FACTORS ASSOCIATED WITH MATERNAL MORTALITY AMONG WOMEN ADMITTED IN MATERNITY WARDS AT MNAZI MMOJA HOSPITAL - ZANZIBAR.

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By

DUA SULEIMAN MUSSA

A dissertation Submitted in (partial) Fulfillments of the Requirements of the Degree of Master of Science (Midwifery and Women' Health) of

Muhimbili University of Health and Allied Sciences

October, 2017

CERTIFICATION

The undersigned certify that she has read and hereby for acceptance by the Muhimbili University of Health and Allied Sciences a dissertation entitled: ***"Factors Associated with maternal mortality among women admitted in Maternity wards at Mnazi Mmoja hospital – Zanzibar****," i*n partial fulfillment of the requirements for the degree of Master of Science (Midwifery and Women's Health) of Muhimbili University of Health and Allied Sciences.

……..

Dr. Sebalda Leshabari (PhD, RN)

(Supervisor)

Date: ……..

DECLARATION AND COPYRIGHT

I, **Dua Suleiman Mussa**, 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……

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DEDICATION

I dedicate this report to my beloved farther, the deceased Mr. Suleiman Mussa Suleiman for his lovely care and good education foundation. May God's forgiveness and blessing be upon him.

Secondly, I dedicate this report to my son Mukhtar Khamis Juma who was very young, just approaching his second birthday, when I registered this course.

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First, I would like to express my thanks to God who has been the greatest helper, giving me good health and security which enables me to accomplish this study. My special thanks should go to my supervisor Dr, Sebalda Leshabari for her supervision, methodological assistance and direction from the designing phase of proposal to the final write up of this report. Her support towards the completion of this report are valued.

Secondly, I would like to thank staffs in the Department of Obstetrics and Gynecology of Mnazi Mmoja Hospital and Maternity block in Zanzibar for their valuable support, especialy during field work.

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ABSTRACT

Background: Improving Good Health and Well-being is the third goal among seventeen Sustainable Development goals (SDG) of 2015. The target of these sustainable development goals is to reduce global maternal mortality ratio to less than 70 per 100,000 live births, with no single country having a maternal mortality rate (MMR) greater than 140/100,000 by 2030**.** Most of maternal deaths are preventable. Zanzibar like other East African countries is experiencing preventable maternal mortality.

Aim: The objective of this study was to determine the factors associated with maternal mortality among women admitted in Maternity wards at Mnazi Mmoja Hospital in Zanzibar.

Methodology: A descriptive retrospective design which employs quantitative approach was utilized. The study was conducted from April to May 2017 involving women admitted at Maternity wards from August 2015 to March 2017 at Mnazi Mmoja hospital. Systematic random sampling was used to select patients' files of women admitted in Maternity Wards at Mnazi Mmoja Hospital. Data abstraction form was used to collect information from women's files. Institutional factors (referral status, mode of delivery and birth attendants) and maternal factors (antenatal attendance, conditions of women during admission, gestational age of women during birth, parity, underlying medical and surgical conditions, age and obstetric factors) were extracted. Data were analyzed using Statistical Package for Social Science (SPSS) version 20. Chi square analyses were employed to determine the existence of a relationship between the variables. Multivariate binary logistic regression analysis was used to measure the magnitude of association with prediction of each factor towards maternal mortality**.**

Results: The proportion of maternal mortality among studied population were 24 (6.2%), N =384. The Chi square results show that; six factors were statistically significantly associated with maternal mortality, these included; Parity (p =0.041), obstetric factors (p =0.000), gestational age during birth (p =0.003), conditions of women's during admission (0.000), pre-existing health conditions (p =0.000) and birth

attendants (0.036). However, in logistic regression, the results revealed that puerperal sepsis had significantly higher risk of deaths as compared to other obstetric factors (OR = 248.95, p value 0.004 with 95% CI from 5.850-10595.03) .Post- partum hemorrhage were twenty times more likely to cause maternal deaths as compared to other obstetric factors (OR =20.112, p value 0.003 with 95% CI from 2.731-149.594). Severe pre-eclampsia were six times more likely to cause maternal deaths as compared to other obstetric factors (OR = 6.744, p value = 0.040 with 95% C.I from 1.092-41.653).

Conclusion:

The findings of this study show that most mothers are dying due to preventable conditions. These findings are alarming and more efforts need to be focused in improving such conditions to cut-down the number of maternal deaths in Zanzibar by strengthening ante natal and post natal clinics. Immediate intervention is required to archive the SDG 2030, and to end with reduce preventable maternal mortality.

Recommendations: Most of these conditions are preventable by early detection during antenatal care. Antenatal and postnatal care could provide opportunities for the detection of risk factors for severe pre-eclampsia, postpartum hemorrhage and puerperal sepsis that may put women at risk during birth and puerperal period. There is a need to focus on intergraded care throughout pregnancy and child birth.

TABLE OF CONTENTS

CERTIFICATION iii
DECLARATION AND COPYRIGHT iv
DEDICATION v
ACKNOWLEDGMENT vi
ABSTRACT vii
LIST OF TABLES xii
LIST OF FIGURES xiii
CHAPTER ONE 1
1.0 INTRODUCTION 1
1.1 Background 1
1.2 Problem statement 3
1.3 Significance of the study 4
1.4 Research questions 4
1.5 Study Objectives 5
1.5.1 Broad objective 5
1.5.2 Specific objectives 5
1.6 Variables 5
CHAPTER: TWO 8
2.0 LITERATURE REVIEW 8
2.1 Maternal factors associated with maternal mortality 8
2.2. Institutional factors associated with maternal mortality 10
CHAPTER: THREE 12
3.0 METHODOLOGY 12
3.1 Study design 12
3.2 Study setting 12
3.3 Study population 13
3.4 Inclusion criteria 13
3.5 Exclusion criteria 13
3.6 Sample size. 14
3.7. Sample size formula. 14
3.9 Pilot Study 14

3.10 Validity 15
3.11 Reliability 15
3.12. Research assistant recruitment 15
3.13 Data collection method and Tool 15
3.14. Data management & data control 16
3.15 Data Analysis 16
3.16 Logistic Regression Model (LRM) 17
3.18 Dissemination Plan 17
CHAPTER FOUR 18
FINDINGS AND DATA PRESENTATION 18
4.0 Introduction 18
4.1Social demographic characteristics of the participants 18
4.2 The proportion of maternal status after delivery 19
4.3 Factors Associated With Maternal Mortality 20
4.3.1 Maternal factors associated with maternal mortality. 20
4.3.2 Antenatal visits 22
4.3.3. Parity and co-morbidities 22
4.3.4 Conditions of women during Admission 23
4.4 Institution Associated Factors 23
4.4.3 Mode of Delivery of Women during Child Birth 24
4.5 Factors associated with maternal mortality 25
4.5.1. Parity 25
4.5.2 Obstetric factors 25
4.5.3 Pre-existing health conditions 25
4.5.4 Conditions of women during admission 27
4.5.5 Gestational age at birth 27
4.6. Institution factors 27
4.8 Multivariate logistic regression findings 29
CHAPTER FIVE 31
DISCUSSION 31

5.0 Introduction 31
5.1 Discussion 31
5.1.1 Maternal associated factors associated with maternal mortality 31
5.1.3 Proportion of maternal mortality 34
5.3 Study limitations and mitigation 34
CONCLUSION 35
REFERENCES 37
APPENDIX A: APPROVAL ETHICAL CLEARANCE 42
APPENDIX B: ETHICAL CLEARANCE LETTER 43
APPENDIX: C PERMISSION LETTER 44
APPENDIX: D1 DATA ABSTRACTION FORM: ENGLISH VERSION 45
KIAMBATISHO: D2 FOMU YA KUKUSANYIA TAARIFA: TOLEO LA KISWAHILI 48

LIST OF TABLES

Table: 1 Demographic characteristics of the study participants……...19
Table: 2 Obstetric factors and Reproductive Characteristics of the participants…….21
Table: 3 Parity and co-morbidities of the study participants……22
Table: 4 Institution Associated Factors (referral status and skilled attendants)…...……24
Table: 5 Association between maternal factors and maternal mortality……..26
Table: 6 Association between maternal factors and maternal mortality……...…...28
Table 7: logistic regression of maternal factors correlated with maternal mortality……...30

LIST OF FIGURES

Figure 1:Conceptual framework on factors associated to maternal mortality……7
Figure 2: Proportion of women status after delivery……20
Figure 3: Antenatal visits…….....22
Figure 4: Conditions of women during admission…….…..…23
Figure 5: Mode of Delivery of Women during Child Birth ……..….24

ABBREVIATIONS

ANC	Ante Natal Clinic
HIMS	Health Information Management System
MDA	Maternal Death Audit
MDSR	Maternal Death Surveillance and Response
MMEIG	Maternal Mortality Estimation Inter-Agency Group
MMH	Mnazi Mmoja Hospital
MMR	Maternal Mortality Rate
MoHCDGEC	Ministry of Health Community Development, Gender, Elderly and Children
MoHZ	Ministry of Health Zanzibar
MPDR	Maternal and Perinatal Death Review
MTUHA	Mfumo wa Taarifa za Uendeshaji wa Huduma za Afya
MUHAS	Muhimbili University of Health and Allied Sciences
ORs	Odds Ratios
PPH	Post-Partum Hemorrhage
SDGs	Sustainable Development Goals
SPSS	Statistical Package for Social Sciences
TDHS	Tanzania Demographic Health Survey
TPHC	Tanzania Population and Housing Census
UNFPA	United Nations Populations Fund
UNICEF	United Nations Children Fund
WHO	World Health Organization
ZHIMS	Zanzibar Health Information Management System
χ^2	Pearson Chi-square

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background

Maternal death is the death of a woman during pregnancy or within 42 days of termination of pregnancy, irrespective of the duration and site of pregnancy, from any cause related to or aggravated by pregnancy or its management but not from accidental or incidental causes (WHO, 2013). Over the years, maternal mortality has been a targeted data point among the major public health problems in developing countries. The data indicate that both maternal and neonatal morbidity and mortality continued to be major problems worldwide especially in developing countries despite efforts to reverse the trends. The health of women and children is vital to creating a healthy world. Despite great progress, there are still too many mothers and children dying, mostly from causes that could be prevented. Around the world, many women die as a result of pregnancy and child birth (WHO & UNICEF, 2014).

