REVIEW OF MATERNAL DEATHS AT MUHIMBILI NATIONAL HOSPITAL, TANZANIA - 2011

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MMed (Obstetrics and Gynaecology) Dissertation
Muhimbili University of Health and Allied Sciences
October,2013

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By

Chetto Paulo, MD

A Dissertation submitted in (partial) fulfilment of the Requement for the Degree of Master of Medicine in Obstetrics and Gynaecology of the Muhimbili University of Health and Allied Sciences

Muhimbili University of Health and Allied Sciences
October, 2013

CERTIFICATION

The undersigned certify that he has read and hereby recommends for acceptance by Muhimbili University of Health and Allied Sciences a dissertation entitled: **Review of Maternal Deaths at Muhimbili National Hospital, Tanzania - 2011,** in partial fulfillment of the requirements for the degree of Masters of Medicine in Obstetrics and Gynaecology of the Muhimbili University of Health and Allied Sciences**.**

_____

Dr. Andrea B. Pembe

(Supervisor)

_____

Date

DECLARATION

AND

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I, **Dr Chetto Paulo**, declare that this dissertation is my own original work, and that it has not been presented and will not be presented to any other university for a similar or any other degree award.

Signature ……..... **Date** …….....

ACKNOWLEDGEMENT

I am greatly indebted to Dr Andrea B. Pembe, my supervisor for his dedicated supervision, unceasing guidance and support in the course of this work. His critical, experienced research eyes were main stay from the very elemental stages of proposal development. He often made critical review of my work, which was vital in molding it to the present form.

I register my special thanks to the specialists who freely volunteered and worked tireless in reviewing the medical case files as external reviewers, without them this study would not have been successfully.

I wish to thank all the specialists and consultants in the department of Obstetrics and Gynaecology of Muhimbili University of Health and Allied Sciences for their valuable inputs during the course of this work.

I also appreciate the cooperation which we received from staff of Obstetrics and Gynaecology department in Muhimbili National Hospital particularly from the in-charge of labour ward, in-charges of gynaecological wards and the head of medical records department. They were helpful in tracing the case files.

Special thanks to the Director of Clinical Services in Muhimbili National Hospital and Head of Department of Obstetrics and Gynaecology of MNH for allowing me to conduct the research at MNH. Thanks to the government of Tanzania through Commission of Sciences and Technology for having sponsored my studies and for giving financial assistance to enable this study.

Last but not least I would like to thank God almighty, who has taken me through this work. Glory, praise and honour be unto him now and forever more. Amen.

DEDICATION

This work is dedicated to my late parents Helena Simon Kassy and Hipolity Cosmas Chetto.

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LIST OF ABREVIATIONS

AIDS	-	Acquired Immunodeficiency Syndrome
ANC	-	Ante Natal Clinic
ARC	-	Aids Related Complications
C/S	-	Caesarian Section
HIV	-	Human Immunodeficiency Virus
ICU	-	Intensive Care Unit
MDG	-	Millennium Developmental Goal
MMR	-	Maternal Mortality Ratio
MNH	-	Muhimbili National Hospital
MUHAS	-	Muhimbili University of Health and Allied Sciences
TDHS	-	Tanzania Demographic Health Survey
WHO	-	World Health Organization

DEFINITION OF TERMS

Maternal deaths - deaths of a woman while pregnant or within 42 days of the 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.

Maternal mortality ratio - is the ratio of the number of maternal deaths during a given time period per 100,000 live births during the same time period.

Referral – The process of directing or redirecting a patient from one level of health facility to a higher level for diagnosis, investigations and treatment.

ABSTRACT

BACK GROUND: Maternal mortality in Tanzania continues to be unacceptably high. By Identifying the avoidable factors, as well as direct and indirect causes of maternal mortality from both obstetrics and gynaecology units and by determining the current MMR, will help to establish areas of improvement and this may help in fighting to reduce the maternal mortality in this institution . The objective of this study was to determine the maternal mortality ratio and identify causes and avoidable factors of maternal deaths at Muhimbili National Hospital.

METHODS: A retrospective review of all maternal death records of cases that occurred from 1st January to 31st December 2011 was done. Data entry was done using Epi info version 3.5.1 and was analyzed using SPSS version 15.0.

RESULTS: There were 10,057 live births, 155 maternal deaths and hence MMR of 1541 per 100,000 live births. Of direct causes eclampsia and pre eclampsia were major causes of deaths (19.9%), followed by post partum haemorrhage (14.9%), abortion complications (9.9%), sepsis (9.2%), ante partum hemorrhage (7.1%), ruptured uterus (5.0%) and obstructed labour (3.5%). Among the indirect causes anaemia was the leading cause (11.3%), followed by HIV/AIDS (9.9%), heart diseases (5.7%), malaria (2.8%) and tuberculosis (0.7%). Avoidable factors contributing to deaths were identified in 83% of all reviewed maternal deaths. Personal avoidable factor was found in 33.8% while medical service factor was seen in 66.2% of the total factors identified. The common personal avoidable factors included delay in seeking care (73.3%) and completely lack of antenatal care (11.1%). Of the medical service factors inadequate blood transfusion (26.1%) completely no transfusion due to lack of blood (19.3%), delay in receiving treatment (18.3%) and poor or mismanagement (17%) were the common factors.

CONCLUSION: There is a high maternal mortality ratio in Muhimbili National Hospital. Hypertensive disorders of pregnancy (eclampsia and pre eclampsia), post partum hemorrhage and anaemia are the leading causes of maternal deaths in this institution. There were multiple factors identified both at individual level and at facility level that contributed to maternal deaths which were avoidable. There is a need for increasing efforts in the fight to reduce maternal deaths in this institution.

