Risk factors for perinatal mortality at Muhimbili national hospital, Dar es salaam Tanzania: un-matched case control study

Alunyo A. Lukoya, MD

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RISK FACTORS FOR PERINATAL MORTALITY AT MUHIMBILI NATIONAL HOSPITAL, DAR ES SALAAM TANZANIA: UN-MATCHED CASE CONTROL STUDY

By

Alunyo A. Lukoya

A Dissertation Submitted in (Partial) Fulfillment of the Requirements for the Degree of Master of Medicine (Obstetrics and Gynecology) of the Muhimbili University of Health and Allied Sciences

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CERTIFICATION

The undersigned certifies that he has read and hereby recommends for acceptance by Muhimbili University of Health and Allied Sciences a dissertation entitled*:* ‘‘**Risk factors for perinatal mortality at Muhimbili university: Unmatched case-control study’’,** in (Partial) Fulfillment of the Requirements for the Degree of Master of Medicine in Obstetrics and Gynecology of the Muhimbili University of Health and Allied Sciences.

_____

Dr. Furaha August MD. M.MED Ph.D.

(Supervisor)

_____

Date

_____

Dr. Sabria Rashid MD. M.MED

(Co-Supervisor)

_____

Date

DECLARATION AND COPYRIGHT

I, **Dr. Alunyo Alfred Lukoya,** 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 work to my Family, friends, benefactors and all those who help me along the way. I thank them all for the patience and support.

ABSTRACT

Background: Perinatal mortality is a sensitive indicator for maternal care. Understanding the risk factors for perinatal mortalityis key to reducing its incidence. There are many risk factors for perinatal mortality that act through complex and interrelated pathways. Intrapartum factors are the main risk factors for perinatal death at MNH, but very little is known on how much a role maternal and socio-demographic factors play in the incidence of perinatal death at MNH.

Methodology: This was a hospital based un-matched Case control study conducted at Muhimbili National Hospital between October 2016 and December 2016. Convenience,Non-probability method of sampling was employed whereby mothers with perinatal deaths are paired with two others who had live births as controls giving a case to control ratio of 1:2 and sample size of 240. Information including maternal Age, referral status, means of arrival at MNH, maternal level of education, marital status, parity, history of perinatal death, history of abortion, mode of delivery, birthweight of fetus, gestational age of the fetus, LNMP, interval between this birth and the preceding one, time of birth, week date of birth, history of hypertensive disorder, **history of diabetes mellitus** and number of ANC clinic visits were obtained by interviewing mothers, checking medical records and examining the babies. Bivariate and multivariate analysis were employed to determine the association between maternal socio-demographicfactors and perinatal death.

Results :A total of 1025 mothers delivered at MNH during the study period, 107 were perinatal deaths and 918 live births. A sample of 240 mothers was selected of which 80 were cases and 160 were controls. Four factors were found to have significant association with perinatal mortality; Gestation Age<37wks (AOR2.53; CI1.1-5.83: p-0.030), Spontaneous Vaginal Delivery (AOR3.7; CI 1.017 – 7.21p-0.001), Birth Weight<2500g (AOR2.3; CI1.03–5.25: p-0.04), and maternal Diabetes Mellitus (AOR 3.44; CI1.077–15.98: p-0.036).

Conclusion: Our Study found that the risk of perinatal death at MNH was high among Diabetic mothers, Babies born by Spontaneous Vaginal Delivery, babies born before 37 completed weeks, and babies with birth weight <2500g. Maternal Hypertension, baby sex, number of ANC attendance weekend birth, maternal age and birth interval were not significant.

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ABBREVIATIONS

ACOG	American College of Obstetricians and Gynaecologist
CI	Confidence Interval
CS	Caesarean Section
END	Early Neonatal Death
LBW	**Low Birth Weight**
MNH	Muhimbili National Hospital
MUCHS	Muhimbili University Collage of Health Sciences
MUHAS	Muhimbili University of Health and Allied Sciences
NBS	National Bureau of Statistics
NBW	National Birth weight
RCOG	Royal Collage of Obstetrician and Gynaecologist
SBF	Still Birth Fresh
SBM	Still Birth Macerated
SID	**SuddenInfant Deaths**
TDHS	Tanzania Demographic Health Survey
UNICEF	United Nation Children Fund
WHO	World Health Organization

DEFINITION OF TERMS

Perinatal period: The perinatal period commences at 28 completed weeks of gestation and/or when the fetus weighs at least 1000g and ends at seven completed days after birth.