Globally, each year more than 303,000 women die and every day approximately 830 women die from preventable causes related to pregnancy and child birth. Almost all maternal deaths (99%) occur in developing countries. More than half of these deaths occur in Sub-Saharan Africa with a reported maternal mortality ratio of 239 per 100,000 live births. Another one third of maternal deaths occur in South Asia (WHO, 2016). Unfortunately, the maternal health situation in Tanzania mainland and Zanzibar is similar to other Sub-Saharan countries. In Tanzania, the maternal mortality rate now is alarming as the trends have increased from 454/100,000 live births in 2010 to 556 /100,000 in (TDHS, 2015-2016). In Tanzania, each year almost 7,900 mothers die due to childbirth and pregnancy related complications which can be prevented (Alkema et al., 2016). According to WHO, Tanzania is among the ten countries leading in maternal mortality and is slow in reducing the trend. In Zanzibar, the maternal mortality ratio (MMR) relatively declined between 2011 and 2014 from 279/100,000 to 187/100,000 live births (MoHZ, 2014). While this is a reduction of 0.092%, Zanzibar still remains far from the targeted figures. The Sustainable Development goal number three (Good

Health and Well-being) targeted that by 2030 the Global maternal mortality ratio should be reduced to less than 70 per 100,000 live births, with no single country having MMR greater than 140/100,000 (WHO &UNICEF ,2014).

Most maternal deaths in Zanzibar occur after the mothers have arrived in health care facilities. This means that these mothers are more likely to survive if appropriate and adequate interventions could have been provided in the facilities. MMH is one of the hospitals which adopted the WHO recommendations of 2013. Each maternal death is discussed by maternal death committee members who then identify the cases, collect information, analyze the results, formulate recommendations and initiate the interventions to solve identified problems. In such audit, the committee determines the cause of death, contributing factors to death and any other preventable factors and recommends how to improve professional practices and services provided which could prevent another maternal death with similar preventable cause hence reduce maternal mortality. Although, MMH implement maternal death surveillance and response (MDSR), in Zanzibar still very few health facilities conduct MDSR.

1.2 Problem statement

The high maternal mortality ratio (MMR) of 556/100, 000 live births in Tanzania have been noted with great concern (TDHS, 2015-2016). This figure is still alarming and remains far from the targeted figures. The Sustainable Development goal number three (Good Health and Well-being) targeted that by 2030 the Global maternal mortality ratio should be reduced to less than 70 per 100,000 live births with no single country having MMR greater than 140/100,000 (WHO &UNICEF ,2014).

In Zanzibar MMR is 187/100,000 (MoHZ, 2014). Mnazi Mmoja Hospital is one of the hospitals in Zanzibar that has been implementing maternal death audit since early 2015. However, maternal deaths occurring with recurrent causes in MMH remains a big challenge and by mid-2016 the hospital had reported 64 maternal mortality cases out of 10,172 live births (MMH, 2016). Hence, specific institution MMR 629/100,000 shows the increasing of mortality cases compared to previous report. In 2014 the hospital registered 37 maternal deaths out of 14,497 live births (MoHZ, 2014). It should be noted that no women should die during pregnancy, when giving birth and during puerperal period. MMH

Despite the provision of free health care services, MMH still report increasing preventable mortality cases related to pregnancy and child birth among pregnant women. These have potential and long term consequences. The death of a woman in pregnancy or child birth has stressful economic, family and social effects. Studies have shown that, when a woman experience a maternal death there is increased risk of mortality among children whose mothers had died related to pregnancy and child birth and decreased nutrition on surviving children (Moucheraud et al, 2015). In addition, studies also reported that families may face economic insecurity especially if deceased the primary household manager or poverty and lack of education among older children. Even though such studies have been carried out in other countries but there is currently limited published study in Zanzibar about maternal deaths at MMH which demonstrates the need to examine this existing gap. Therefore, this study aims to investigate associated factors to maternal mortality among women admitted in Maternity Wards at Mnazi Mmoja Hospital.

1.3 Significance of the study

Midwives education

The findings are expected to be useful among midwives in caring women during pregnancy and childbirth.

Midwifery practice

The findings of this study are expected to provide valuable information on factors associated with maternal mortality at MMH and also inform practices that might be adopted to reduce maternal mortality. Specifically, this study is expected to recommend changes to develop professional practices in Zanzibar, especially at MMH with the potential to improve maternal and newborn health.

Policy development

This study is also expected to be used to address gaps identified and inform measures to strengthen health at Ministry levels which influences policymakers at ministry level prioritizing funds, in implementing strategies to reduce maternal deaths. The findings are also expected to provide insights for evidence based health policies and programs aiming to reduce maternal deaths in Zanzibar.

Midwifery research

The results of this study are expected to show gaps which will help further research.

1.4 Research questions

1. What are Institutional factors associated to maternal mortality among women admitted in maternity wards at Mnazi Mmoja Hospital?
2. What are the Maternal factors associated with maternal mortality among women admitted in maternity wards at Mnazi Mmoja Hospital?
3. What are the proportions of maternal mortality among women admitted in maternity wards at Mnazi Mmoja Hospital August 2015-March 2017?

1.5 Study Objectives

1.5.1 Broad objective

Factors associated with maternal mortality among women admitted in maternity wards at Mnazi Mmoja Hospital in Zanzibar.

1.5.2 Specific objectives

1. To determine Institutional factors associated with maternal mortality at Mnazi Mmoja Hospital in Zanzibar.

2. To identify maternal factors associated with maternal mortality at Mnazi Mmoja Hospital in Zanzibar.

3. To determine the proportions of maternal mortality among women admitted in maternity wards at Mnazi Mmoja Hospital August 2015-March 2017?

1.6 Variables

Dependent variable is the variable that depends upon independent variables. In this case, the measure is maternal status after delivery (to be alive or died).

Independent Variables are variables that stand alone and do not change by the other variables. In this study, there are a number of independent variables. There are those which are social demographic characteristic, institution specific variables and others are maternal related variables.

DEFINITIONS OF TERMS

Maternal death is the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of pregnancy, from any cause related to or aggravated by pregnancy or its management but not from accidental or incidental causes (WHO, 2013).

Maternal Death Surveillance and Response (MDSR) is a continuous cycle of identification, notification and review of maternal deaths followed by actions to improve quality of care and prevent future deaths (WHO, 2013).

Maternal mortality ratio is the number of women who die from any cause related to or aggravated by pregnancy or its management (excluding accidental or incidental causes) during pregnancy and child birth or within 42 days of termination of pregnancy, irrespective of the duration and site of the pregnancy per 100,000 live births (WHO,2014).

Operational definitions

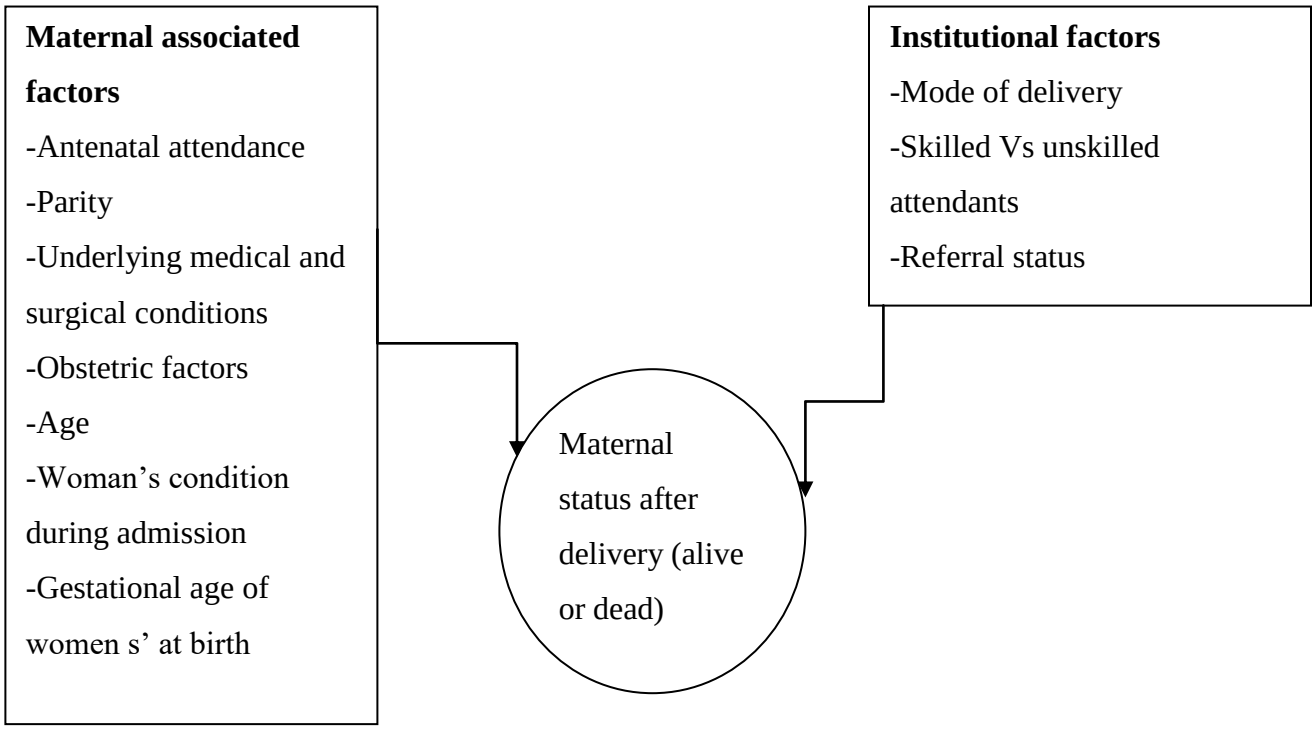
Maternal factors: These are maternal conditions which may rise during pregnancy or child birth and have consequences on pregnancy and pregnancy out come and influence women's maternal deaths.

Institutional factors: These are hospital related situations which in their presence have predisposed maternal deaths.

1.7 Conceptual frame work

The conceptual framework has been developed after getting ideas through reviewing various literatures (McCall et al., 2016, Nair et al., 2015 &Yego et al., 2014). Through those ideas, researcher constructed specific concepts suitable to the setting that was studied. The conceptual framework contains dependent and independent variables. Therefore, institutional (mode of delivery, birth attendants and referral status) and maternal related factors (antenatal attendance, parity, underlying medical and surgical conditions, obstetric factors, age, woman's condition during admission and gestational age of women at birth) were determined in this study to find out if there is association to maternal mortality at MMH. This conceptual model helped in developing research questions and developing data abstraction form. Moreover, this conceptual framework was used in analysis and presentation of the study findings.

Figure 1: Examined Factors associated to maternal mortality



Source: Developed from (McCall et al., 2016, Nair et al., 2015 &Yego et al., 2014).

CHAPTER: TWO

2.0 LITERATURE REVIEW

Determining factors associated with maternal mortality is very important in hospital settings. This is because identification of gaps and recognition of preventable deaths among similar cases can lead to changes that result in reduction of numbers of maternal deaths. The following literature review covers currently known causes of maternal death and factors associated to maternal mortality.