INTRODUCTION

According to the international statistical classification of diseases and related health conditions (10^{th} revision), maternal death is defined as death of a woman while pregnant or within 42 days of the termination of pregnancy irrespective of the duration and the site of pregnancy, from any cause related to or aggravated by the pregnancy or its management but not from accidental or incidental causes (1). This definition allows identification of maternal deaths, based on their causes as either direct or indirect. A direct obstetric death is defined as those resulting from obstetric complications of the pregnant state during pregnancy, labour and the puerperium, from interventions, omissions, incorrect treatment, or from a chain of events resulting from any of the above (2). Deaths due to hemorrhage, preeclampsia/eclampsia, those due to complications of anesthesia, caesarean section, ectopic pregnancy, sepsis and obstructed labour are classified as direct obstetric deaths. Indirect obstetric deaths are those resulting from previous existing disease or disease that developed during pregnancy and which was not due to direct obstetric causes, but was aggravated by physiologic effects of pregnancy. Deaths due to heart diseases, HIV-AIDS, Malaria and anaemia are examples of indirect obstetric deaths.

The death of the mother spells the loss of a strategic house hold care giver (3). Pregnancies may pose risks to the health of women and/or their babies, leading to unwanted consequences in varying severity, ranging from pelvic lacerations due to obstetric trauma to death (4). Most women survive severe illnesses that occur in pregnancy however, some pregnant women unfortunately do die (5). At an individual level, it is not usually easy to predict which women will experience either a minor or a life threatening complication, although certain characteristics such as age, number of previous pregnancies and their outcomes, health status and family history are associated with some of the negative outcomes (4).

New estimates released by World Health Organization (WHO), indicated that globally the number of women who died in pregnancy and child birth was around 358,000 (1). This is 34 percent lower than previous estimates. Globally Maternal Mortality Ratio (MMR) is at 260 per

100,000 live births. With developed regions having MMR of 14 per 100,000 live births while developing regions has MMR of 290 per 100,000 live births. In sub Saharan Africa MMR is 640, Oceania 230, Asia 190, Latin America and Caribbean 85 per 100,000 live births. In developed countries, life time risk of maternal death is one in 4300. On the other end developing countries with high fertility, shattered infrastructure and poor health care systems, have a life time risk of more than 1 in 120 (4).

Maternal mortality ratio is highest in Africa with figures up to 590 per 100,000 live births. In western, central and eastern Africa the risk is generally higher than in northern and southern Africa. Maternal mortality in Africa is compounded by high fertility, shattered health system and HIV AIDS (5).

Tanzania is among the eleven countries in the world which in totality comprised 65 percent of all maternal deaths in 2008 (1). The country has set a national road map strategic plan to accelerate the reduction of maternal, newborn and child mortality. Tanzania has planned to reduce MMR from 578 to 193 per 100,000 live births by the year 2015 (6). The current country MMR estimate is 454 per 100,000 live births in 2010. This estimate is an improvement from 578 in 2005 and 529 in 1999 (7). The life time risk of maternal death in Tanzania is 1 in 23 women (1).

Causes of maternal death can be viewed either narrowly or broadly. A broad view will take into account individual, community and health service factors that contributed to the death. Considering these factors separately marks the narrow view of causes of maternal mortality (8).

Maternal mortality prevention can be targeted at three levels. The first level is primary prevention which aim at prevention of pregnancy, secondary prevention aims at prevention of obstetric complications and tertiary level which aim at prevention of maternal death once complications have occurred (9). The three level delay model developed by Thaddeus and Maine is concerned with tertiary prevention. It is used to identify factors that affect the

interval between the onset of obstetrics complications and its outcome, where if prompt, adequate treatment is provided, the outcome will usually be satisfactory. In this situation, the outcome is mostly affected by delayed treatment. There are three main factors which delay access to effective interventions to prevent maternal mortality as explained in the three level delay model. The first delay is making the decision to seek care because of failure to recognize complications. The second is a delay in reaching care, due to poor roads and geographical barriers and the last is a delay in receiving care in health facilities. The later is associated with inadequate facilities, supplies, poor training, demotivated staff and lack of finance. Interventions to reduce maternal mortality must address each of the three delays in order to have the greatest effect (10).

There are different methods which can be used in the estimation of maternal mortality ratio. This include use of vital registration, in places with good vital event registration system, population based data either census and survey which uses reproductive age mortality survey, sister hood method and household death methods (2). The other way is of using health service data as hospitals generally do collect data on maternal deaths, and then in depth investigation of the causes and circumstances surrounding a maternal death at a health facility is done. This kind of review is also concerned with identifying a combination of factors at the facility and community and sort out which ones are avoidable (11).

LITERATURE REVIEW

At the global level, maternal mortality has been reported to be decreasing at an average of 1.3% annually between 1990 and 2008. This is far lower than the 5.5% annual decline recommended by the World Health Organization (12). Hemorrhage together with hypertensive disorders account for the largest proportion of maternal deaths in the world. The distribution of cause of maternal deaths varies by geographical regions. Hemorrhage for example, is the leading cause of maternal mortality in low resource countries particularly in Africa accounting for 34% of maternal deaths. In Latin America and Caribbean, the leading causes are hypertensive disorders causing 26% of maternal deaths. In high resource countries, the most important causes of maternal deaths are other direct causes. These include complications during interventions such as caesarian section and anesthesia followed by hypertensive disorders and embolisms. In these settings hemorrhage and sepsis are uncommon (1).

Sub Saharan Africa with only 20% of world child birth, has about half of the global maternal mortality (13). The life time risk of maternal death is 1 in 31. The main causes of maternal death in Sub Saharan Africa are haemorrhage (34%), infection (10%), eclampsia (9%) and obstruction during birth (4%). The indirect causes, although are not complications relating to the birth itself, become worse over the course of pregnancy and cause 20% of deaths in Sub Saharan Africa (14).

With the increase in prevalence of HIV/AIDS infection in Africa, there has been change in the pattern of causes of maternal deaths. In places where direct obstetric conditions were major causes of maternal deaths, HIV/AIDS related complications now account for the majority of maternal deaths. A study in South Africa showed that the proportion of maternal deaths due to HIV increased from 23% in 1998 to 31% in 2001, and is by far the leading cause of maternal deaths in South Africa (15). Another study in Rio De Jenairo Brazil, revealed that most of the indirect obstetric maternal deaths were mainly related to HIV/AIDS (16). In sub Saharan Africa 9% of all maternal deaths were found to be due to HIV/AIDS (17).