Perinatal death: Is defined as fetal death occurring in the period between twenty eight completed weeks of gestation and the first seven days of extra-uterine life. (And/or when the fetus weighs at least 1000g)

Stillbirth....Is defined as death of a fetus prior to the complete expulsion or extraction from its mother of a product of conception after 28 completed weeks of gestation or when the fetus is weighing 1000g or more.

Stillbirth fresh: is a still birth with an intact fetal skin and not mottled.

Stillbirth Macerated: Is a stillbirth with a fetal skin broken and mottled with signs of dis-integration.

Live born: Is the complete expulsion or extraction from its mother of a product of conception after 28 weeks of gestation or weighing 1000g or more and shows any sign of life such as breathing, beating of the heart or movement of voluntary muscle

Early Neonatal death: Is death of a live born baby as defined above before completing 7 days of extra uterine life?

Low Birth weight: Birth weight below 2500g

Premature birth: Birth before 37 completed weeks of gestation

Birth Interval: The interval between the current delivery (28 weeks of Gestation) and the last one also 28 weeks and above.

1.0 INTRODUCTION

In 1992, WHO redefined perinatal period as the interval beginning at 22 completed weeks of gestation to the first 7 days of extra uterine life. Death occurring during this period is referred to as perinatal death(1).In thedeveloping countries like Tanzania where there is luck of facilities to care for severely premature babies however,the definition remained as that period from 28 completed weeks of gestation to first seven days of life.

Perinatal mortality rates Varies not only between countries but also within countries and over time.The globalaverage ranges from 6/1000 in Scandinavia to 240/1000 in sub-Saharan Africa (1). In Tanzania the national average rate is 99/1000(2). In a national referral hospital in neighbouring Uganda the rate is 109/1000 (3) and at MNH the rate is 124/1000 birth(4). This differences usually run along socioeconomic strata of the family which is defined, among other things, by parental level of education, access to health services, ethnic and religious orientation(1).

While information on early neonatal deaths worldwide is still limited, more so is the information on stillbirths(5). Especially in the developing countries where it has received very little research and policy attention(6). This is probably because in many rural societies in Africa, perinatal death is not perceived as a problem and a mention of it is still treated as a taboo(7). This view was further entrenched when perinatal mortality was excluded from amongst the indicators of the **millennium development goals**(MDGs) of the UN despite it being a sensitive indicator of maternal care (8).

Risk factors of perinatal death are varied and interrelated, they affect perinatal mortality through complex and intertwine pathways which UNICEF grouped as proximal, intermediate and distal(8). The proximal factors are those affecting the mother directly like Age, weight, parity, pregnancy interval and pre-existing medical conditions such as Hypertension and diabetes; Intermediate factors are those related to the family in which the mother lives, this include marital status, religious affiliation, maternal and paternal level of education.; The distal factors includes literacy level in the community and availability, accessibility and affordability of quality health care services by the mothers.

Perinatal deaths fall in three categories; Stillbirth fresh(SBF), Stillbirth macerated(SBM), and Early neonatal death(END), all of them have the same obstetric origins and are linked to the availability and quality of obstetric care in the health facility(1). Despite be-

ing the biggest and well equipped health facility in the country,Intrapartum factors (a distal risk factor) is known to be the major risk of perinatal death at MNH(4)

Although a wealth of information on perinatal deaths has been accumulated over the last few years, there is yet to be an effective screening test that can detect , prevent and ultimately reduce perinatal mortality among pregnant mothers (9). However,improving the management of labour and neonatal care can dramatically decreases the incidence of perinatal death (10).