2.1 Maternal factors associated with maternal mortality

A study done in the United Kingdom about factors associated with maternal death from direct pregnancy complications. The study which investigated factors associated with maternal deaths from direct pregnancy complications revealed that six factors were independently associated with maternal death. They are: inadequate use of antenatal care, substance misuse, medical co-morbidities, previous pregnancy problems, hypertensive disorders of pregnancy and Indian ethnicity together; these contributed 70% of the increased population risk to maternal mortality (Nair et al., 2015).

Another study done in India on factors associated with maternal deaths revealed that: delay in use of maternal healthcare services, delays caused by poor health infrastructure, and delays caused by harmful rituals were major contributing factors of maternal deaths (Khan & Pradhan, 2013). Analysis of maternal mortality to determine care and preventable factors in a study done in Pakistan reported that delay in seeking help contributed to more than 80% of maternal deaths followed by no antenatal attendance. Poor education and socio economic standing of women in Pakistan was a contributing factor (Begum& Aziz-un-Nisa, 2003). Delay is a recurrent finding in studies on maternal mortality.

A case control study about factors associated with mortality at advanced maternal age in the United Kingdom reported that inadequate use of antenatal care contributed 23.62% followed by medical co-morbidities 5.92%, while previous pregnancy problems were associated with only 2.06% of maternal mortality. Therefore this study shows that there

is strong association between advanced age and to maternal mortality (McCall et al., 2016).

In addition, a study done in Ethiopia about factors associated with maternal mortality in Sub-Saharan Africa reported that, there was significant correlation of the maternal mortality with prenatal care coverage, births assisted by skilled health personnel and adult literacy. Education and an effective and efficient health system, especially during pregnancy and delivery are strongly related to maternal deaths (Alvarez et al., 2009). Moreover, a study done in Namibia about analysis of causes and risk factors associated with maternal deaths reported that healthcare systems, lack of transport, social and cultural factors were the major contributing factors to maternal deaths (Mulama, 2015). Furthermore, a study done in five rural districts of Southern Tanzania about maternal mortality and distance to facility-based obstetrics care in rural southern Tanzania: a secondary analysis of cross-sectional census data in 226,000 households reported that pregnancy related mortality was highly associated with distance to hospital (Hanson et al., 2015).

A case control study done in Kenya about risk factors for maternal mortality in a Tertiary Hospital in Kenya reported that factors significantly associated with maternal mortality included: having no education equivalent to secondary education (OR 3.3, 95% CI 1.1-10.4,p = 0.0284), history of underlying medical conditions (OR 3.0, 95% CI1.7-5.3; p < 0.0001) , doctor attendance at birth (OR 4.6, 95% CI 2.1-10.1, p = 0.0001) , having no antenatal visits (OR 4.1, 95% CI 1.6-10.4, p = 0.0007), being admitted with eclampsia (OR 10.9 95% CI 3.7-31.9, p < 0.0001), being admitted with co morbidities (OR 9.0, 95%CI 4.2-19.3, p < 0.0001), and being referred to MTRH (OR 3.3, 95% CI 1.9-5.7; p < 0.0001). A Similar study also found five factors associated with maternal mortality they included, smoking during pregnancy, older maternal age, pre-existing medical co morbidities, previous pregnancy problems and inadequate use of antenatal care (Yego et al., 2014). A study done in Rwanda on maternal death audits reported that health system failures contributed to 61% of maternal deaths and patient or community related factors contributed to 30.3% of deaths (Sayinzoga et al., 2009-2013).

A study done at Rufiji Region about causes and risk factors associated with maternal mortality in rural Tanzania found that maternal age and marital status was associated with maternal mortality. Women aged 20 to 29 years were 56% more likely to experience maternal death compared to women less than 20 years .The study also found that women who had ever been married had a protective effect of 62% compared to women who had never been married (HR=0.38, 95% CI=0.176-0.839) (Illah et al., 2013).

2.2. Institutional factors associated with maternal mortality

A study conducted in Syria about causes, contributing factors and preventability reported that substandard care was the main contributing factor to maternal deaths., in addition many movements between hospitals, due to lack of both a formal referral system and emergency transport were contributors to maternal deaths. Referral and emergency transport are weak points of the maternal health system in Syria .These findings are also supported by the study done in Sweden (Esscher at al., 2014)).

In addition, a study done in Afghanistan about determinants of delays in travelling to an emergency obstetric care facility in Herat, Afghanistan: an analysis of cross-sectional survey data and spatial modeling revealed that delays in reaching emergency obstetric care in care (EmOC) facilities contribute to high maternal mortality and morbidity in low-income countries. Distance and travelling were major reported obstacles in second delay (Hirose et al., 2015). In addition, a qualitative study about "Piecing Together the Maternal Death Puzzle through Narratives": The Three Delays Model Revisited reported that the three delays are the most contributing factors to deaths. The delays are: recognizing signs, symptoms and severity. Access to transport and hardship of long distance are all contributing factors to maternal mortality (Thorsen & Sundby, 2012). A study done about three delays of maternal mortality in a public-sector tertiary teaching hospital in Egypt found that third delay are the most contributing factor to maternal deaths that accounts 79%, followed by first delay 71% while the least one is the second delay 40% (Gelany, Mansour & Hassan, 2015). These findings were also supported by other studies (Hynes et al., 2012, Khan & Pradhan, 2013, Muchemi et al., 2016).

In a study done about facility-based maternal death review in three Districts in the Central Region of Malawi on analysis of causes and characteristics of maternal deaths reported that inadequate resuscitation is among the health workers factors contributing to maternal mortality. They accounted for 69.8%, followed by inadequate monitoring 55% and delay in starting management. Furthermore, a study done about access to health facilities reported that, delay in reaching an appropriate medical facility has been reported, lack of transport and prolonged transportation contributed to delay in reaching the appropriate medical facility in a timely manner (Cham et al., 2005). A qualitative study done in Kenya about barriers to formal emergency obstetrics care and services utilization revealed that inadequately equipped health facilities and poor accessibility to referrals was reported as a factor. This is due to communication and transport challenges where by the women must pay for the transport to go to the health facility. The delayed transport can lead to third delay which may be associated with maternal mortality (Essendi, Mills &Fotso, 2011).

A study done by Pembe in Muhimbili National Hospital in Tanzania on maternal mortality reported that delay in seeking care (73.3%) and completely lack of antenatal care (11.1%) were the major maternal factors contributing to maternal deaths. Direct causes of death were preeclampsia, postpartum hemorrhage, abortion complications and sepsis. Indirect causes included anemia and the presence of HIV. Substandard care factors contributed to 82.3% of all deaths and medical service factors such as inadequate blood transfusion services (26.1%) or no blood transfusion services (19.3%) also contributed substantially to maternal deaths. Other common medical service factors included delay in receiving treatment (18.3%) and case mismanagement (17%) in care received at Muhimbili National Hospital (Pembe at al., 2014).

CHAPTER: THREE

3.0 METHODOLOGY

3.1 Study design

A descriptive retrospective study design using review of women's files which employs quantitative approach was conducted to determine factors associated with maternal mortality involving women admitted at Maternity wards from August 2015-March 2017.

3.2 Study setting

The study was conducted at Mnazi Mmoja hospital in Zanzibar. Zanzibar lies on the east coast of Africa and consists of two main Islands namely Unguja and Pemba with several other surrounding islets in between. The Island of Unguja is situated on latitude 6°south and longitude 39.50° east and is about 86 kilometers long and 39 kilometers wide with total area of 3,354 square kilometers. Pemba lies about 40 kilometers to the Northeast of Unguja Island and is situated on latitude 5° south and longitude 400° east and is about 68 kilometers long and 22.75 kilometers wide with total area of 1,537 square kilometers. Total area of Zanzibar is 950 square kilometers and has its capital city called Zanzibar Town. The estimated population of Zanzibar was 1,304 million people (TPHC, 2012).

MMH is located in urban district of Unguja Island in Stone Town. Unguja Island is divided into seven districts; the urban two large public hospitals which provide obstetrics and gynecological services are Mnazi Mmoja and Mwembeladu hospitals. MMH has 776 beds in two wings and the Mwembeladu Maternity Home has 36 beds. The Mnazi Mmoja hospital serves as a teaching hospital for various cadres trained up to diploma with students from different institutions. Over 500 students each year are provided with practical training and supervision. MMH is mandated to provide advanced health care services in Zanzibar such as obstetrics and gynecology, diagnostic service and more specialized services such as newborn hearing screening. The site was selected because it is the main referral Hospital in Zanzibar that reported high maternal mortality for 2015-2016 compared with other Hospitals. This is the reason why MMH was

selected to conduct this study on factors associated with maternal mortality among women admitted in Maternity wards at Mnazi Mmoja hospital.

On average, the hospital attends over 600 out patients, 71 admissions and 40 deliveries on a daily basis. The hospital has an active Maternity department that can reasonably manage maternal complications. Maternity block at MMH constitutes seven wards, two post-natal wards for women delivered by caesarean section and women with normal deliveries, antenatal wards with rooms for low risk pregnancy, high risk pregnancy and room for normal pregnancy, labor ward, obstetric theatre and women above 28 weeks of gestation with any pregnancy complications are also admitted in a special ward at Maternity block. Additionally, there is a ward for neonatal admissions and kangaroo mother care. Furthermore, there is also a special room for intensive care-like unit for patients with severe pre-eclampsia and eclampsia (Highly dependence ward).

MMH has a total of 354 nurses and midwives. The number of deliveries per day is between 20 and 40. The maternity ward also has 15 doctors among which only two are specialists with 25 nurses and midwives. MMH receive Obstetric referral from all Health centers and Regional Hospitals including from Kivunge Cottage Hospital, Makunduchi Cottage Hospital, Al-Rahma private Hospital and other health centers.

3.3 Study population

The study population was all women admitted at maternity wards (Discharged alive and died) at Mnazi Mmoja hospital above 28 weeks of pregnancy.

3.4 Inclusion criteria

Women admitted in (antenatal ward, labor ward, postnatal ward, intensive care unit and high dependency ward discharged alive and died) at Mnazi Mmoja Hospital .

3.5 Exclusion criteria

Women with gestational age of less than 28 weeks.

3.6 Sample size.

Sample size was 384 files of women admitted at maternity wards (live and died) at Mnazi Mmoja Hospital.

3.7. Sample size formula.

The sample size was calculated using the following formula

$$\frac{n=Z^2 p\,(100-p)}{d}$$

Where n-is the sample size

Z-is the Z statistics for the desired level of confidence (confidence level).

P-is the expected proportion, 50% will be used as a standard proportion.

d-is the affordable margin of error (confidence interval).