From Muhimbili National Hospital (MNH) obstetrics data base unit, HIV/AIDS related maternal deaths have been increasing. A study done in mid 1990, in Dar es salaam revealed that, AIDS and related diseases was the leading cause of death in women of reproductive age group (18). The TDHS also stated that, slow progress in reducing maternal deaths in Tanzania mainland is compounded by the impact of HIV/AIDS (7). Despite this, a study done in MNH did not report any impact of HIV AIDS on maternal mortality. This could be explained by the fact that the study was mostly based on the direct causes of maternal mortality.

Most of the maternal deaths occur due to avoidable factors. A study done on Maternal mortality in Ilala district in Dar es salaam found that three quarters of the women dying as a result of pregnancy had been seen by health care provider died in a health facility. The study further explained that poor management has been shown to increase maternal mortality. Quality of care was adversely affected by lack of supplies. Blood and drugs were not available in the majority of cases with suboptimal care (19). This was similar to other study findings done in rural Gambia, on access to emergency obstetric care. It was found that delay in providing prompt and adequate care, lack of blood, basic medical supplies and poor management of staff particularly doctors were mentioned as factors contributing to poor care (8). Another hospital based study done in Enugu Nigeria on avoidable maternal mortality, found MMR of 2397.3 per 100,000. Major avoidable factors were substandard care (27.7%), delay in seeking care (19.1%), financial constraints (8.4%), delay in recognizing problem (6.4%), lack of blood (4.3%), lack of drugs (2.1%) and no major avoidable factors were identified in 29.8% (20).

The problem of maternal mortality can be successfully approached by low cost interventions aiming at identifying avoidable issues and focusing on locally available solutions. An interventional study done on reducing maternal mortality in Kigoma showed that MMR fell from 933 to 186 over the period of seven years following intervention program based on avoidable factors. Some of the avoidable factors addressed include malfunctioning of theatre equipments, shortage of water due to the absence of a reserve water tank, staff attitudes, patient’s attitudes, unavailability of essential drugs and blood (21).

There are different preventive steps that can be adopted to decrease maternal mortality. In multicentre studies done in Malawi, India and United Kingdom to make every mother count. The studies showed that preventive steps for reducing maternal mortality include promoting family planning, antenatal care, skilled attendance at birth and improving of emergency obstetric care (22). Maternal mortality can be halved in developing countries every seven to ten years. This is affordable regardless of income level and economic growth rate. A steady, modest investment in poverty reduction and in maternal health services to improve access and quality of emergency obstetric care are required (23).

In MNH, eclampsia was the leading cause of maternal death followed by postpartum hemorrhage with 23.5% and 23.3% respectively (24). This was different from a retrospective study on maternal death audit in Benin referral hospitals, where direct obstetric causes accounted for most causes of death (74%). In this study maternal deaths were caused by bleeding (32.2%), infections (32.6%), hypertensive diseases (21.1%) and obstructed labour (10.5%) (25).

It is estimated that abortion complications contribute about 20% of maternal deaths worldwide (2)]. In every 8 minutes a woman in a developing country will die of complications arising from an unsafe abortion (26). Unsafe abortion is one of the leading causes of maternal mortality with 13% worldwide (1). In developing countries 55% of all abortions are unsafe (26). In Tanzania, induced abortion is illegal except when there is a medical indication, hence the actual magnitude of the problems is not known. A study done in Hai district, Kilimanjaro, reported that nearly a quarter of maternal deaths are related to unsafe abortion (27).

Maternal mortality is extremely high during labour, delivery and within 48 hours after delivery. A study done in Bangladesh showed that, 40% of maternal death from all causes occurred at these times (28). Another study showed that about 60 percent of the maternal deaths occur during child birth and immediate post partum period, with 50% of these deaths occurring within the first 24 hours of delivery (23). In a study in Eritrea, 16 percent of maternal deaths occurred during pregnancy, 48 percent during childbirth and 36 percent

postpartum (29). Hence the period of labour to within 48 hours is very important and requires careful evaluation and monitoring to avoid possible complications that can arise.

Pregnancy is the leading cause of deaths for young women aged 15 through 19. The other group at high risk is that with advanced maternal age of above 35 years (2). This was similar to a study done in Pakistan where most of the maternal deaths occurred in the age group of less than 20 years and those more than 35 years (61%) (30).

STATEMENT OF THE PROBLEM

Sub Saharan Africa with only 20% of the world's child birth, has about half of the global maternal mortality (13). The life time risk of maternal death is 1 in 31 compared to 1 in 4300 in developed countries (1).

An estimated 14,000 women die each year in Tanzania due to labor and pregnancy-related complications and more than a quarter of a million more suffer disabling conditions (1). According to TDHS report of 2010, Tanzania has MMR of 454 per 100,000 live births. This is an improvement compared with MMR of 578 per 100,000 in 2005, but the figure is still high and very far beyond the MDG's 5 target of reducing maternal mortality ratio to 193 per 100,000 lives births by 2015.

Various studies have shown the impact of indirect obstetric causes like HIV/AIDS, malaria, heart diseases and anaemia to be significant causes of maternal mortality. The previous study in MNH was concerned mainly with direct obstetric causes and did not show the effect of HIV/AIDS, Malaria and heart diseases. This previous study also did not include deaths due to abortions, ectopic pregnancies and other disease conditions from gynaecological wards. .

Most of the maternal deaths occur in the health facilities after the mothers have had contact with health personnel due to factors which are avoidable (18). There is a need of identifying the avoidable factors and the actual medical causes contributing to maternal deaths so as to suggest the possible interventions of reducing maternal deaths at Muhimbili National Hospital.

RATIONALE OF THE STUDY

Maternal mortality in Tanzania continues to be unacceptably high. Most of these deaths are preventable with prompt and adequate medical interventions. To reduce maternal mortality effectively in any location, the circumstances under which pregnant women are dying and proportional of those deaths that are avoidable should be known.