1.1 Literature review

Some studies have shown that the risk of perinatal death increases with advancing maternal age(11).Qazi et al reported that the long-held beliefs about the risks related to teenage pregnancy are not all justified(12).Yet other studies shows that the risk is higher among younger mothers(13). Ages of the mothers coming to deliver at Muhimbili national hospital has been progressively increasing over the years(14), this trend however contrast with that reported in the general Tanzanian population(15).**There is little literature relating the progressive rise in the ages of the mothers delivering at MNH and perinatal death.**

Tanzania demographic health survey defined interdelivery interval as the period between two consecutive live births,this period is deemed to be short if it is less than 18 month and long if it is 60 months or more, it also showed that the median birth interval in Tanzania is 36 months(2)**.** Pregnancy interval outside the optimal bracket of (18-59)months are significant risk factors for perinatal death(16). **It is not known if birth interval outside the optimal period is a significant risk factor for perinatal death among mothers delivering at MNH.**

Higher level of education was associated with reduced risk of perinatal mortality in a US study(17)**similar findings were observed in rural Nepal**(18) Other studies stresses that community literacy is far more effective at reducing perinatal mortality compared to individual level education(19)Low level of education and home delivery was a significant risk factor of perinatal mortality in rural Tanzania(20). **The influence of parental education on the risk of perinatal death among mothers delivering at MNH is not known**.

Being Young and single is not a risk factor for perinatal mortality(21)but other studies seems to dispute this findings (22).**There is no proper literature that explores association between maritalstatus and perinatal mortality in Tanzania.**

The prevalence of hypertensive disorder in pregnancy in Tanzania is high(23).and is a risk factor for perinatal mortality(24). Women who developed preeclampsia after 36 weeks of gestation have relatively lower risk of perinatal mortality and morbidity compared to those who develop it before 36 weeks(25). Hypertensive disorder was a significant risk for perinatal mortality at MNH ten years ago (4). Prematurity along with hypertensive

disorder was a major risk factor for perinatal death in a study around Dar es salaam(26) a Pakistani study (27)and a Kenyan study(28).

Unrecognized gestational diabetes increases risks of macrosomia, shoulder dystocia, and birth trauma(29)Mothers diagnosed late to have GDM in Zimbabwe had an increased risk of perinatal deaths(30). Use of insulin in diabetic mothers can significantly influence the perinatal outcome.(31). **There is no adequate literature on the risk of perinatal death among diabetic mothers at MNH**.

A review study concluded that there is no strong evidence linking ANC visits with good pregnancy outcome(32) yet other studies saw significant advantages in ANC visits(33).

Night birth was a high risk of perinatal death in a US study(34), Similar findings were observed in Sweden (35)Birth during holiday season was a risk factor for perinatal death in a UK study(36)Weekend birth was a Risk factor for perinatal death in Canada(37).**Literature on Holiday birth, weekend birth or night birth as risk factors for perinatal death at MNH is not available**.

The male gender of a fetus was an independent risk factor for still birth at the University of Tennessee, Memphis(38). Vital statistics data for the United States from 1922 to 1936 and from 1950 to 1972 shows that the risk of perinatal death was high among males than female babies.(39)

Higher level of education was protective against perinatal mortality in Nepal.(18) A similar finding was observed by Mpempeni in a study conducted in and around Dar es Salaam(26)

1.2 Problem Statement

Perinatal mortality is a good indicator of maternal care but is often ignored at both community and policy level(11). Although many risk factors associated perinatal death are known, they are mostly non-specific and often varies from one region to another and over time(4). A record based case control study at MNH 10 years ago concluded thatintrapartum factors are the major risk factors for perinatal death at MNH(6). But very little is known regarding Maternal and Sociodemographic risk factors for perinatal death at MNH.It is against this background that we designed this study to determine the maternal and sociodemographic risk factors associated with perinatal death at MNH.

1.3 Rationale

It is our hope that this study will shine light to risk factors of perinatal mortality among women delivering at MNH,provide bases for further investigation of perinatal mortality at MNH and other similar settings further afield and ultimately contribute to a criteria to screen for perinatal morality.