Then affording a margin of error of plus or minus (±) 5% at a confidence level of 95% with the estimated proportion of 50 %, the sample size will be

$$n=\frac{1.96^2 \times 50\,(100-50)}{25} = 384$$

Therefore the required sample was 384 participants (women's files)

3.8 Sampling procedure /technique

Systematic random sampling was used where by 384 files of women admitted in maternity wards at Mnazi Mmoja hospital during the study period were reviewed. The files were obtained at Maternity block. Systematic method was used to obtain the required files. The total number of women that were admitted in maternity wards in a study period were calculated as 18,132 (women's files) and divided by a sample size that was 384. The sampling intervals were calculated as follows: (N/n) 384 and K th was obtained which was 47. Thus every 47 women were included. Therefore; the researcher started counting from 47 numbers to 94,141,188 and continued until the required sample size was obtained**.**

3.9 Pilot Study

Data abstracted form was piloted at Mwembeladu Maternity Hospital. The pilot was conducted to refine the tool and provide content validity. Permission to conduct pilot

study was sought at Mwembeladu Maternity Hospital. The findings of the pilot were used to revise the tool prior to conducting the main study.

3.10 Validity

Validity is the degree to which the tool measures what it is intended to measure (Polit& Beck, 2004). In this study, construct validity was done by providing the data abstraction forms to obstetricians to review the items. So, content validity was achieved by reviewing each question and providing opinion on whether the items covered the research objectives. The opinion of the reviewers was compared and analyzed to determine the degree of content validity**.**

3.11 Reliability

Reliability is the degree to which an instrument measures the same way each time. It is used under the same conditions with the same subjects (Polit& Beck, 2004). The pilot study was conducted to pre-test the instrument ability and accuracy to get the needed information. After doing a pre-test; all ambiguous questions on extracting data sheet were reframed.

3.12. Research assistant recruitment

Before data collection, one research assistant (RA) was recruited and trained. The aim of the training was focused on how to extract information from the case notes.

3.13 Data collection method and Tool

The study was conducted from April 2017 to May 2017. Data was collected by Principal investigator and research assistant. A data abstraction form was used to collect information through review of women's files (Appendix D) which was in English language version. The data abstraction form was divided into three sections whereby the first section collected information on the social demographic characteristics. The second section collected information on the maternal factors and the third section collected information on the institutional factors. The extracted variables information that were collected included characteristics of each womans' social demographic factors (age, occupation and marital status,) institution factors (referral status, mode of delivery and births attendants), maternal related factors (antenatal attendance, underlying medical and

surgical conditions, obstetric factors, conditions of women's during admission, gestational age of women during birth and parity). Collected data were double checked to ensure consistency and quality; this was done before; during and after data entry. The source of data was women files that were available at maternity wards MMH. Midwives register books were also used to verify the missing information or those which were not clearly explained.

3.14. Data management & data control

Number identification was used to protect women's confidentiality. The data abstraction form (paper form) was stored in the locked cabinet while electronic data set was protected by password. Data was accessed by only the researcher and was used for academic purposes only.

3.15 Data Analysis

Collected data were entered, coded, cleaned and analyzed using Statistical Package for Social Science (SPSS) version 20. Collected data were double checked to ensure data validation and consistency; this was done before, during and after data entry. Univariate analysis was used to describe single variables using frequency distributions tables and charts. Bivariate analysis was employed to establish association between variables. Maternal status after delivery is dependent variable, institutional and maternal factors were independent variables. Association between institutional factors and maternal factors were analyzed by Chi-square test at 95% confidence interval (CI) to determine the existence of a relationship between the variables (continuous and categorical). Also "p" value was used for making justification, inferences and hence conclusions. Factors with p value < 0.05 were considered to be statistically significant. Odds ratio was used and the variable was considered a risk factor if odds ratio was greater than one and chi square test was less than 0.05**.** The reasons of combining both chi-square and multivariate analysis was; Chi square was used to determine the existing relationship between variables while multivariate binary logistic regression analysis was used to measure the magnitude of the association after controlling the confounders and to make comparison clear. Therefore, in this study the confounders that were controlled were delays (first, second and third delays).

3.16 Logistic Regression Model (LRM)

Logistic regression is a statistical method for analyzing a dataset in which there are one or more independent variables that determine an outcome (David W Hosmer & Stanley Lemeshow, 2000). The outcome is measured with a dichotomous variable (in which there are only two possible outcomes) that can be either continuous or categorical which takes values 0 or 1. In this study the Logistic Regression model was used for analysis. This is because the study's dependent variable is maternal status after delivery whose responses are binary or dummy i.e. if women survive after delivery it is assigned value 1 and it is assigned value 2 if not.

3.17 Ethical considerations

Ethical clearance was granted by MUHAS Research Ethical Committee (Appendix A) and Zanzibar Medical Research Board (Appendix B). Permission to conduct the study was obtained from Mnazi Mmoja Hospital -Zanzibar (Appendix C). The study was a retrospective review of woman's files among women admitted (discharged or died) at maternity wards-Mnazi Mmoja hospital. Therefore; direct consent from the women was not obtained. To maintain confidentiality of the MMH, anonymity of the study participants was assured by not recording their names. Individual number identification was used; the files were allocated or identified by number and not names. The same numbers allocated in the files were used in data abstraction form and the key was accessible only to the researcher. All files were reviewed in the hospital site.

3.18 Dissemination Plan

Findings of this study will be disseminated by sending one copy to the School of Nursing where it will be submitted for the award of Master degree in Midwifery and Women's Health. Other copies will be sent to the Director of MUHAS library; Mnazi Mmoja Hospital Director, Department of obstetrics and gynecological ward Mnazi Mmoja Hospital -Zanzibar and UNFPA office in -Zanzibar. For the wider spread of knowledge, the results also will be published in the journal of midwifery and also might be disseminated in the academic workshops within and outside Tanzania.

CHAPTER FOUR

FINDINGS AND DATA PRESENTATION

4.0 Introduction

This chapter presents results following the completion of statistical analysis of the data collected from 384 women admitted at Maternity wards, Mnazi Mmoja Hospital-Zanzibar from August 2015 to March 2017. It describes the social demographic characteristics of the study participants, maternal and institutional factors associated with maternal mortality. It also presents proportion of maternal deaths. A total of 384 women records were reviewed to obtain the information needed. The results are summarized into descriptive statistics, bivariate analysis and conclude by the logistic regression model (LRM) that was developed earlier.

4.1Social demographic characteristics of the participants

Social demographic characteristics analyzed were age, marital status and employment status. Out of a total of 384 participants, 359 (93.5%) were married. Women between 20-24 years were 96 (25%) while those between 25-29 years were 112 (29.2%). The mean age group of the participants was 28 and standard deviation of the mean was 6.5 whereas the range was (16- 45 years). More than half of the participants were unemployed 257 (66.9%). Table .1 below presents the social demographic characteristics among the study participants who were admitted at Maternity wards.

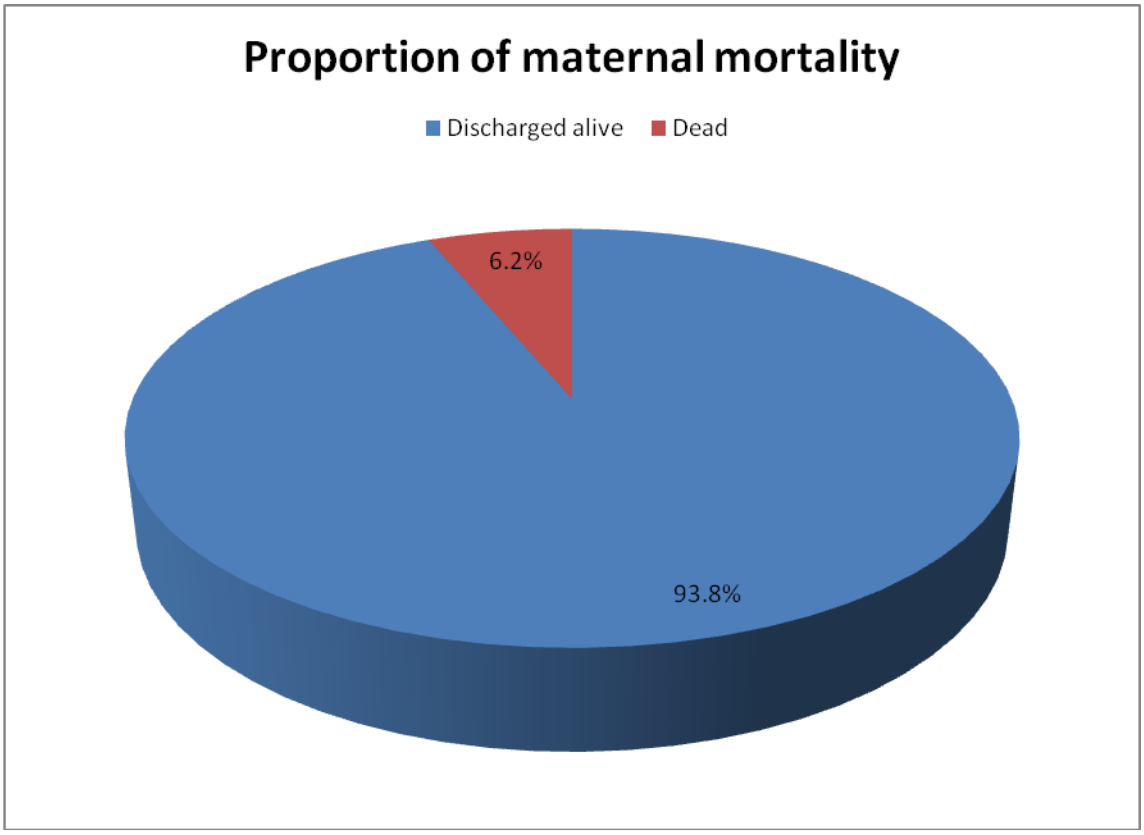
Table: 1 Demographic characteristic of the study participants

Demographic Characteristics	Frequency (n=384)	Percent (%)
Marital status		
Married	359	93.5
Single	11	2.9
Divorced	8	2.1
Widowed	6	1.5
Age Groups		
15-19	30	7.8
20-24	96	25.0
25-29	112	29.2
30-34	76	19.7
35-39	53	13.8
40-44	14	3.6
45-49	3	0.8
Occupation status		
Unemployed	257	66.9
Employed	55	14.3
Self employed	72	18.8
Total	**384**	**100.0**

4.2 The proportion of maternal status after delivery

The results of the study show that, of the 384 studied population, majority 360 (93.8%) were discharged alive while only 24 (6.2%) were reported to be dead.

Figure: 2 Proportion of maternal mortality delivery



4.3 Factors Associated With Maternal Mortality

4.3.1 Maternal factors associated with maternal mortality.

The results of the study show that, Severe pre-eclampsia accounted for 39 (10.2%) of maternal deaths while obstructed labor due to maternal pelvic abnormality contributed 26 (6.8%) and Postpartum hemorrhage 16 (4.2%) of the deaths. About 218 (56.8%) had term pregnancy at the time of delivery while in the remaining, (46 documents 11.9%), and their gestational ages item were not documented in the charts registers.