The previous study which was done in MNH, concluded that on average MMR was steadily increasing over time, from about 447 to over 560 per 100,000 between 1999 to 2005 (24). However there is no any documented study on identifying avoidable factors for maternal deaths which has been done in Muhimbili National Hospital

By Identifying the avoidable factors, as well as direct and indirect medical causes of maternal mortality from both obstetrics and gynaecology units and by determining the current MMR, will help to establish areas of improvement and this may help in fighting to reduce the maternal mortality in this institution.

Moreover, with two years until 2015, it is essential to monitor progress towards attaining MDG'S 5 of reducing MMR by three quarter. Information obtained in this study will be of use to health care workers, hospital administrators, policy makers and on improving maternal health guidelines on the fight to reduce maternal mortality.

RESEARCH QUESTION

What is the current Maternal Mortality Ratio and what are the avoidable factors contributing to maternal deaths at Muhimbili National Hospital?

Broad Objective

To determine the maternal mortality ratio and identify causes and avoidable factors of maternal deaths at Muhimbili National Hospital in the year 2011.

Specific Objectives

1. To determine the Maternal Mortality Ratio
2. To describe social demographic characteristics of maternal deaths
3. To identify the causes of maternal death
4. To identify the avoidable factors contributing to maternal deaths.

METHODOLOGY

Study Design

This was a retrospective case review of all maternal deaths at MNH.

Study Setting

The study was conducted at Muhimbili National Hospital, Which is the largest referral hospital in Tanzania and teaching hospital for Muhimbili University of Health and Allied Sciences (MUHAS). MNH caters for the population of about 3 Millions Dar es Salaam residents. The population growth rate of the city is 4.3% and birth rate is 4.2%. Muhimbili National Hospital in particular maternity and gynaecology unit receive maternal cases from the three Municipal hospitals in Dar es Salaam namely Amana, Temeke and Mwananyamala and occasionally patients from upcountry.

The study took place in the maternity block where pregnant women above 28 weeks of gestation age having complications, women in labour, postnatal women with and without complications are admitted. Also in gynaecology wards where pregnant women with less than 28 weeks of gestation age are admitted due to abortion complications, ectopic pregnancy and other medical conditions such as malaria, HIV AIDS and anaemia . Maternity block has five postnatal wards, in which postnatal women with sick babies are admitted. There are two labour wards, one with 20 beds and which receives the public patients. The other labour ward is for private patients. The average number of deliveries per day is 20 to 40. There are two operating rooms adjacent to labour ward where about 8 to 12 operative deliveries both emergences and elective are performed each day. There is one postnatal ward where women without complications, who had spontaneous vaginal delivery with normal babies, are kept for 6 to 12 hours observation before discharge. This postnatal ward has a partition where ICU with 8 beds for very sick women such as severe PIH, eclampsia, severe malaria are cared for.

There are two Gynaecological wards, each with capacity of 32 beds. These wards receive patients with gynaecological conditions like ectopic pregnancies and all types of abortion complications.

Health care providers in the maternity unit of Muhimbili National Hospital include consultants, specialists, residents, registrars, intern doctors and nurse midwives. Emergencies are handled by the team on duty were by the patient is seen first by either an intern, registrar or resident on duty then the specialist on duty is informed to come to review the patient. Each day there is a team on duty comprising the above categories.

Muhimbili National Hospital has a maternal mortality review committee which is responsible for reviewing all cases of maternal deaths. The committee has six members comprising of four specialist and two senior nursing officers. The committee meets once every week for reviewing of maternal death. The maternal mortality review form used has three main parts. First part is a summary of social demographic factors, date of death, duration of hospital stay name of referring institution, referral diagnosis and duration of the problem. The second part of the summary consists of past obstetric problems, the history of the index pregnancy and antenatal care history. The third part of the summary is for findings on admission and diagnosis. The last part of the summary has a part of immediate management received by the patient and follow up. Second part of the form is for case analysis, where it is divided into four sections which are for antenatal, intrapartum, intraoperative and postpartum analysis. Third part of the form is for comments from the team.

But because of unknown reasons, there were only fifteen maternal deaths which were reviewed by this hospital committee in the whole year of 2011. Therefore in this study maternal mortality review form aided only in those records which were reviewed.

Data Collection

During the review process, maternal deaths were identified from various sources of the hospital. These included record books of each ward, operating theaters, labour wards together with hospital data base unit. These then were used to trace the case files in the medical records department both in maternity unit and main record department for gynaecological cases. Other case files were found in the admitting wards.

Files from records office, record books of labour wards, postnatal wards, theatres and summaries from data base units were used to collect data. The information for the women who died during their pregnancy and post partum periods in the maternity block and gynaecological wards was obtained. The information obtained included age, education status, parity, marital status, booking status, referral source, referral diagnosis, length of hospital stay, mode of delivery, interventions in the hospital before death and number of live birth.

Avoidable factor was defined as deficiencies in the medical care (process) that may have contributed to death (outcome). For the quality of the study involving avoidable factor, the avoidable factors should be defined, the source of information presented and people responsible for the judgment should be stated (31).

In this study the sources of information of avoidable factors contributing to maternal mortality were medical records and maternal mortality review form. Using these two sources, we were able to pick deficiencies in the medical care that occurred. Two external reviewers (Not working at the hospital) both being the obstetric and gynaecology specialist, were responsible for judgment of avoidable factors influencing death after in depth review of the case file. The final decision of avoidable factor was reached after comparing it with that of the principal investigator who had prior reviewed the case files and recorded the information in the check list. In case of differences a discussion was conducted and consensus reached.

Causes of maternal deaths were obtained from the medical records. The same external reviewers together with the principal investigator were used to identify the cause of deaths. When there was more than one possible cause of deaths, priority was given to the primary cause, judged on the basis of available clinical information, investigations and diagnosis.

