio-demographic data characteristics of the mothers, causes of maternal death, and factors associated to maternal death and the management provided.

3.4. Ethics Clearance

This study was approved by the Kilimanjaro Christian medical university college research ethics committee. Permission to use data from the hospital records was obtained from the regional administrative authority. Confidentiality was adhered by the use of patient hospital number instead of names.

3.5. Data Processing and Analysis

Data was rechecked first then entered, cleaned, checked for missing value and analysed using statistical package for social science (SPSS) version 18.0 for Windows (SPSS Inc, Chicago, IL, USA). Data was descriptively analysed; demographic characteristics and associated factors of participants were described, MMR was summarised, causes of maternal death and managements provided were identified and summarised.

4. Results

A total of 120 cases were obtained from the files of the maternal deaths that had occurred from 2010 to 2014. Focusing on demographic data observed; 72% of women who experienced maternal deaths were aged between 20 and 34 years with mean age of 26.5 years. About 83% of the study cases were married. Regarding education, 52% had primary school education while 38% had no formal education. 60% of the cases were reported in rural areas (Table 1).

Table 1. Socio-Demographic Characteristics of Maternal Deaths at Shinyanga Regional Referral Hospital from 2010 - 2014 (N = 120)

Characteristics	N	%
Mean age (SD)	26.5 (6.84)	
Age (years)		
< 20	18	15
20 - 34	86	71.7
> 35	16	13.3
Religion		
Christian	86	71.7
Muslim	17	14.2
Others	17	14.2
Marital status		
Married	99	82.5
Unmarried	21	17.5
Educational status		
No formal education	46	38.3
Primary school	62	51.7
Secondary school	11	9.2
Tertiary level	1	0.8
Occupation		
Housewife	40	33.3
Peasant	73	60.8
Civil servant	2	1.7
Business	5	4.2
Area of Resident		
Rural	72	60
Urban	48	40

The highest maternal mortality ratio was reported in 2010 at 635/100,000 live births, it was then declined from 2011 to 2013, being 463, 279 and 256 per 100,000 live births respectively. There was a steady increase in maternal mortality ratio in 2014 at 449/100,000 live births (Figure 1).

The obstetric characteristics observed were such as 42% of the reported maternal deaths occurred among multi-gravida women and nearly 30% occurred among primigravida and grand multiparous (29% versus 28%, respectively). Some underlying conditions such as hypertension (7%), cardiac disease (11%) and HIV (12%) were more likely to be attributed to maternal deaths, yet 92% had less than four antenatal visits (Table 2).

Among all the delays encountered by the maternal deaths only 97% of all the maternal deaths had encountered a certain delay, whereby majority of the delays were encountered at Hospital (77%) and 56% were encountered at home (Table 3).

50% of all the maternal deaths were contributed by haemorrhage complications followed by pre-eclampsia/eclampsia (20%) while 14% was contributed by postpartum/puerperal sepsis. Indirect complications contributed about 53.3% of all the maternal deaths (Table 4).

Most of the complications that occurred were haemorrhage and pre-eclampsia. Treatments were given to patients who had haemorrhage such as caesarean section (C-Section)-(35%) in patients who had APH and surgery (hysterectomy) (17%) in patients who had PPH. For pre-eclampsia/eclampsia most patients (87%) were given anti-convulsants but only 12% had C-section (Table 5).

5. Discussion

The study reviewed and assessed the maternal deaths that occurred at Shinyanga regional referral hospital from 2010 to 2014. The maternal mortality ratio (MMR) slowly declined from 635/100,000 live births in 2010 to 449/100,000 live births in 2014. Fifty percent of the maternal deaths were attributed to haemorrhage complications, while 20% were attributed to pre-eclampsia/eclampsia. Most (97.5%) of all the maternal deaths had encountered a certain delay, whereby majority (76.7%) of the delays were encountered at the hospital level and at home (55.8%).

In this study, we found that there was a declining trend in maternal mortality from 2010 to 2014 in Shinyanga region; This is similar to community based study as reported in THDS 2010 (5) and hospital based study in Kilimanjaro (8). However, the estimate of MMR is high in this study and similar to findings at Muhimbili national hospital and Kilimanjaro Christian medical center in Tanzania (8, 10). High MMR in the study area could be due to less urbanization and less advance hospital technology compared to Dar es Salaam and Kilimanjaro. Similar high MMR have also being reported in other countries; Kenya with MMR 426 per 100,000 live birth, Ethiopia with MMR ranging from 500