Table: 2 Obstetric factors and Reproductive Characteristics of the participants

Variable	Category	Frequency	Percent%
Obstetric factors	Severe pre- eclampsia	39	10.2
	Placenta Previa	8	2.1
	Eclampsia	18	4.7
	Puerperal sepsis	3	0.8
	Obstructed labor	8	2.1
	Obstructed labor -maternal pelvic abnormalitly	26	6.8
	Obstructed labor –Other causes	11	2.9
	Abruptio placenta	12	3.1
	PPH – Trauma	16	4.2
	PPH - Non traumatic	12	3.1
	Anesthetic complication	1	0.3
	Embolism	2	0.5
	Others obstetric factors	53	13.8
	None	175	45.6
	Total	384	100.0
Gestational age at birth	Preterm birth	117	30.5
	Term birth	218	56.8
	Post term birth	3	0.8
	N/A	46	11.9
	Total	384	100.0

4.3.2 Antenatal visits.

More than half of the respondents 194 (51. %) had attended more than four antenatal visits throughout pregnancy. Those who had less than two visits comprised only 8.0%.

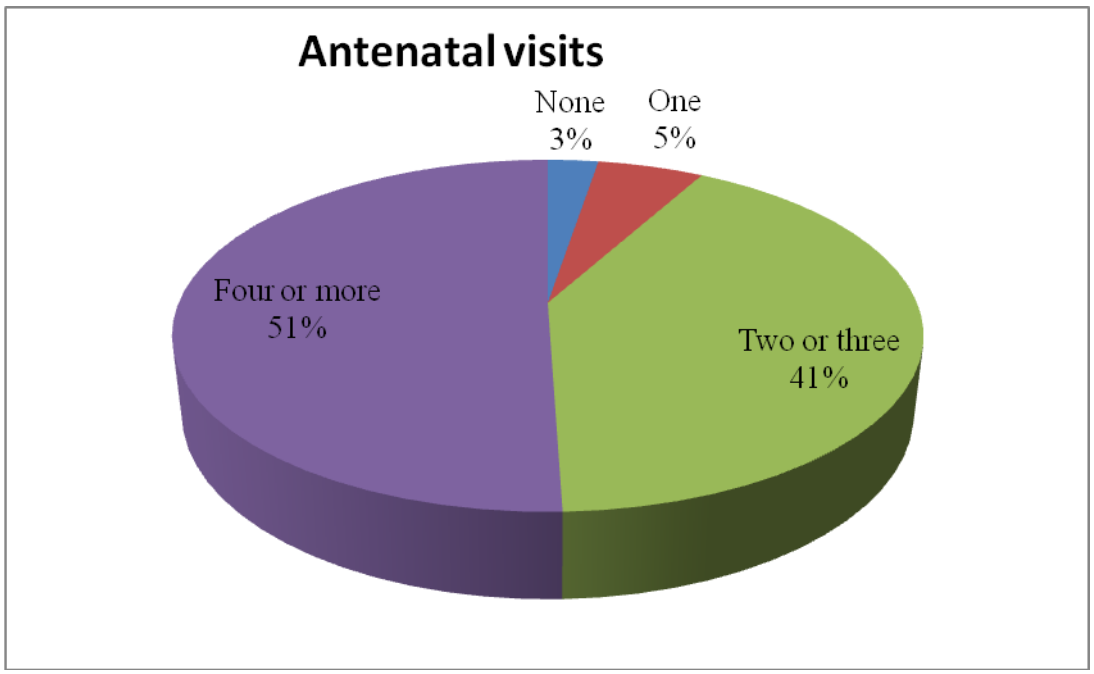


Figure: 3 Proportion of women antenatal visits

4.3.3. Parity and co-morbidities

The results show that the most common parity was multipara women 171 (44.5%) and about 348 (90.6%) were admitted without any pre-existing medical or surgical conditions.

Table: 3 Parity and co-morbidities of the study participants.

Variable	Category	Frequency	Percent%
Parity	Para one	139	36.2
	Multipara (2-4)	171	44.5
	Grandimultipara (>5)	74	19.3
	Total	**384**	**100.0**
Previous or pre-existing health conditions	None	348	90.6
	Yes	36	9.4
	Total	**384**	**100.0**

4.3.4 Conditions of women during Admission.

Majority of the respondents (70.6%) were admitted in maternity wards with stable conditions. The sick, the critical ill and those who died on arrival comprised only 12%.

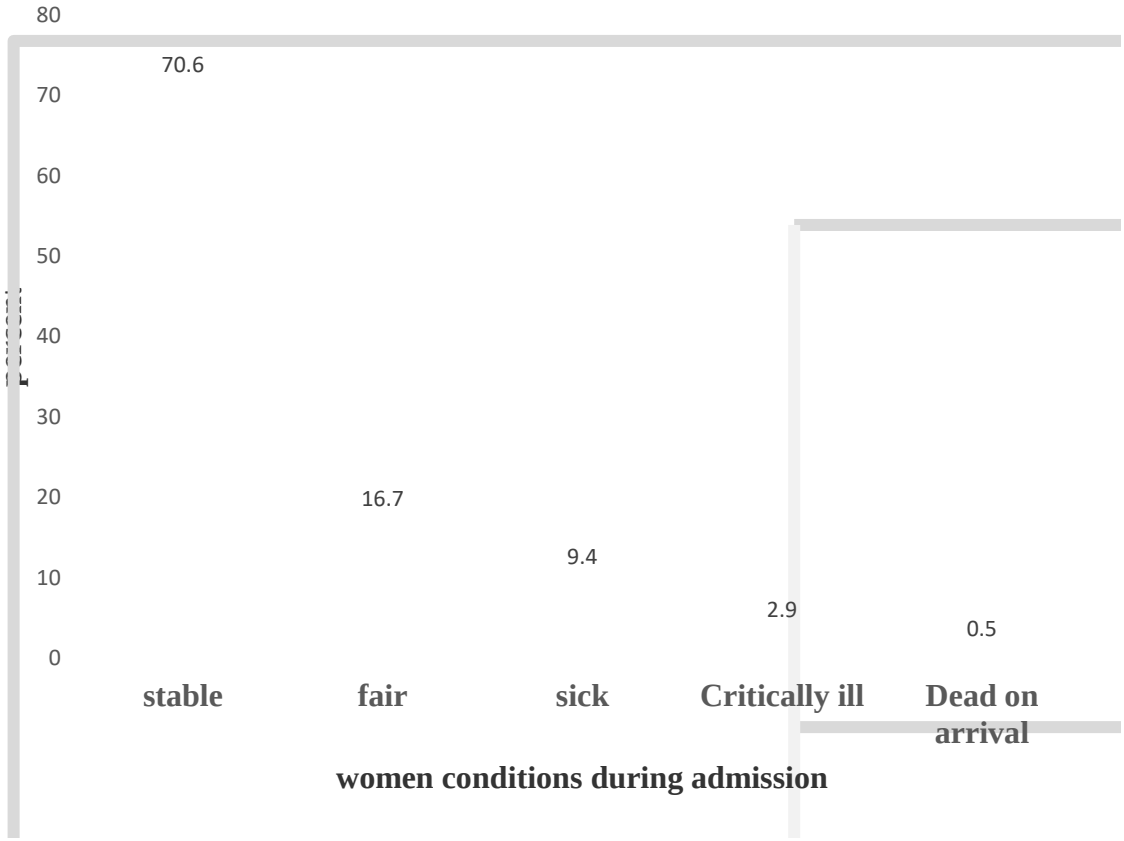


Figure 4: Conditions of women during admission

4.4 Institution Associated Factors

Another factor that was studied is the institutional factor that impacted positively or negatively on maternal mortality at Mnazi Mmoja hospital. The studied variables were referral status, birth attendants and mode of delivery during birth. More than half of the respondents 327 (85.2%) were not referred from either district hospitals or private hospitals to Mnazi Mmoja hospital. Majority 190 (49.5%) of women who delivered were attended by midwives. Those who were attended by other health officers constitute only 10.9%. Table: 5 present Institution Associated Factors**.**

Table: 4 Institution Associated Factors (referral status and skilled attendants).

Variable	Category	Frequency	Percent%
Referral status	Referred	57	14.8
	Not referred	327	85.2
	Total	384	100.0
Skilled attendants	Medical officer	152	39.6
	Midwives/Nurse	190	49.5
	Medical assistant	3	.8
	Intern doctor	8	2.1
	Obstetrician	7	1.8
	Traditional birth attendants	5	1.3
	Others	19	4.9
	Total	384	100.0

4.4.3 Mode of Delivery of Women during Child Birth

More than half of the respondents (56.5%) delivered normally through spontaneous vertex delivery while the other five factors totaled 43.5%.

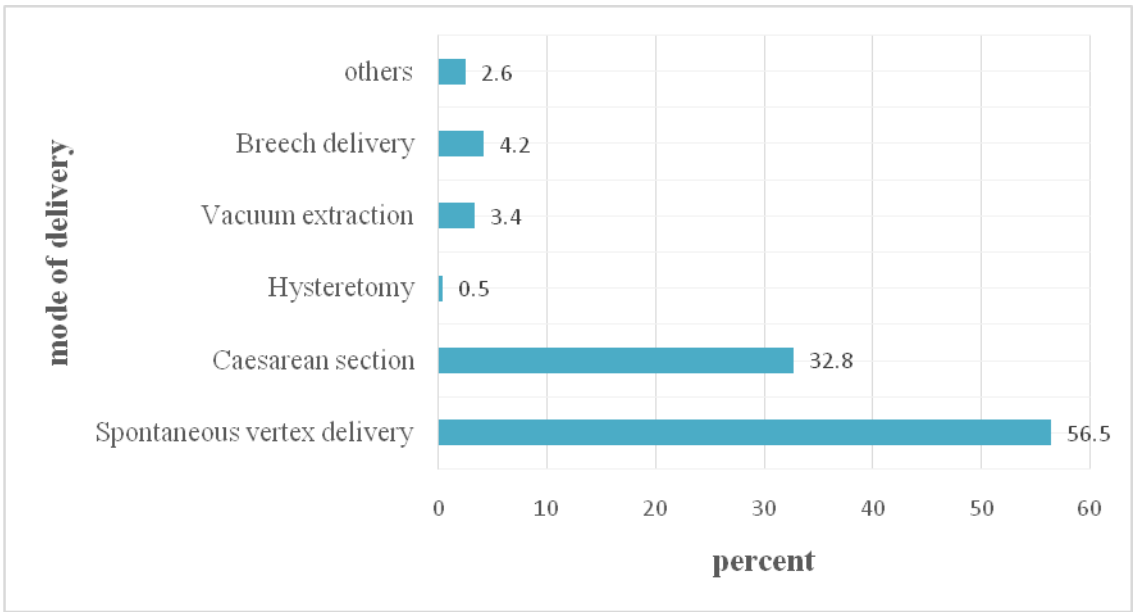


Figure: 5 Frequency distribution of mode of delivery of women during child birth

4.5 Factors associated with maternal mortality

The analysis was carried out to measure the association between independent variables and dependent variables. Associations were analyzed by Chi-square test at 95% confidence interval (CI) factors with p value < 0.05 considered statistically significant. All factors that were statistically significant were analyzed again by logistic regression to determine the contributions of each toward maternal death. The results of the study show that six factors were statistically significantly associated with maternal deaths among women admitted in maternity wards. These were parity, obstetric factors, pre-existing conditions, women's conditions during admission, birth attendants and gestational age at birth. Factors which were not statistically significant were age group of mothers (p value =0.009), antenatal attendance as p value observed (p=0.12), mode of delivery (p value = 0.9) and referral status (p value = 0.394).