Avoidable factor(s) contributing to maternal deaths identified included, patient factors and medical service factors. Patient factors included home delivery while having previous bad obstetric history/event, completely lack of antenatal care visit and insufficient antenatal care visit. Other patient factors include bad compliance to treatment such as refusal to take medications or refusal to undergo surgery. Moreover delay in seeking care such as admission in the hospital while in critical condition like shock, comma, in gasping stage or HIV/AIDS stage four was considered to have experienced a delay in seeking care. Medical service factors included inadequate blood transfusion completely lack of blood, delay in receiving treatment, and lack of medications such as antibiotics in patient who died of sepsis. Other medical service factors included, lack of oxygen, poor management of patients, delayed investigations and delayed diagnosis. In some of the deceased women there were more than one avoidable factors identified.

Data Analysis

Data collected was entered into computer using EPI info version 3.5.1 which allows double entry and validation. Data was transferred to SPSS version 15.0 for analysis and analyzed data has been presented by using tables so as to make the interpretation and discussion of findings meaningful.

Ethical Issues

Ethical clearance was obtained from MUHAS Senate Research and Publication Committee. Permission to conduct the study was obtained from the Executive Director of Muhimbili National Hospital. Patient information remained highly confidential. Patient names were not used. All files were reviewed in the hospital premises by all reviewers. All files were returned to the records department after extracting the required information.

RESULTS

During the reviewed period, there were a total of 10,870 deliveries with 10,057 live births. Among the total deliveries, 74 were unrecorded whether they were live, fresh or macerated still birth. Of all recorded deliveries 3.2% were fresh still births while 3.6%were macerated still births. There were 155 maternal deaths, among these 128 maternal deaths were obstetrics related and 27 maternal deaths were gynaecology related. Maternal mortality ratio was 1541 per 100,000 live births. Case notes files were missing for 14 maternal deaths, ten from obstetrics unit and four from gynaecology unit and therefore out of total maternal deaths which occurred at MNH only 141 case notes files were used for review. In the calculation of maternal mortality ratio, all maternal deaths which occurred in MNH were used. In the other particulars of analysis only the reviewed maternal deaths that is available case notice files, were used.

The outcome of pregnancy of the deceased women, among obstetrics cases 98(69.5%) had already delivered while Undelivered women were 20(14.2%). Gynaecological cases (below 28 weeks of gestation age), 14(9.9%) had an abortion while 9(6.4%) died with their pregnancy in utero.

Table 1: Socio - Demographic and Obstetrical Characteristics of the Deceased Women, (N=141).

Variable	Responses	Frequency	Percent
Age	< 20 yrs	14	9.9
	20-24 yrs	33	23.4
	25-29 yrs	43	30.5
	30-34 yrs	29	20.6
	≥ 35 yrs	22	15.6
Level of education	No education	9	6.4
	Primary	116	82.3
	Secondary	16	11.3
Marital status	single	14	9.9
	married/cohabiting	125	88.7
	divorced	2	1.4
Occupation	House wife	76	53.9
	Petty trader	30	21.3
	Peasants	28	19.9
	Employed	7	5.0
Gravidity	1	46	32.6
	2	31	22.0
	3	27	19.1
	4	20	14.2
	≥5	17	12.1
HIV Status	HIV positive	29	20.6
	HIV negative	72	51.1
	Not recorded	40	28.4

The age range of the deceased women was 17 years to 45 years with the median age of 31 years. Women aged 25-29 years constituted majority (30.5%) of the deceased. Those with less than 20 years and more than 35 years constituted 9.9% and 15.6% respectively.

Majority had primary education while only 6.4% had no education. On marital status, those who were married or cohabiting constituted 88.7% and the majorities were house wives. More than half of maternal deaths were HIV negative and less than a quarter were found to be HIV positive (20.6%), while less than a third of maternal deaths had unrecorded HIV status. Half of the deceased were primiparas and secundiparas.

Table 2: Source of the Referred Patient to MNH, (N=127).

Hospital	Frequency	Percent

Temeke	34	26.8
Amana	34	26.8
Mwananyamala	30	23.6
Bagamoyo	17	13.4
Others	12	9.4

*****Others include: Vijibweni health centre, Kisarawe district hospital, Tumbi hospital, Utete district hospital, Tumaini hospital, Massana hospital, Magomeni health centre, Mkuranga health centre and Lukumi dispensary.

Table 2 shows that 90.1% of the maternal deaths were referred to Muhimbili national hospital. Three-quarters of the referral were from the Dar es Salaam Municipal hospitals (Temeke, Amana and Mwananyamala). There were about 9.9 percent of maternal deaths who were self referral from home and among them 3(2.1%) were attending antenatal clinic in Muhimbili National Hospital.

Table 3: Reason for Referral to Muhimbili National Hospital, (N=127).

Reason for referral	**Frequency**	**Percent**

No blood available	38	29.9
Lack of personnel	34	26.8
Lack of supplies and equipments	33	25.9
For ICU care	14	11.0
Unrecorded	8	6.3

Of the reasons for referral to MNH, Majority were referred due to lack of blood, followed by lack of personnel, lack of supplies and equipments and for intensive care

Table 4: Referral Diagnosis of the Deceased Women, (N=127).

Variable	Frequency	Percent
Anaemia	34	29.1
Eclampsia	20	17.1
Cardiomyopathy	9	7.7
Obstructed labour	8	6.8
Abortion	7	6.0
Pre eclampsia	6	5.1
ARC	6	5.1
Postpartum haemorrhage	5	4.3
Puerperal sepsis	5	4.3
Previous scar	5	4.3
Others*	4	3.6
Unrecorded	12	8.5

*Others: severe malaria, premature labour, placenta praevia, breech presentation

The commonest referral diagnosis was severe anaemia followed by eclampsia.

Table 5: Conditions of Patients on Admissions, (N=141).

Variable	Frequency	Percent
Stable	10	7.1
Sick	54	38.3
Critically ill	44	31.2
Unconscious/Semiconscious	25	17.7
Gasping/Died just on arrival	8	5.7

Table above shows 38.3% were sick, while 31.2% were critically ill and 5.7% were gasping and died just on arrival.

Table 6: Duration of Hospital Stay at MNH, (N=141).

Duration (hours)	Frequency	Percent
≤24 hours	72	51.1
25-48 hours	16	11.3
49-72 hours	8	5.7
>72 hours	45	31.9

More than half of maternal deaths occurred during the first twenty four hours of admissions. One third stayed for more than three days while 5.7% had duration of hospital of 49-72 hours since admission.