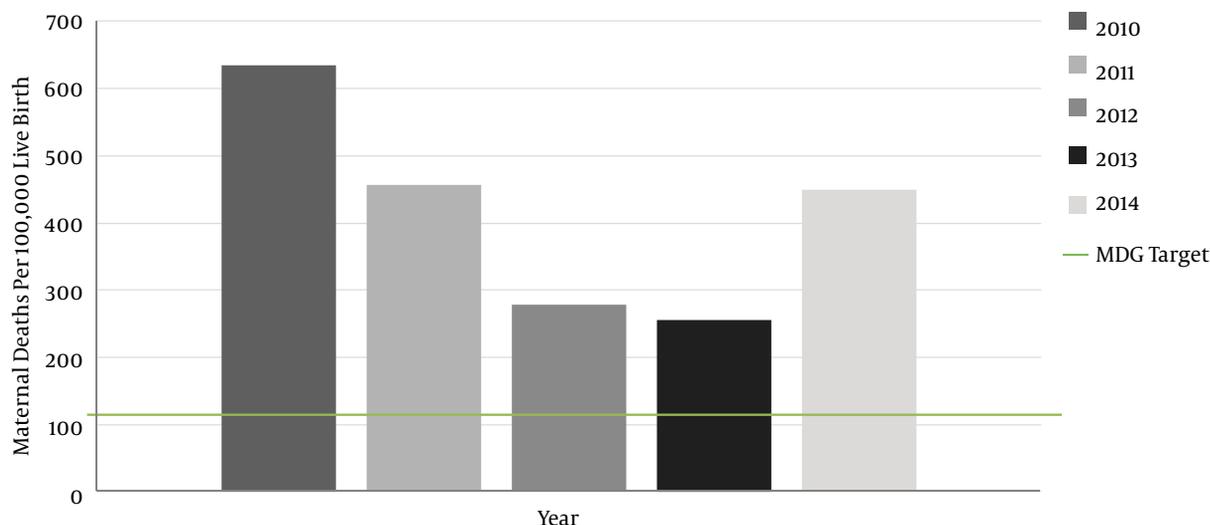


Figure 1. Maternal Mortality Ratio in Shinyanga Regional Referral Hospital, 2010-2014

to 2500 per 100,000 live births and Ghana with MMR of 493 per 100,000 live births (11-13).

In this study, half of maternal death were due to hemorrhage followed by pre-eclampsia/eclampsia which account for (20%) of all direct causes of mortality while 64% of all indirect causes were due to anaemia, followed by HIV/AIDS which account for 17% of all indirect causes. This finding is consistent with hospital based study in Muhimbili and Kilimanjaro hospital, community based study in Rufiji District in Tanzania and Ethiopia whereby the leading direct cause of maternal mortality was haemorrhage followed by pre-eclampsia /eclampsia yet in contrast to indirect cause whereby HIV/AIDS was the leading cause in study conducted in Rufiji District (8, 10, 13-15). Also similar findings have been reported in some other countries in Africa and Asia (11, 12, 16), and haemorrhage has been reported as the leading cause of maternal death in Africa (3). The high proportion of death in study area due to hemorrhage is a result of poor prenatal and delivery care and lack of competent and skilled health personnel to handle obstetric EmOC compared to study in Kilimanjaro and Dar es salaam. With these findings it implies that there is a need for improving emergency obstetric care in rural area so as to reduce the maternal mortality due to haemorrhage and pre-eclampsia/eclampsia.

The observed type of delays in this study setting were mainly at the hospital as a result of lack of skills/trained personnel, delay in decision making and lack of resources at the hospital. Our findings corresponds to those reported in Muhimbili national hospital in Tanzania and other parts

of the African continent (4, 10). A good number of delays were also at home being contributed to delay in decision making at family level mainly due to lack of resources in the family to afford proper hospital treatment. With well-trained health personnel, adequate and accessible health facilities, the delays can be alleviated.

Management of pregnancy complications is an important aspect to reduce maternal deaths related to pregnancy and delivery. In the present study, most of the treatment provided was not according to the WHO EmOC guidelines. The majority of patients who had antepartum haemorrhage complications had undergone C- section, for the sake of PPH, preeclampsia/eclampsia, postpartum sepsis and obstructed labor. A few number of the patients underwent assisted vaginal delivery, removal of retained products and surgery. All this misdirected managements are a result of improper management skills and lack of well-trained personnel, this findings are in agreement with studies conducted by WHO, Muhimbili National Hospital in Tanzania as well as in Botswana (4, 10, 17). The treatments provided in the study setting were also accessible for a few proportions of mothers due to their low income and lack of resources in the particular setting. This reasons were also observed in studies performed in rural areas of northern Tanzania and Uganda (18, 19).

Being a cross-sectional study, it is difficult to establish the temporally relation between the outcome (maternal mortality) and the exposure variable. The assessment on the current study based on the treatments provided and observations from the files and surroundings, therefore it

Table 2. Obstetric Characteristics of Maternal Deaths at Shinyanga Regional Referral Hospital from 2010 - 2014 (N = 120).