4.5.1. Parity

The results of the study show that maternal mortality increased with parity and the highest maternal deaths were reported among the group of multiparous women (parity two to four) which was 58.3%. This was followed by grand multiparous women (29.2%). The results were found to be statistically significant (p =0.041).

4.5.2 Obstetric factors

Findings also shows that 29.2% of the participants died with severe pre-eclampsia followed by postpartum hemorrhage due to trauma which constituted 25.0% compared with those having other obstetric factors such as ruptured uterus 12.5%. These results show there is strong association between obstetric factors as p value observed is (p=0.00).

4.5.3 Pre-existing health conditions

The results also showed that, women with prior medical and surgical health conditions had significantly higher chance of death (33.3%) than those who have no prior medical or surgical conditions. There is strong association between pre-existing diseases and maternal deaths as observed (p = 0.000).

Table: 5 Association between maternal factors and maternal mortality.

Variables	Maternal status after delivery N=384		
	Discharged alive n (%)	Dead n (%)	$\chi 2$ P value
Parity			
Para one	136 (37.8%)	3 (12.5%)	6.368 (p= 0.041*)
Multipara	157 (43.6%)	14 (58.3%)	
Grandimultipara	67(18.6%)	7 (29.2%)	
Obstetric factors			
None	175 (48.6%)	0 (0.0%)	78.622 (p= 000*)
Severe pre- eclampsia	32 (8.9%)	7 (29.2%)	
Placenta Previa	7 (1.9%)	1 (4.2%)	
Eclampsia	17 (4.7%)	1 (4.2%)	
Puerperal sepsis	1 (0.3%)	2 (8.3%)	
Obstructed labour	8 (2.2%)	0 (0.0%)	
Obstructed labour -maternal pelvic abnormalitly	26 (7.2%)	0 (0.0%)	
Obstracted labour –Other causes	11 (3.1%)	0 (0.0%)	
Abruptio placenta	10 (2.8)	2 (8.3%)	
PPH – Trauma	10 (2.8%)	6 (25.0%)	
PPH - Non traumatic Anesthetic	11 (3.1%)	1 (4.2%)	
Complications	1 (0.3%)	0 (0.0%)	
Embolism	1 (0.3%)	1 (4.2%)	
Others	50 (13.9%)	3 (12.5%)	
Pre-existing conditions			
Yes	28 (7.8%)	8 (33.3%)	17.99 (p= 000*)
No	322 (92.2%)	16 (66.7%)	
Total	**360**	**24**	**384**

4.5.4 Conditions of women during admission

Women who were admitted with fair (25%) or sick condition died more (29.2%) as compared with those who were stable condition. These findings were observed to be strongly statistically significant to maternal mortality among the study population (p value=0.000).

4.5.5 Gestational age at birth

Women with preterm birth had more deaths 62.5% as compared with women with term and post term birth. The finding showed, gestational age of women at time of birth is a strong statistically significant factor for maternal mortality as (p value is 0.003). The Table: 6 below present's maternal factors as associated with maternal mortality.

4.6. Institution factors

Institution factors, mode of delivery, referral status and births attendants were carried out to measure the association between independent variables and dependent variables. The results show only one factor is statistically significant with maternal mortality.

4.7 Skilled Vs unskilled attendants

Results show that, women who had been attended by medical officers had more risk of dying (45.8%) than those who had been attended by other providers. There is strong association between birth attendants and maternal mortality as observed (p = 0.036).

Table: 6 Factors associated with maternal mortality.

Variables	Maternal status after delivery N =384		
	Discharged alive n (%)	Dead n (%)	$\chi 2$ P value
Condition of women's during admission			
Stable	264 (73.3%)	7 (29.2%)	
Fair	58 (16.1%)	6 (25.0%)	
Sick	29 (8.1%)	7 (29.2%)	
Critically ill	8 (2.2%)	3 (12.5%)	
Dead on arrived	1(0.3%)	1(4.2%)	32.812 (p =0.000*).
Gestational age at birth			
Preterm birth	106 (33.8%)	15 (62.5%)	11.942 (p= 0.003*)
Term birth	206 (65.6%)	8 (33.3%)	
Post term birth	2 (0.6%)	1 (4.2%)	
NA	46 (11.9%)		
Skilled Vs unskilled attendants			
Medical officer	141(39.2%)	11 (45.8%)	13.487 (p = 0.036*)
Midwives/Nurse	181 (50.3%)	9 (37.5%)	
Medical assistant	3 (0.8%)	0 (0.0%)	
Intern doctor	7 (1.9%)	1(4.2%)	
Obstetrician	6 (1.7%)	1 (4.2%)	
Traditional birth Attendants	3 (0.8%)	2(8.3%)	
Others	19 (5.3%)	0(0.0%)	
Total	**360**	**24**	

4.8 Multivariate logistic regression findings

Maternal factors that were statistically significant were analyzed again to measure the size of the impact and contribution of each towards maternal mortality at 5% significance level using Pearson Chi square test. These variables were pre-existing health conditions, parity, obstetric factors, gestational age at birth, birth attendants and conditions of women during admission.

The results revealed that, women with puerperal sepsis were at more risk of dying as compared to women with other obstetric factors (OR = 248.95, p value 0.004 with 95% CI from 5.850-10595.038). Women with postpartum hemorrhage were twenty times more likely to die as compared to women with other obstetric factors (OR =20.112, p value 0.003 with 95% CI from 2.731-149.594).

Women with severe pre-eclampsia were six times more likely to die as compared to women with other obstetric factors (OR = 6.744, p value = 0.040 with 95% C.I from 1.092-41.653) and gestational age at birth the results also showed that maternal deaths had a protective effect with preterm birth as compared with women with post term birth (OR =0.040, p value =0.038 with 95% C.I 0.002-0.839). Other factors were not statistically significant in multiple regressions.

Table 7: logistic regressions of maternal factors correlated with maternal mortality

Variables	Alive N= 360 n (%)	Died N=24 n (%)	Sig (P-value)	COR (95% C.I)	AOR (95% C.I)
Obstetric factors					
Severe pre-eclampsia	32 (8.9%)	7 (29.2%)	.040*	3.646 (0.878 -15.135)	6.744(1.092-41.653)
Plecenta previa	7 (1.9%)	1 (4.2%)	.538	2.381 (0.217-26.178)	2.312 (0.161-33.189)
Eclampsia	17 (4.7%)	1 (4.2%)	.768	0.980 (10.067)	0.665 (0.044-10.0090
Peuperal sepsis	1 (0.3%)	2 (8.3%)	.004*	33.333 (2.312.-480.486)	248 (955(5.850-10595-038)
Abruptio placenta	10 (2.8)	2 (8.3%)	.343	3.333 (0.492-22.593)	3.077 (0.301-31.469)
PPH Trauma	10 (2.8%)	6 (25.0%)	.003*	10.000 (2.137- 46.799)	20 .212 (2.731-149.594)
PPH-non traumatic	11 (3.1%)	1 (4.2%)	.320	1.515 (0.144-15.974)	3.934 (0.264-58.588)
Embolism	1 (0.3%)	1 (4.2%)	.133	16.667 (0.824-337.009)	15.927 (0.428-592.175)
Other obstetric factors				Ref. category	
Parity					
Paraone	136 (37.8%)	3 (12.5%)	.067	0.211 (0.053-0.842)	.102 (.009-1.170)
Multipara (2-4)	157 (43.6%)	14 (58.3%)	.684	0.854 (0.330- 2.210)	1.297 (0.371-4.536)
Grandimultipara				Ref. category	
Skilled Vs un skilled attendants					
Skilled	341(93.9%)	22 (91.7%)	0.531	0.716 (0.158-3.242)	2.152 (0.196-23.644)
Unskilled	21 (6.1%)	2 (8.3%)		Ref. category	
Pre-existing conditions					
None	322 (92.2%)	16 (66.7%)	0.075	0.169 (0.066-0.428)	0.297 (0.078-1.133)
Yes	28 (7.8%)	8 (33.3%)		Ref. category	
Conditions of women during admissions					
Stable	264 (73.3%)	7 (29.2%)	0.171	0.027 (0.002- 0.468)	0.017 (0.000-5.819)
Fair	58 (16.1%)	6 (25.0%)	0.267	0.103 (0.006-1.873)	0.038 (0.000-12.249)
Sick	29 (8.1%)	7 (29.2%)	0.327	0.241 (0.013-4.352)	0.055 (0.000-18.166)
Critically ill	8 (2.2%)	3 (12.5%)	0.571	0.375 (0.017)	0.185 90.001-63.108)
Died on arrived	1(0.3%)	1(4.2%)		Ref. category	
Gestational age at birth					
Preterm delivery	106 (33.8%)	15 (62.5%)	0.038*	0.283 (0.024-3.315)	0.040 (0.002-0.839)
Post term delivery	2 (0.6%)	1 (4.2%)		Ref. category	

CHAPTER FIVE

DISCUSSION

5.0 Introduction

This chapter discusses the study findings which are then followed by recommendations and conclusion of the study. The main objective of this study was to determine proportion, maternal and institution factors associated with maternal mortality among women admitted at maternity wards at Mnazi Mmoja Hospital. This study had highlighted several factors associated with maternal mortality. The findings of this study revealed six maternal factors were positively associated with maternal deaths. They are; pre-existing health conditions, parity, obstetric factors, condition of the women's during admission and gestational age at birth. The study also found that, some institutional factors are associated with maternal deaths. Such factor includes birth attendants.

5.1 Discussion

5.1.1 Maternal associated factors associated with maternal mortality

The study found that severe pre-eclampsia contributed 29% of maternal deaths during the study period. The findings were contrary with most studies done in Africa and elsewhere (Bauserman et al., 2015, Yego et al., 2014, Esmaou et al., 2014). A retrospective study conducted in Dar-es-salaam found that pre-eclampsia /eclampsia (19.9%) was the commonest cause of death in Muhimbili hospital during their study period (Pembe et al., 2011). In similar findings with the descriptive cross-sectional study done in Iran that reported hypertensive disorders contributed 25.7% of the maternal deaths Esmaou and his college, (2014). Logistic regression results also showed that, women with severe pre-eclampsia were six times more likely to die as compared to women with other obstetric factors (OR = 6.744, p value = 0.040 with 95% C.I from 1.092-41.653). This finding is contrary with the study done in Kenya that reported being admitted with eclampsia was ten times likely to cause deaths (OR 10.9 95% CI 3.7-31.9, $p < 0.0001$, Yego et al., 2014). Moreover, another study done by Global Network for women's and Children Health Research reported that obstructed labor and hypertensive disorders were also associated with maternal deaths (Bauserman et al., 2015).