Table 7: Causes of Maternal Deaths at MNH, (N=141).

Variable	Responses	Frequency	Percent
Direct causes	Eclampsia / pre eclampsia	28	19.9
	Postpartum haemorrhage	21	14.9
	Abortion complications	14	9.9
	Sepsis	13	9.2
	Abruptio placenta	9	6.4
	Ruptured uterus	7	5.0
	Obstructed labour	5	3.5
	Placenta previa	1	0.7
Indirect causes	Anaemia	16	11.3
	HIV related	14	9.9
	Heart diseases	8	5.7
	Malaria	4	2.8
	Tuberculosis	1	0.7

Direct causes were identified in 69.5% of the reviewed maternal deaths while 30.5% were identified to be due to causes not directly related to pregnancy. Of the direct causes the eclampsia and severe pre eclampsia constituted the commonest causes of maternal mortality (19.9%), eclampsia accounted for 14.3% and severe pre eclampsia had 5.6% then followed by post partum haemorrhage (14.9%).

Table 8: Avoidable Factors Contributing to Maternal Deaths, (N=141).

Variable	Responses	Frequency	Percent
Patient factors	Delay in seeking care	33	73.3
(n=45)	Lack of antennal care visit	5	11.1
	Bad compliance to treatment	3	6.7
	Insufficient antenatal care visit	2	4.4
	Home delivery with bad event	2	4.4
Medical services	Inadequate blood transfusion	23	26.1
factors	Complete lack of blood	17	19.3
(n=88)	Delay in receiving treatment	16	18.3
	Poor management	15	17.0
	Delayed investigation	9	10.2
	Delayed diagnosis	6	6.8
	Lack of medications	2	2.3
	No avoidable factors	24	17

Avoidable factors were found in 117 cases, which is 83.0% of reviewed maternal deaths. Of the identified factors 33.8% were personal avoidable factors and 66.2% were medical service factors. Delay in seeking care 73.3% was a predominant personal avoidable factor, followed by complete lack of antenatal care (11.1%) and bad compliance to treatment (6.7%). Of the medical service factors common factors were inadequate blood transfusion 26.1% followed by completely no transfusion due to lack of blood (19.3), delay in receiving treatment (18.3%) and poor or mismanagement (17.0%).

DISCUSSION

Analyses of maternal health data to assess maternal mortality ratio, medical causes of maternal deaths and possible avoidable factors are some of the best gauges of the quality of health care in a particular health facility. It also helps in understanding the improvement resulting from investment in its maternity services (32). This study provides important information about maternal mortality in Tanzania's largest tertiary hospital during the year 2011.By conducting a review of records in a large tertiary referral hospital with high risk of obstetrics complications. It was possible to measure the annual ratio for maternal mortality, describe characteristics of maternal deaths, identify the medical causes of maternal deaths and sort out the preventable factors that possibly resulted to maternal deaths.

In this study maternal mortality ratio was found to be 1541 per 100,000 live births which is three times higher the National estimate of 454 per 100,000 live births (7). The high MMR may be it is because of institutional based MMR are considered high than community rates, due to high risk status and complicated cases of mother delivering in the hospital (33). The findings are comparable to the other facility based study done in Karachi, Pakistan where MMR was found to be 1650 (34). Other facility based studies have also reported to have high maternal mortality ratio and they include Ambo hospital in Ethiopia where MMR was found to be 1852 (35) and in Irrua specialist teaching hospital, Nigeria where MMR was 1747 (36). The high Maternal mortality ratio in MNH might among others, be as a result of increased in referrals and pulling of high risk cases from Dar es salaam district hospitals. However this may imply that the overall quality of maternal care in this hospital is poor and the present strategies to make pregnancy safer are yet to achieve the desired changes.

Majority of the maternal deaths occurred in the age group of 20-34 years in more than 70%. The age between 25-29 years formed the large group of women who deceased; this was similar to a study done in Zubeyde Hanim in Turkey (36) where women of the same age group formed the largest group of the deceased women. This may be because of majority of women deliver at this particular age group, but does not show the high MMR as this is not the age specific mortality ratio.

Women with primary education were the prominent group with 82.3% while those with no education were only 6.4%, this showed majority had low formal education and only very few were illiterate. This was different from studies done in Pakistan and Nigeria were majority of maternal deaths had no education (30,37). This may be due to different in literancy level of these societies.

Majority of women who died were primigravida forming about one third while grand multigravida were few. Other study has shown an association between gravidity and MMR, a study done in maternity unit of Jos University teaching hospital, Nigeria on factors contributing to maternal mortality, has shown an association (37). This may reflect the possibility of poor antenatal care and unfortunate birth preparedness and complication redness in this group.

Regarding the outcome of pregnancy, more than two third of the deceased women had delivered. These findings suggest that may be there is a need of improving post natal care monitoring and prolong the duration of hospital stay after delivery to twenty four hours instead of six to twelve hours currently used. However there were about 14.2% of deceased women who had gestational age of twenty eight or more who died undelivered. This was comparable to a study done in maternity unity of Jos university teaching hospital, in Nigeria were a comparable proportional of women who died of maternal death were undelivered and accounted for 21.3% (37). This might reflect the possibility of poor emergency obstetrics care provided by the facility resulting in deaths of undelivered women.

Of the maternal deaths at the hospital, more than 90% were referred admissions from various hospitals, health centres and dispensaries. Dar es Salaam municipals hospitals referred two third of the deceased, lack of blood, personnel, lack of supplies and equipments were found to be the main reasons for referral from these municipal hospitals. This question on the proper function of comprehensive emergence obstetrics care in these facilities. This may also suggest the possibility of delay in reporting by the patients to these hospitals. While there are a number of areas that could be followed up, some important key points are noted here, there is a need to improve hospital referral policies. Review of clinical guidelines and management protocols for

at risk mothers at these district hospitals is important. There is also a need of improving knowledge of staff handling these obstetrics emergencies to ensure proper management of complications that can occur in pregnancy.