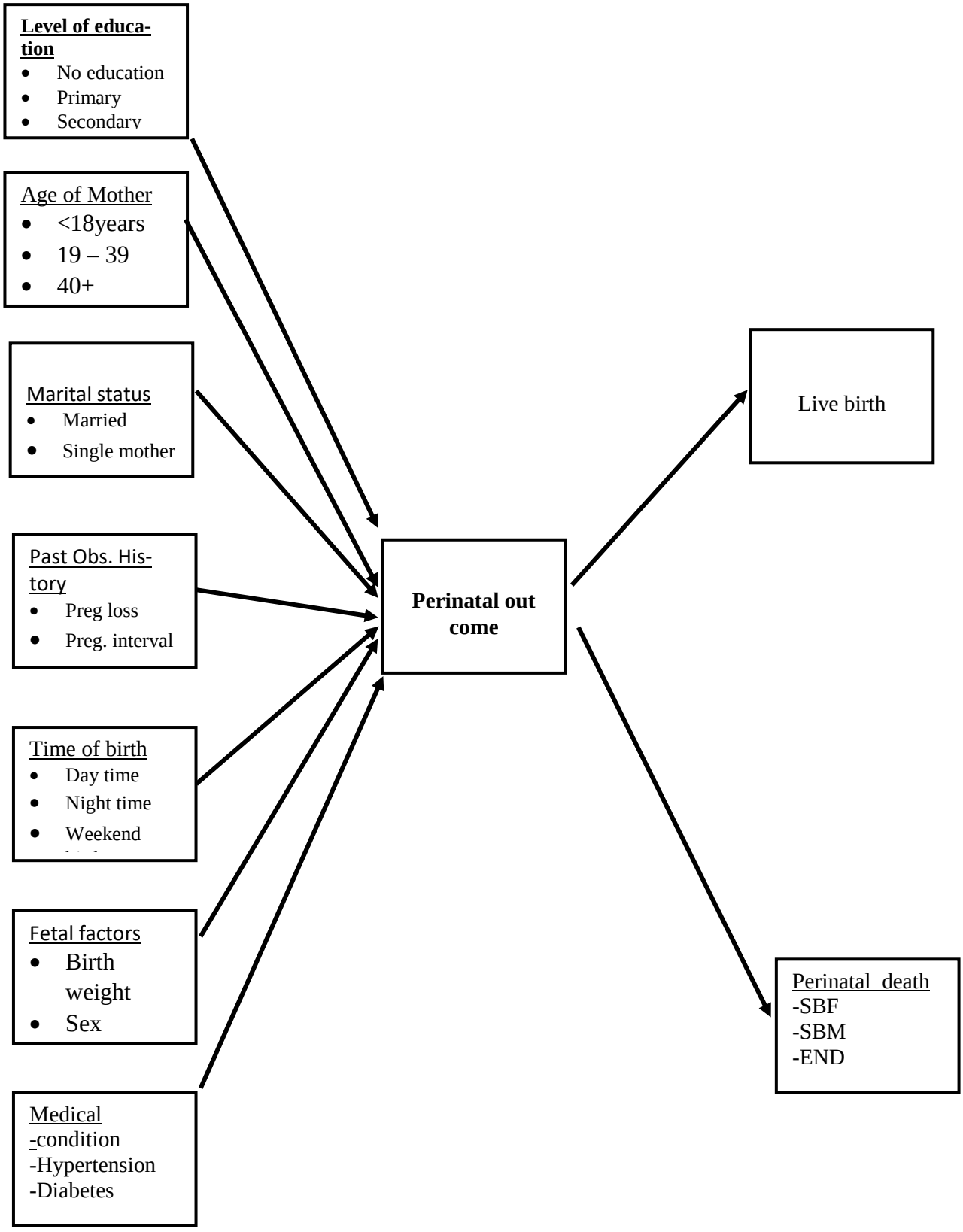


Figure 1: Conceptual Framework

Explanation of the conceptual frame work

This conceptual framework shows risk factors for perinatal death on the left (Independent variables) with arrows showing how the influence perinatal out On the right (Dependent variable)

1.4 Research Question

What are the maternal and socio-demographic risk factors for perinatal mortality among women giving birth at Muhimbili National Hospital?