The study also found that, postpartum hemorrhage which contributed 25.2% of all deaths, was twelve times more likely to cause death (OR =20.112, p value 0.003 with 95% CI from 2.731-149.594). Similar situation in Iran, according to Esmaou and his college, (2014) that was reported obstetric hemorrhage was 36.6%. The findings also correlate with the study done in Shinyanga Tanzania which found that direct cause of maternal deaths was hemorrhage that accounted for 50% (Mapunda et al., 2016). The study also showed 8.3% died due to puerperal sepsis. These findings indicate that obstetric complications are predominant identifiable causes of maternal deaths in developing countries which indicate the need of emergency obstetric care.

About parity, the study observed that multipara was at more risk of death (56.8%) compared to women with parity one and grandimultipara. This result doesn't indicate that women with multiparity were at more risk of death because they were likely to develop complications during delivery if there was no inter-pregnancy interval. The findings are contrary with the case control study conducted at Botswana that reported maternal mortality were most common with parity one that accounting 58.3% for cases and 47.5% control than the parity of five or more that were (5.0%) cases and the controls (2.1%) (Mokgatlhe, 2012). This finding was also contrary with study done in India that reported women with a parity of one or more than four were at more risk (OR= 1.94) of maternal mortality than women with a parity of two or three (Aggarwal et al.,2007).

On the side of gestational age, the study reported that 62.5% of mothers had preterm pregnancy at the time of death. These results indicated that most of the women with preterm delivery were those with pregnancy illness conditions that would easily develop complications and hence predispose them to maternal deaths. These findings were contrary with those from the study done in Ethiopia by Hailu, (2016) who reported that 70.5% of mothers who died had term pregnancy. In a different situation in Kenya, a study done by Muchemi et al., (2016) reported that women who died were those between 37-42 weeks gestation.

Furthermore, the study found that, conditions of women during admission is positively associated with maternal deaths. Women admitted with some pregnancy conditions were found to be associated with maternal deaths. This indicates that late admission resulted in low chances of these women surviving, as they had less time to be resuscitated. This correlates with the study done in Muhimbili hospital Dar es-Salaam (Pembe and his college, 2011) who found that seventy seven 77 (54.6%) of women who died were critically ill on admission and eight of the critically ill women were gasping and died on arrival.

Presence of pre-existing health conditions was also found to be significant and had been associated with maternal mortality by 33.3% among women who died compared with women who survived. These findings correlated with a study done in United Kingdom that reported medical co-morbidities had high chance of maternal deaths (OR 4.82, 95% CI 3.14–7.40) as compared with those who had none (Naira et al., 2015). This correlates with the study done in Kenya that reported history of underlying medical conditions were three times more likely to cause maternal deaths (OR 3.9, 95% CI 1.7-9.2, p = 0.0016 Yego et al., 2013). Another study done in Ethiopia reported the same situation that women with a pre-existing history of other illness were also at increased risk (OR 5.58, 95% CI 2.17–14.30) Godefay et al., (2015). Several studies have demonstrated individual medical conditions such as asthma; hypertension and malignancy were associated with maternal mortality. Same situation in the study conducted at Ethiopia Jimma University specialized hospital reported that, those having medical co-morbidities were 40 (50.63%) cases as compared with control 39 (49.37%) respectively (Legesse, Abdillahi &Dirar, 2016). These results indicate that women who suffered problems during pregnancy were more likely to develop complications and hence lead to their death. However, these findings are contrary to other research showing that direct pregnancy complications are leading causes of maternal deaths. Such study was done in Shinyanga Tanzania by Mapunda et al., (2016) and found direct cause of maternal deaths was hemorrhage that accounting for 50% of all maternal deaths during their study time**.**

5.1.2 Institutional factors associated to maternal mortality

The study found that doctor's attendance at birth was associated with maternal mortality (48.5%). However, the results do not confirm that the doctors were killers. This finding indicates that it might be because these mothers were either delayed in reaching care or they were attended after complications occur. The findings also indicate that it might be there was poor communication between staff on how to recognize the problem when arise. Findings correlates with results of a retrospective study done in Kenya which reported that, deaths were more in women who were attended by doctors than midwives (OR 4.6.95% CI 2.1- 10.1,p = 0.0001, Yego and his college, (2014).

5.1.3 Proportion of maternal mortality

One of the objectives of the study was to determine the proportion of maternal mortality. To achieve the intention of the researcher, the identification of maternal status after delivery was determined to be either alive or dead. The proportion of maternal mortality in maternity wards at Mnazi Mmoja hospital from August 2015-March 2017 was 6.2%. The findings are contrary to those of a retrospective study done in Kenya that found 46% proportion of maternal deaths (Yego at al., 2013).

5.2 Strengths of the study

The study used selected representative sampling and was free from recall and selection bias due to design and sampling technique used.

5.3 Study limitations and mitigation

The following were the general methodological limitations and strengths of the present study:

Incomplete information, missing data and lack of clarity in some women's' files and was mitigated by verifying incomplete information through midwives' registers and books (MTUHA delivery book, and report books) that were available in relevant wards (post-natal ward, antenatal ward, labor ward, and ICU and Obstetric theatre). However, tracing and retrieving of information from the registers were difficult and time consuming. This is because most of the time the registers were poorly stored.

CONCLUSION

In conclusion, this study highlighted both maternal and institutional factors associated with maternal mortality at Mnazi Mmoja hospital in Zanzibar. The findings showed that most maternal deaths in MMH were caused by preventable conditions. These findings are alarming and more efforts need to be focused in improving such conditions to cut-down the number of maternal deaths in Zanzibar by strengthening ante natal and post natal clinics. Indirect causes of maternal deaths were also of significant proportion; therefore, antenatal visits and post natal visits should provide opportunities for the detection of risk factors for eclampsia and other underlying illnesses that may put a mother at risk during birth. There is a need to focus on intergraded care throughout pregnancy. Further studies are required to understand whether specific aspects of care could be improved to reduce maternal deaths. The findings of this study are specific to this setting, even though there are some similarities and differences to other countries. Therefore, there is a need of reaction that is relevant to the setting of this study only.

Recommendation

Findings from the study have highlighted both maternal and institutional factors that were associated with maternal mortality. The recommendations of this study have implications on policy, practices and doing further research.

Policy

Ministry of Health in Zanzibar ought to take more efforts focused in strengthening ante natal and post natal clinics to cut-down or to reduce the number of maternal deaths in Zanzibar. Availability of skilled attendants and adequate essential equipment and drugs at antenatal and postnatal visits that easily manage obstetric condition promptly.

Practices

Secondly, medical recording system needs to be improved to enhance the standard of care in the health system.

Thirdly, health providers need to work hard towards preventive causes of maternal deaths during child birth; severe pre-eclampsia and pre-existing health conditions can be

detected and prevented earlier so that it can reduce maternal complications and even maternal deaths. Training of updated evidence based protocols should also be implemented by health providers.

Fourthly, the study found that late admission to hospital is associated with maternal deaths. Therefore, prompt education should be given in antenatal clinics on women to come to the hospital early so that appropriate life saving measures needed could be taken within the study setting to reduce maternal mortality as well-timed management and treatment can make the variation between life and death.

Further research

Both institutional and maternal factors are associated with maternal mortality in MMH, It is clear that doing further research in other Zanzibar hospitals is needed in order to understand and give a clear picture of the other factors associated with maternal deaths.

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APPENDIX A: APPROVAL ETHICAL CLEARANCE

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Ref. No. MU/PGS/SAEC/Vol. IX

12nd April, 2017

Mr. Dua Suleiman Mussa
MSc. Midwifery and Women Health
MUHAS.

RE: APPROVAL OF ETHICAL CLEARANCE FOR A STUDY TITLED "FACTORS ASSOCIATED WITH MATERNAL MORTALITY AMONG WOMEN ADMITTED MATERNITY WARD AT MNAZI MMOJA HOSPITAL IN ZANZIBAR."

Reference is made to the above heading.

I am pleased to inform you that, the Chairman has, on behalf of the Senate, approved ethical clearance for the above-mentioned study. Hence you may proceed with the planned study.

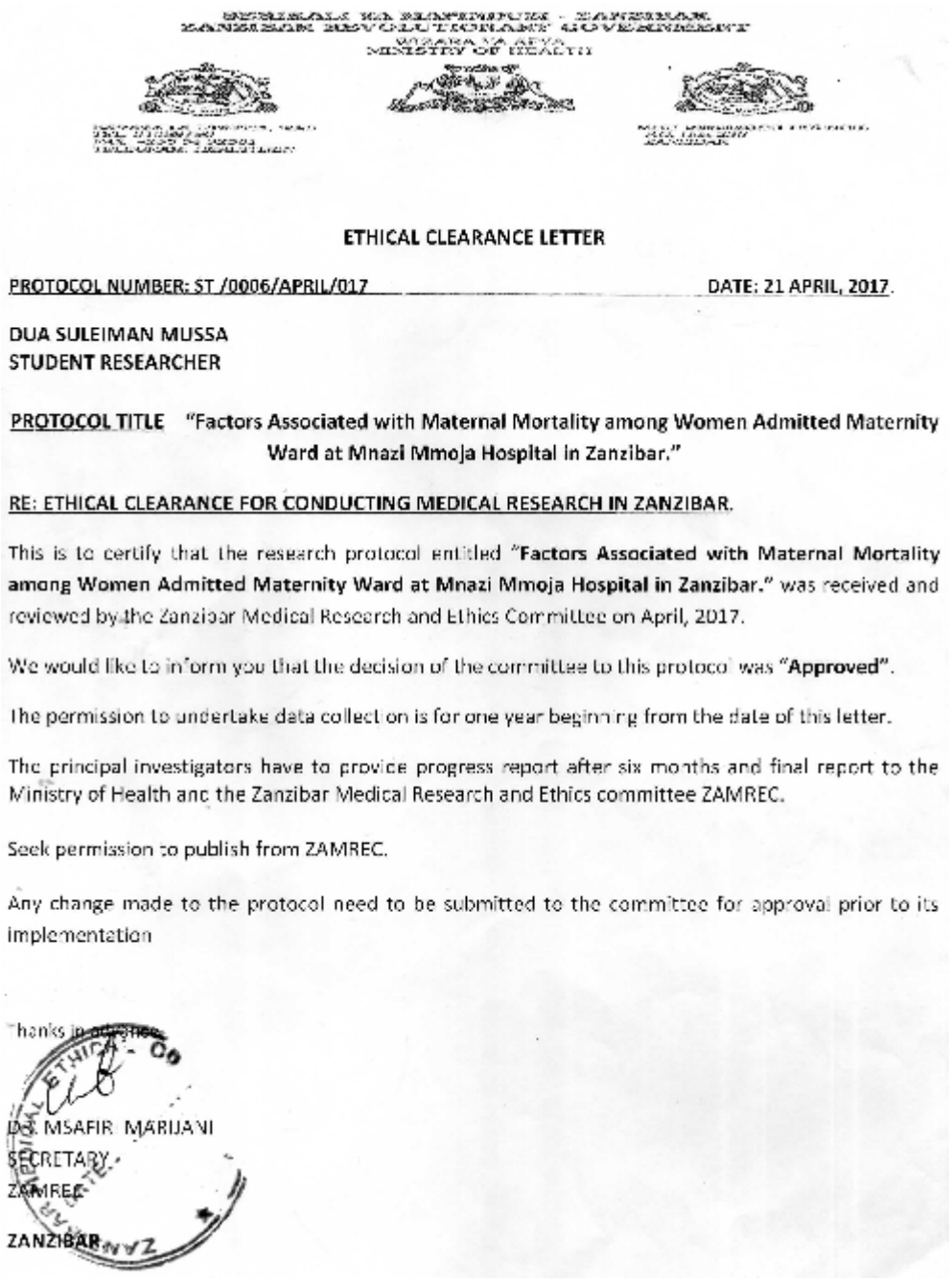
The ethical clearance is valid for one year only, from 13rd April, 2017 to 12nd April, 2018. In case you do not complete data analysis and dissertation report writing by 12nd April 2018, you will have to apply for renewal of ethical clearance prior to the expiry date.