This study showed that more than half of maternal death occurred within the first twenty four hours of admission to Muhimbili National Hospital. This was similar to studies done in Bangladesh and Nepal, with similar findings (28,38). The findings were also similar to facility based prospective review of maternal deaths in Jos Nigeria were 57.1% of death occurred within the first twenty four hours (39). This reflects the possibility of late referral of these patients to MNH as more than half at the time of admission were either critically ill, unconscious/ semiconscious or in gasping stage. This may reflect poor quality of services in these referring centres. This may also suggest the possibility of delay in reporting by these patients to the referring centre once have complications at home

Direct causes of maternal deaths in our study accounted for about two third of maternal deaths while indirect causes were found in about one third, (31.5%) of the maternal deaths. Possibly reflecting delay in seeking care, delay in referral, delay in receiving treatment while already in hospital, poor diagnosis and treatment of disease that developed during pregnancy. These findings were similar to other study done in Nepal (38).

Of the direct causes in our study the hypertensive disease of pregnancy was the leading cause of maternal deaths with 19.9% of maternal deaths. Eclampsia had 14.3% and 5.6% been due to severe pre eclampsia. There is overall decrease in mortality due to eclampsia, pre eclampsia when compared to previous study in the same institution (24). However these findings were similar to other study done in Nigeria and Kenya, were the main cause of deaths was due to hypertensive disorder of pregnancy (32,40). A study in India on maternal autopsy and other multicentre study in West African countries tertiary hospitals the hypertensive disorders of pregnancy were the leading cause of maternal deaths (41,42). It reflects the possibility of inadequate or poor antenatal care delivery in the peripheral health centres as this is important in early detection and management of hypertension in pregnancy. This may also suggest either late reporting by the patients or inadequate supportive therapy in these referring centres.

Postpartum hemorrhage was the second most common cause of maternal mortality in Muhimbili National Hospital; this however was similar to a previous study in the same institution (24). This was similar to some other studies done in sub-Saharan Africa where post partum hemorrhage was among the leading cause of maternal mortality (42,43). The absence of blood in the hospital as well as inadequate blood transfusion as seen in this study may have contributed to some of these deaths.

Abortion complications had about 9.9% of maternal deaths and were the leading gynaecological deaths. The contribution of abortion complications to overall maternal deaths concurs to other study which was done in Jos university teaching hospital, Nigeria were 8.7% (39) was due to abortion. Study in Hai district, Kilimanjaro reported unsafe abortion contributing to about a quarter of maternal deaths (27). There is a need of sticking on the components of postabortal care which include resuscitation to stabilize the patient, treatment of complications, counseling and follow up and linking between postabortal emergency services and reproductive health care.

The other direct causes of maternal deaths in Muhimbili National Hospital were sepsis, Ante partum hemorrhage, ruptured uterus and obstructed labour. These were similar to findings in other study in Sub Saharan Africa with same trends (42, 44). This shows the similar conditions found elsewhere in Sub-Saharan Africa are similar to those killing the pregnant women in MNH.

Of indirect causes of maternal deaths, severe anaemia was the major cause of deaths. Anaemia is highly prevalent in Africa, with up to three fifths of pregnant women having some degree of anaemia and approximately one third classified as having severe anaemia (45,46). Anaemia is common in Dar es Salaam (46). Women do enter pregnancy in a state of nutritutional deficit and therefore are unprepared to cope with extra physiological demands of pregnancy. Studies done has shown anaemia to be underlying risk factor for maternal mortality (47,48). Furthermore anaemia in pregnant reduces woman's ability to survive bleeding during and after child births. There is a need of improving nutrition to non pregnant mothers before conception.

Pregnant mothers should be counseled to adhere on haematenics use so as to avoid the likely complications during pregnancy.

The contribution of HIV/AIDS related deaths to indirect causes of maternal mortality in this study was 9.9%. The opportunistic infection such as pneumonia and tuberculosis do progress faster in immunosupressed pregnant women resulting to maternal deaths (37). In this study HIV/AIDS related complications has shown the great impact to maternal deaths, and was similar to a study which was done in South Africa, which showed that proportional of maternal deaths due to HIV/AIDS increased to 31% and was so far the leading cause of maternal deaths in South Africa (15). However a similar study in Rio De Jenairo Brazil has shown large contribution of maternal deaths to be due to HIV related causes (16). Then the ongoing campaign on prevention of HIV AIDS may play a role in the reduction of maternal deaths associated with this calamity.

This study provided a baseline of avoidable factors of maternal deaths at Muhimbili National Hospital. Many of the maternal deaths in this study were associated with avoidable factors. Patient factors accounted for about one third of factors identified, The findings found in this study were similar to other studies done in sub Saharan (8,20)]. Reflecting the possibility of importance of interventions of the first two delay components, of recognizing complications and making decision to seek medical attention and also delay in reaching care due to poor infrastructure.

Medical service factors had more than two third of factors identified. These included administrative factors such as inadequate blood transfusion and completely lack of blood. Even though the country's ministry of health has established zonal blood banking and all hospitals are taking blood from nearby zonal branch, but in this study we found shortage of blood both in MNH and in referring centres. There is a need of intervention to insure adequate and constant supply of blood to these hospitals. Other medical service factors include, delay in receiving treatment (poor management delayed investigation delayed diagnosis and lack of medication. These findings were similar to other studies done in Sub Saharan Africa. studies done in Tanzania have shown similar factors to be contributing to maternal deaths (21,19).

Other health facility based maternal deaths audit in Tigra, Ethiopia (49) and Central part of Malawi (50), has shown a similar trends with different magnitude. This implies that women are still dying of the previous known preventable factors and maybe there are no enough efforts made to address these challenges facing the health provision to the pregnant mothers.

This study had some limitation which included, availability of all case files was not possible and in those available some had incomplete documentation. Thou we tried to obtain missing information in many ways as possible like using record books of each ward and obstetrics data base but lack of a standard way of maintaining medical records posed a challenge. This was similar to a study done in Ethiopia were maternal deaths was found not properly documented with many missing information (49). It is absolutely important to have detailed medical records so as to provide proper care and follow progress more effectively hence calling for proper storage as well documentation of case files at MNH and proper writing of referral notices at referring centres.