Characteristics	N	%
Gravidity		
Primigravida	35	29.2
Multigravida	51	42.5
Grand multigravida	34	28.3
Underlining medical condition		
None	77	64.2
Diabetes mellitus	1	0.8
Hypertension	9	7.5
Cardiac diseases	13	10.8
Renal problems	3	2.5
Haematological disorders	1	0.8
Epilepsy	2	1.7
HIV	14	11.7
Pregnancy stage		
Antepartum	23	19.2
Intrapartum	64	53.3
Peurperium	33	27.5
Labour Stage		
Latent	22	18.3
Active	64	53.3
Second stage	2	1.7
Third stage	32	26.7
Delivery Mode		
Vaginal	56	46.7
Caesarean section	37	30.8
Assisted vaginal delivery	3	2.5
Didn't not deliver	24	20.0
Birth Attendant		
Nurse/midwife	72	60.0
Doctor	47	39.8
Medical attendant	1	0.8
Antenatal Visit		
< 4	112	93.4
≥ 4	8	6.7
Admission mode		
Referred	42	35.0
From home	78	65.0

Table 3. Delays of Maternal Death at Shinyanga Regional Referral Hospital 2010-2014 (N = 120)^a

Delay Places	N	%
Delay (n = 120)		
Home	67	55.8
Home - hospital	7	5.8
Hospital	92	76.7
Home (n = 67)		
Delay in decision making	67	100
Malcultural practices	2	3.0
Traditional treatments	4	6.0
Home - hospital (n = 7)		
Long distance	7	100
Poor infrastructure	6	85.7
Hospital (n = 92)		
Lack of resources	57	62.0
Lack of trained personnel/ skills	81	88.0
Delay in decision making	77	83.7
Late referral	22	23.9

^aThe total add up to over 100% because of multiple responses.

Table 4. Direct and Indirect Obstetrics Causes of Maternal Deaths at Shinyanga Regional Referral Hospital from 2010 - 2014 (N = 120)^a

Causes	N	%
Direct causes (n = 120)		
Haemorrhage (APH/PPH)	60	50
Prolonged/obstructed labor	7	5.8
Postpartum/puerperal sepsis	17	14.2
Complications of abortion/unsafe abortion	5	4.2
Pre-eclampsia/eclampsia	24	20
Ectopic pregnancy	2	1.7
Ruptured uterus	2	1.7
Indirect causes (n = 64)		
Anaemia	41	64.4
HIV/AIDS	11	17.2
Malaria	4	6.3
Other indirect causes	8	12.5

^aOther indirect causes - Aspiration pneumonia, hypoglycaemia and intestinal obstruction.

is difficult to conclude what existed in the past five years

based on what is currently seen. Most of the stored files had poor documentation and missing information regardless of being traced from labor ward or obstetric department.

Table 5. Treatment Due to Complications Given to Maternal Deaths at Shinyanga Regional Referral Hospital 2010-2014 (N = 120)

Complications	Treatment	N	%
Haemorrhage (APH/PPH) (n = 60)			
APH (n = 31)		31	51.7
	Blood transfusion	20	64.5
	Caesarean section	11	35.5
PPH (n = 29)		29	48.3
	Blood transfusion	23	79.3
	Manual removal of placenta and retained products	1	3.4
	Surgery (hysterectomy)	5	17.2
Prolonged/Obstructed labour (n = 7)			
	Assisted vaginal delivery (not done)	7	100
	Caesarean section	5	71.4
Postpartum/puerperal sepsis (n = 17)			
	Antibiotics	17	100
	Removal of retained products (not done)	17	100
	Surgery	3	17.6
Complications of abortion/unsafe abortion (n = 5)			
	Antibiotics	3	60.0
	Removal of retained products	1	20.0
	Surgery	1	20.0
Pre-eclampsia/eclampsia (n = 24)			
	Anticonvulsants	21	87.5
	Surgery (caesarean section)	3	12.5
Ectopic pregnancy (n = 2)			
	Blood transfusion	2	100
	Surgery (caesarean section)	2	100
Ruptured uterus (n = 2)			
	Blood transfusion (not done)	2	100
	Surgery (caesarean section)	1	50.0
	Antibiotics	1	50.0

Notwithstanding the limitation, this study provide knowledge on the causes of maternal mortality in Shinyanga region and this might provide a way forward in planning for intervention.

5.1. Conclusion

Maternal mortality ratio in the study area is still higher compared to the region and National average. Some factors such as delays at hospital and at home were reported to be associated with MMR while haemorrhage complications and pre-eclampsia/eclampsia were the main causes of MMR. The common treatments provided were C-section and surgery (hysterectomy) for patients who had antepartum haemorrhage and postpartum haemorrhage respectively. Therefore, the recording system at Shinyanga Regional Referral Hospital should be improved and clinicians should be instructed to collect information properly from the patients without leaving any gaps. More studies should be done to assess the maternal death and maternal near miss association to risk factors of maternal death, also prospective studies should be done to assess more causes and their associations to the maternal death at Shinyanga Regional Referral Hospital. Education should be provided to women and their families to seek medical attention on signs and symptoms indicating an underlying medical condition or an emergency obstetric condition, also education on regular ANC visits will assist in identifying the conditions sooner.

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Footnotes

Authors' Contribution: Oscar E Mapunda designed the study and performed the statistical analysis and participated in the writing of the manuscript; Sia E Msuya, Damian J Damian, Ntuli A. Kapologwe, and Beatrice John contributed in reviewing the manuscript for intellectual content; Michael J Mahande participated in drafting the manuscript, review and performed the statistical analysis; All authors read and approved the final manuscript.

Conflict of Interests: The authors declared that they have no conflict of interests; All authors have read the manuscript and agreed on its submission.

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