Please liaise with the Directorate of Finance to get your research funds.

Prof. Andrea B. Pembe
DIRECTOR OF POSTGRADUATE STUDIES

cc: Director of Research and Publication
cc: Dean, School of Nursing

APPENDIX B: ETHICAL CLEARANCE LETTER



ETHICAL CLEARANCE LETTER

PROTOCOL NUMBER: ST /0006/APRIL/017 DATE: 21 APRIL, 2017.

DUA SULEIMAN MUSSA
STUDENT RESEARCHER

PROTOCOL TITLE **"Factors Associated with Maternal Mortality among Women Admitted Maternity Ward at Mnazi Mmoja Hospital in Zanzibar."**

RE: ETHICAL CLEARANCE FOR CONDUCTING MEDICAL RESEARCH IN ZANZIBAR.

This is to certify that the research protocol entitled **"Factors Associated with Maternal Mortality among Women Admitted Maternity Ward at Mnazi Mmoja Hospital in Zanzibar."** was received and reviewed by the Zanzibar Medical Research and Ethics Committee on April, 2017.

We would like to inform you that the decision of the committee to this protocol was **"Approved"**.

The permission to undertake data collection is for one year beginning from the date of this letter.

The principal investigators have to provice progress report after six months and final report to the Ministry of Health and the Zanzibar Medical Research and Ethics committee ZAMREC.

Seek permission to publish from ZAMREC.

Any change made to the protocol need to be submitted to the committee for approval prior to its implementation

Thanks in advance.

DR. MSAFIR MARIJANI
SECRETARY
ZAMREC
ZANZIBAR

APPENDIX: C PERMISSION LETTER

2 Mei 2017

Dua Suleiman Mussa
S. L. Barua 672
Zanzibar

YAH: OMBI LA KUFANYA UTAFITI KWENYE HOSPITALI YA MNAZI MMOJA

Rejea barua yako ya tarehe 24 April 2017 yenye nada ya hapo juu.

Ruhusa imetolewa kufanya utafiti huu ndani ya hospitali ya Mnazi mmoja, ni imani yangu kuwa kazi ya kudadisi utaifanya mwenyewe au msaidizi ambae hatokuwa kazini wakati wa kazi yako.

Ripoti ya kazi hii itolewe kwenye ngazi zifuatazo:-

- Kwenye mkutano wa kila wiki *"Continuous Nursing Education"* kwa ajili ya taaluma kwa wanguzi wenzio
- Kwa maandishi kwenda kwa Mkuruqenzi mtendaji wa hospitali kwa matumizi ya baadae na kumbukumbu.

Natanguliza shukurani za dhati kwa uamuzi wako, nakutakia kazi njema na masomo mema.

Ahsante

Mwinyi I. Msellem
/Mkuu
Kitengo cha Mafunzo na Utafiti
Hospitali ya Mnazi mmoja
Wizara ya Afya –Zanzibar

APPENDIX: D1 DATA ABSTRACTION FORM: ENGLISH VERSION

Data abstraction form

Factors associated with maternal mortality among women admitted maternity wards at MnaziMmoja hospital-Zanzibar.

Identification number: **Date of admission:**

PART ONE: Social demographic characteristics

1.	Age		
2.	Education level	1.None ☐ 2.Primary ☐	3.Secondary ☐ 4.Higher education ☐
3.	Marital status	1.Married ☐ 2.Single ☐ 5.Separated ☐	3.Divorced ☐ 4.Widowed ☐ 6.Cohabiting ☐
4.	Occupation	1.Unemployed ☐ 2.Employment ☐ 3.Self employed employment ☐	
	PART TWO: Maternal associated factors (Obstetric and reproductive characteristics)		
5.	Parity		
6.	Obstetric risk factors	1.None ☐ 2.Severe pre- eclampsia ☐ 3. Placenta Previa ☐ 4. Eclampsia ☐ 5. Puerperal sepsis ☐ 6. Obstructed labour (malposition/malpresentation) ☐ 7. Obstructed labour -maternal pelvic abnormalitly 8.Obstracted labour –Other causes ☐	

		9. Abruptio placenta ☐ 10. PPH - Trauma ☐ 11. PPH - Non traumatic ☐ 12.Anesthetic complication ☐ 13. Embolism ☐ 14.Others obstetric factors ☐	
7.	Number of antenatal visits	1.None ☐ 2.One ☐	3.Two or three ☐ 4.Four or more ☐
8.	Previous or pre-existing maternal medical condition	**1.**None ☐ 2.Yes ☐	
9.	Gestational age of women during birth		
10.	Condition of women's during admission	1.Stable ☐ 2.Fair ☐ 3.Sick ☐ 4.Criticallyill ☐ 5..Dead on arrival ☐	

PART THREE: Institution associated factors

11.	Referral status	1.Referral ☐ 2.Not referral ☐
12.	Mode of delivery	1.Spontaneous vertex delivery ☐ 2.Caesarean section ☐ 3.Hysteretomy ☐ 4.Vacuum extraction ☐

		5.Breech delivery ☐ Others……..
13.	Skilled Vs unskilled providers	**1.**Medical officer ☐ 2.Midwive/ Nurse ☐ 3.Medical assistant ☐ 4.Intern doctor ☐ 5.Obstetrician ☐ 6.Traditional birth attendant ☐ 8. Other……..
14.	Maternal status after delivery	1.Discharged alive 2.Died

KIAMBATISHO: D2 FOMU YA KUKUSANYIA TAARIFA: TOLEO LA KISWAHILI

FOMU YA KUKUSANYIA TAARIFA

Mambo yanayohusiana na vifo vya kina mama katika wodi za wazazi hospital ya Mnazi Mmoja Zanzibar.

Nambari ya Utambulisho: **Tarehe ya kulazwa:**

hospital:

SEHEMU YA KWANZA: Taarifamuhimu

1.	Umri		
2.	Kiwango cha elimu	1.Hana ☐ 2.Elimu ya msingi ☐	3.Elimu ya Secondary ☐ 4.Elimu ya juu ☐
3.	Hali ya ndoa	1.Ameolewa ☐ 2.Yuko pekee ☐	3.Ameachika ☐ 4.Mjane ☐
4.	Kazi	**1.**Hajaajiriwa 2.Muajiriwa 3.Mjasiri amali	
	SEHEMU YA PILI: Yanayohusiana kwa upande wa mama (taarifa za uzazi)		
5.	Amezaa mara ngapi		
6.	Pingamizi za uzazi	1.Hana tatizololote ☐ 2.Dalili za hatari za kifafa cha mimba ☐ 3. Kondo la nyumba kuwa chini ya kizazi ☐ 4. Kifafa cha mimba ☐ 5. Maambukizi baada ya kujifungua ☐ 6. Uchungu pingamizi (mlalo wa mtoto/vitangulizi vya mtoto) ☐ 7. Uchungu pingamizi-matatizo katika kiuno cha mama cha uzazi ☐ 8.Uchungu pingamizi–sababu nyenginezo ☐ 9. Zalio kumeguka kabla mtoto kuzaliwa ☐ 10. Damu nyingi baada ya kujifungua-jeraha ☐ 11. Damu nyingi baada ya kujifungua – Hakuna jeraha ☐	

		12.Matatizo yatokanayo na ganzi 13. Hewa kwenye mzunguko wa damu ☐ 14.Matatizo mengineyo ☐	
7.	Amehudhuria mara ngapi kliniki ya mama na mtoto	1.Hakuhudhuria ☐ 3.Mara mbili au tatu ☐	2.Mara moja ☐ 4.Zaidi ya maranne ☐
8.	Kuna Ugonjwa wowote aliokuanao kabla ya ujauzito	Ndio ☐ Hapana ☐	

SEHEMU YA TATU: Sababu zinazohusiana naTaasisi

9.	Hali ya rufaa	1.Amepewa rufaa ☐ 2.Hakupewa rufaa ☐
10.	Hali ya mama wakati wa kulazwa Hospital Mambo ya uzazi	1.Nzuri ☐ 2.Afadhali ☐ 3.Anaumwa ☐ 2.Anaumwa sana ☐ 3.Anafariki wakatialipofika Hospital ☐
11.	Njiaambayo mama aliyojifungulia	1.Njia ya kawaida ☐ 2.Njia ya upasuaji ☐ 3. Alipasuliwa tumboni ☐ 4. Alijifungua kwa kuvutwa na vacuum ☐ 5.Alijufungua kwakusaidiwa mtoto alietanguliza makalio ☐ Njia nyenginezo……
12.	Umri wa mimba wakati mama anajifungua (wiki)	
13.	Aliemsaidia kujifungua	**1.**Daktari ☐ 2.Mkunga ☐ 3.Msaidizi wadaktari ☐ 4.Daktarimwanafunzi ☐ 5.Daktari wamagonjwa ya kina mama ☐ 6.Mkunga wajadi ☐ 8. Wengineo……..
14.	Hali ya mama baada ya kujifungua	1.Aliruhusiwa nyumbani ☐ 2.Amefariki ☐