Other study limitations include maternal deaths review forms were only available in fifteen out of 141 case notes. Hence in the review of maternal deaths forms aided only in few cases but were not used in the majority of reviewed case notice as they were unavailable. Maternal deaths occurring in other wards other than the maternity wards and gynaecology wards could have been missed, but we tried to avoid this by compiling the list of all maternal deaths in MNH and all possible sources were accessed.

This study although undertaken from a hospital viewpoint, the work contributes more generally to understanding some of the reasons for Tanzania's lack of progress towards achieving millennium development goal number 5 targeted by 2015, were the maternal mortality will be expected to have decreased by 75%.

CONCLUSIONS

Maternal mortality ratio at Muhimbili National Hospital is high. The direct causes accounted for more than two third and the most common were the hypertensive disorder of pregnancy the eclampsia/pre eclampsia and post partum hemorrhage. The common indirect causes were anaemia and HIV/AIDS.

More than half of maternal deaths occurred within twenty four hours of admission. More than two third of all referral cases were from Dar es salaam district hospitals and the main reasons for referral were for blood transfusion and for expert management.

Most maternal deaths occurred due to avoidable factors, with medical service factors contributing to large percentage when compared to personal factors.

RECOMMENDATIONS

There is a need of improving management of life threatening condition, both in the referring centre and in Muhimbili National Hospital.

Improvement in blood banking and transfusion services as well as stocking the health facilities with sufficient equipment and supplies.

The maternal mortality committee of the MNH has to continue reviewing maternal deaths regulary and the review should be used to improve the delivery of quality management of the cases.

Further research is recommended in order to understand community level factors associated with maternal mortality in Dar es salaam. Also a prospective audit of the maternal deaths and nearmisses involving interviews with patients and their relatives and the staff involved in management is recommended as this will provide more information on the avoidable factors.

Adhere to management protocols in the wards on the management of life threatening conditions such as eclampsia and post partum hemorrhage as this may help reduce maternal mortality.

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APPENDICES

Appendix i: Check List for Data Collection

1. Case Number: | | | | | | | | | | |
2. Age: | | |
3. Parity: | | |
4. Gravida: | | |
5. Gestational age | |
6. Marital status
    a. Married
    b. Single
    c. Divorced
    d. Cohabiting
    e. Other (specify)……
7. Date of admission: | | | | | | | | Time of admission: | | | | |
8. Date of death | | | | | | | | Time of death: | | | | |
9. Duration of hospital stay ……
10. Education:
    a. Informal education
    b. Primary education
    c. Secondary education
    d. College education
11. Occupation ……
12. Referral from:
    a. Temeke District Hospital
    b. Mwananyamala District Hospital
    c. Amana District Hospital
    d. Other (Specify): ……

13. Reason(s) for referral ……

14. Condition during deaths

a.Antenatal

b.Intrapartum

c.Postpartum

d.abortion

c.undelivered

15. Condition on admission

a. Stable
b. Unconscious/semiconscious
c. sick
d. Died just on arrival
e. Other-specify……..

16. Antenatal history:

a. Did not receive antenatal care
b. Received (Specify number of visits): ……
c. Risk factor identified ……
d. HIV status …….

17. If received ANC in 16b above was it in

a. First trimester

b. Second trimester

c.Third trimester

18. Went into labour

a. Yes
b. No
    i. Fetal heart rate still present
    ii. Fetal heart rate absent

19. Was she induced

    1. Yes 2. No

20. Mode of delivery

    1. Emergency caesarian section
    2. Spontaneous Vaginal Delivery
    3. Instrumental vaginal delivery such as craniotomy/ decapitation
    4. Undelivered

21. Delivery history

    i. Partograph used
        a. Yes
        b. No
    ii. Alert line crossed
        a. Yes
        b. No
    iii. Action line crossed
        a. Yes
        b. No
    iv. When where the membrane ruptured?
        a. Before onset of labour
        b. After onset of labour with cervical dilatation of or ≥3cm
        c. After onset of labour with cervical dilatation of <3cm
    v. Was oxtocin aurgumentation used?
        a. Yes
        b. No
    vi. Indication for c/s (specify) ……

22. Causes of death
    a. Direct causes
        i. Ante partum hemorrhage(specify eg placenta praevia or abruption placenta)
        ii. Postpartum hemorrhage (specify) eg atony or retained products
        iii. Sepsis (specify) if due to obstetric sepsis or non obstetric sepsis
        iv. Obstructed labour
        v. Pre-eclampsia/ eclampsia
        vi. Ruptured uterus
        vii. Ectopic pregnancy
        viii. Abortion
        ix. anaesthesia
        x. Other (Specify): ……
    b. Indirect causes
        i. Anaemia
        ii. HIV-related
        iii. Heart diseases
        iv. Malaria
        v. Tuberculosis
        vi. Other (Specify): ……..
23. Interventions before death:
    a. Evacuation
    b. Hysterectomy
        i. Sub Total Abdominal Hysterectomy
        ii. Total Abdominal Hysterectomy
    c. Blood transfusion (specify number of units)…….
    d. Manual removal of placental
    e. Magnesium sulphate
    f. Other (Specify)……

24. Avoidable factor(s) contributing to death identified

i. Patient factors
   a. Home delivery while having previous bad obstetric history/event
   b. Lack of antenatal care visit
   c. Bad compliance to treatment such as refusal to take medications or refusal to undergo surgery
   d. Delay in seeking care
   e. Insufficient antenatal care visit

ii. Medical service factors
   a. Lack of blood
   b. Delay in receiving treatment
   c. Inadequate blood transfusion
   d. Lack of medications such as magnesium sulphate for patient with pre eclampsia/ eclampsia or antibiotics in patient died of sepsis
   e. Lack of oxygen
   f. Poor management such as inadequate restitutions (stabilization) before surgery
   g. Delayed diagnosis
   h. Delayed investigation

iii. Others ……