1.5 Objectives

1.5.1 Broad objective

To determine the risk factors for perinatal death among women delivering at Muhimbili National hospital**from october 2016 through december 2016.**

1.5.2 Specific objectives

1. To determine the proportion ofperinatal deaths among women delivering atMNH.
2. To determine maternal and socio-demographic factors associated with perinatal deaths at MNH
3. To identify fetal and peripartum factors associated with perinatal deaths at MNH.

2.0 METHODOLOGY

2.1 Study design

Unmatched case control study

2.2 Study setting

This was a hospital based study conducted at Muhimbili National Hospital, the largest tertiary institution in Dar es SalaamTanzaniafrom October 2016 through December 2016. It also serves as a teaching hospital for MuhimbiliUniversity of Health and Allied Sciences (MUHAS). The Department of Obstetrics and gynaecology is one of 25 departments in the Hospital and conducts an average of 20 - 30 deliveries per day and more than half of which are born by Caesarean section. Vaginal deliveries are conducted in the main labour ward or the Eclampsia ward for mothers with severe preeclampsia or Eclampsia. The abdominal deliveries are conducted in the obstetric theatre which has 2 rooms. Both the theatre and the delivery rooms have adequate neonatal resuscitation equipment and is manned by experience midwifes and sometimes by the obstetrician on call. Babies with complication are sent to neonatal ward which is a 68 bed capacity unit housed in the same block as the labour ward. Healthy babies are discharged within three days of delivery or longer if the mother had complications. Stillbirth are released to the relative with a death certificate often within 24hours. Post-mortem inquiries are rarely performed.

2.3 Study population

This included all mothers who deliver at MNH during the study period.

Sample size 240participants of which 80 are cases and 160 are controls.

Sample size calculation was done using the fleiss formula

$$n = \left(\frac{r+1}{r}\right)\frac{(\bar{p})(1-\bar{p})(Z_{\beta}+Z_{\alpha/2})^2}{(p_1-p_2)^2}$$

Where;

n= the desired Sample size for the case group

r = ratio of controls to cases = 2:1

$\bar{p}$ =The average proportion exposed in the reference study.

Z_β= Desired power of the study. And for 80% power = 0.84,

Zα=Desired level of statistical significance. For 0.05 significance level= 1.96

p_1 = The proportion exposed in the case group in the reference study

p_2 = The proportion exposed in the control group in the reference study

The referrnce study used here was one done in Nepal(39).This paper was chosen because it was done in a similar setting using the same methodology. The predictor variable with the least extreme odds among the variables studied was the maternal level of Education with the ODDS ratio of 2.4

The values used are;

Proportion of controls exposed (p_2) = 0.324

Proportion of cases exposed (p_1) = 0.535

Least extreme odds ratio to be detected = 2.4

Control: Case ratio (r) = 2:1

Average proportion exposed ($\bar{p}$) = ($p_1 + p_2$)/2 = 0.535 + 0.324 /2 = 0.859/2 = 0.43

Zβ= for 80% power is = 0.84 and Zα= for 0.05 significance level = 1.96

$$n(number of cases) = (\frac{2+1}{2})\frac{(0.43)(1-0.43)(0.84+1.96)^2}{(0.535-0.324)^2}$$

Therefore substituting in the formula;

= 3/2 x 1.9216/0.044521=65 case

Number of Controls = 2 x number of cases= 2 x 65 = 130

Sample size = number of cases + number of controls= 130 + 65 = 195

Adding a 10% non-participation and rounding it up to a convenient figure gives a sample size of 240

Cases = 80

Controls = 160

Total = 240

2.4 Sampling technique

A non-probabilityconvenience sampling was used whereby all Perinatal deaths that occurred during the study period and two live births following each perinatal death were serially assessed for recruitment eligibility, those who met the inclusion criteria with no objection from the mother were recruited for the study. This was continued until the sample size of 240 participants was reached.

2.5 Inclusion criteria

All Singleton babies born at MNH during the study period,with gestational age of at least 28 completed weeks and/or birth weight of 1000g and above were considered eligible for the study.

2.6 Exclusion criteria

1. Cases whos controls were lost to tracing
2. Cases Whos mothers declined to consent
3. Babies whose mothers died in child birth.
4. Controls who later died within seven days of birth.

2.7 Data collection

A case was identified by observing the dead body and/or checking the death certificate of the fetus/neonate as soon as possible.Then the eligibility for recruitment is assessed by reviewing the record and/or examining the dead fetus.The mother is identified andcounselled by the counsellor, she is then asked to sign a written consent. The necessary information was collected using the questionnaire. Deaths in the neonatal ward were similarly processed. Fetal weight was taken using an electronic weighing scale and GA is corroborated with information from the mother, theANC card, or on rare occasions, using the Ballard gestationalage assessment tool. The next two live births born within 24 hours of the case are similarly processed and recruited as controls. The relevant information collected from the participating mothers included maternal age, referral status, means of arrival at MNH, level of education, marital status, parity, history of perinatal death, history of abortion, mode of delivery, Birthweight of fetus, gestational age of the fetus, LNMP, interval between this birth and the preceding one, time of birth, week date of birth, history of hy-

pertensive disorder, history of diabetes mellitus and number of times the mother attended ANC clinic. Being an unmatched case control study, a cases born by caesarean section was paired with controls born by spontaneous vaginal delivery and vice versa, a case born toan ecliptic motherwas paired with controls born to non-ecliptic mothers regardless of gestation age, birthweight or maternal condition. Controls recruited but discharged before 7 days were followed up with a phone call to the parents on day 7 post-delivery to make sure they survived the early neonatal period. Those who succumbed or could not be traced were excluded.

Sources of data

1. Interviews with Mothers and next of kin
2. From registry books in theatre, labor ward, Eclampsia ward neonatal ward and post natal ward.
3. ANC cards carried by the mothers.

Quality of data

The principle investigator cross checked all the data collected by the assistants for accuracy and completeness. Ambiguousinformation were corrected by repeat interviews either physically, by phone or by cross checking the data in the questionnairesagainst information available in hospital record and/or ANC card. Questionnaires missing critical information were excluded.

2.8 Data analysis

Data from coded questionnaires wereserially entered into SPSS programme version 20 until the sample size was completed. It was then cleaned and transformed accordingly. Frequency analysis was conducted to remove off layers and provide the descriptive statistics of the sample. Cross tabulation was employed to assess the sociodemographic characteristics of the participants. Variables with p-value of < 0.05 were considered to be significantly differentand are selected for further analysis. Bivariate analysis was performed to obtain the crude Odds ratio of the risk factors.

Those variables with p-value of <0.05 were considered significant and were included in the multivariate analysis to obtain the adjusted odds ratios. We considered variableswith

adjusted odds with p-values <0.05 asstrong independentrisk factors for perinatal death at MNH.

2.9 Ethical clearance

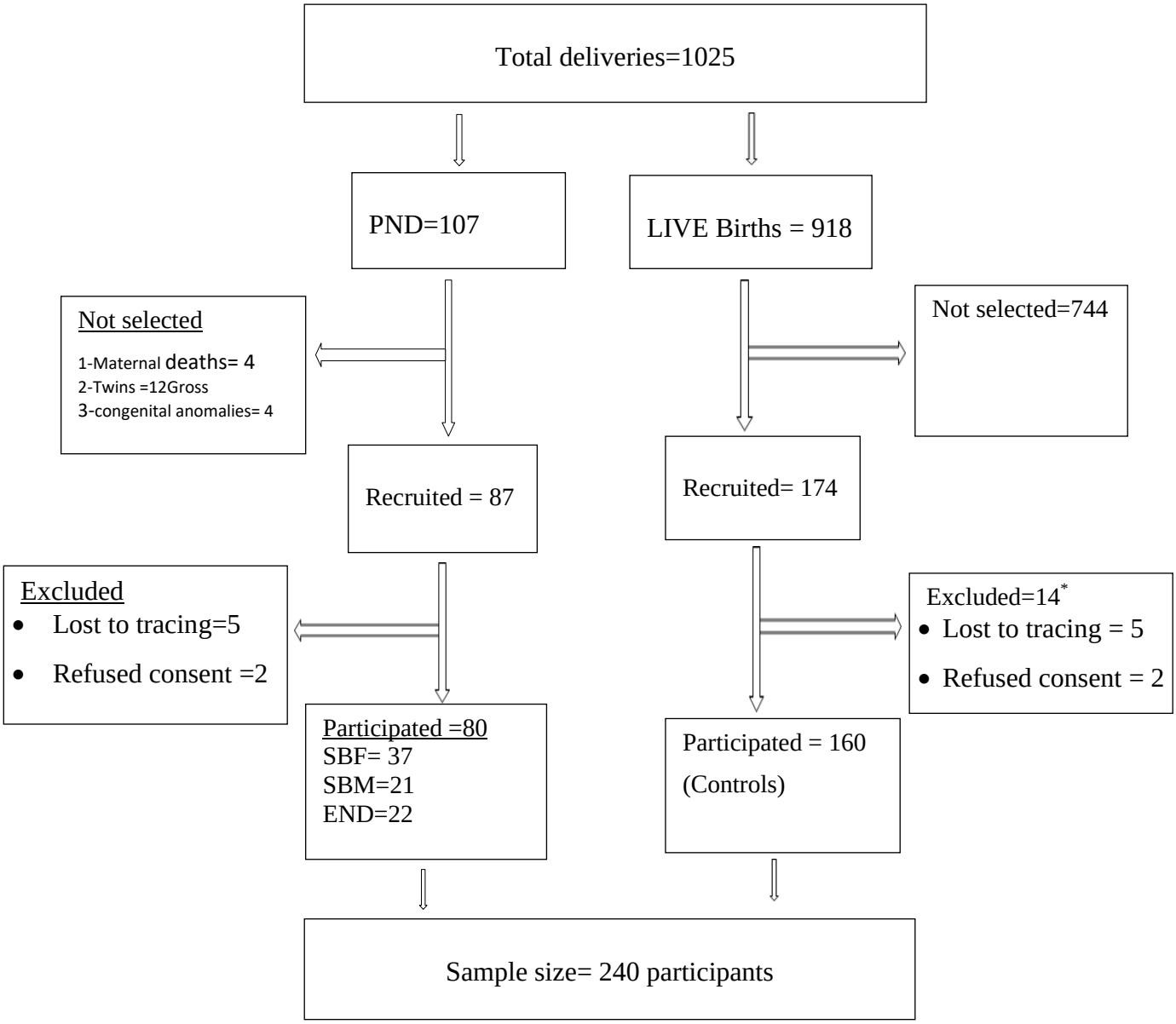
Ethical clearance was obtained from MUHAS research and publication committee, Permission to conduct the research was sought and obtained from the office of the Director of MNH and head of department of obstetrics and Gynaecology MNH.

2.10 Ethical consideration

A careful approach, cognisant of the sensitivity associated with the subject (perinatal death) was considered carefully. A trained counsellor was recruited for this specific task.Participants were informed on objectives of the study and their benefits before voluntarily signing a consent form. Nonames appeared on the questionnaire which enable freedom in giving valid answers and avoided fears. Telephone numbers were obtained from all participants in the study for the sole purpose of follow up until the end of the perinatal period.

3.0 RESULTS

During the study period 1025 deliveries were conducted at MNH of which 107 were perinatal deaths. Of these perinatal deaths, 20 did not qualify for inclusion (12 pairs of twins, four congenital anomalies and four maternal deaths). 7 met the exclusion criteria (in 5 cases the controls were lost to tracing and 2 mothers declined to consent)



* This controls were excluded because of the corresponding cases.

Figure 2: Selection flow chart

Table 1: Socio-demographic Characteristics of participants

	Total N=240	**Control N=160 (%)**	**Cases N=80 (%)**	**P-value**
Mothers level of education				
No formal Education	11	5(3.1%)	6(7.5%)	0.187
Primary education	127	80 (50%)	47(58.8%)	
Secondary Education	76	54(33.8%)	22(27.5%)	
University Education	26	21(13.1%)	5(6.2%)	
Mother marital status				
Single	34	28(17.5%)	6(7.5%)	0.036
Married	206	132(82.5%)	74(92.5%)	
Mothers age				
Mean /SD	28.3/6.04			0.711
<20	8	7(4.4%)	1(1.3%)	
20 - 29	137	92(57.5%)	45(56.2%)	
30 - 39	85	55(34.4%)	30((37.5%)	
40 and above	10	6(3.8%)	4(5.0%)	

The cases and the controls are not different except for the marital status where the p-value is <0.05.

Table 2: Descriptive statistics of perinatal Outcome among participants

Variable	Live birth	SBF	SBM	END	Total
GA					
<37 wks	58((36.3%)	26(70.3%)	16(76.2%)	17(77.3%)	117(48.8%)
37 wks +	102(67.7%)	11(29.7%)	5(23.8%)	5(22.7%)	123(51.2%)
Birth weight					
< 2500g	48(30%)	23(62.2%)	15(71.4%)	14(63.6%)	100((41.7%)
2500g +	112(70%)	14(37.8%)	6(28.6%)	8(36.4%)	140(58.3%)
Sex of the baby					
Female	65(40.6%)	23(62.2%)	11(52.4%)	12(54.5%)	111(46.3%)
Male	95(59.4%)	14(37.8%)	10(47.6%)	10(45.5%)	129(53.7%)
Weekend birth					
yes	24(15%)	13(35.1%)	6(28.6%)	5(22.7%)	48(20.0%)
No	136(85%)	24(64.9%)	15(71.4%)	17(77.3%)	192(80%)
Delivery Mode					
SVD	59((36.9%)	27(73%)	12(57.1%)	17(77.3%)	115(47.9%)
C/S	101(63.1%)	10(27%)	9(42.9%)	5(22.7%)	125(52.1%)

SBF=Still birth fresh, SBM=Stillbirth macerated, END=Early Neonatal death

Seventy percent of all the perinatal deaths were born by SVD of which 48.2% were SBF, 23% SBM and 32.7% END. The proportion of SBF and END occurring on weekend 27% and 10.4% respectively. There is a 50% rise in incidence of SBF on

Table 3: Bivariate Analysis of fetal and peripartum factors associated with perinatal deaths

Variable	Control N=160 (%)	Cases N=80 (%)		Crude OR 95% CI	P-value
Fetal sex					
Female	65(40.6%)	46(57.3%)	1		
Male (yes)	95(59.4%)	34(42.5%)	0.5	(0.294 – 0.871)	0.014
Gestational Age					
37 wks. or more	102(63.8%)	21(26.2%)	1		
<37 wks.	58(36.2%)	59(73.8%)	4.9	(2.73 - 8.942)	0.000
Birth weight					
2500g and above	112(70%)	28(35%)	1		
BW < 2500g (Yes)	48(30%)	52(65%)	4.0	(2.450 – 7.67)	0.000
Mode of Delivered					
Cesarean	101(63.1%)	24(30%)	1		
By SVD (yes)	59(36.9%)	56(70%)	4.0	(2.24 – 7.106)	0.000
Born on Weekend					
No	136(85%)	56(70%)	1		
Yes (yes)	24(15%)	24(30%)	2.4	(1.273 – 4.632)	0.007
Referral status					
Not Referred	34(21.2%)	8(10%)	1		
Referred (yes)	126(78.8%)	72(90%)	2.4	(1.067 – 5.530)	0.035
Time of birth					
Day	76(47.5%)	44(55%)	1		
Night	84(52.5%)	36(45%)	0.7	(0.43 – 1.269)	0.274*

* P value > 0.05 not significant

In the Bivariate analysis, the fetal and peripartum factors were significantly associated with perinatal death (p-values< 0.05) except for the time of birth where the p-value is > 0.05. All the significant factors are positively associated with perinatal mortality except for sex of the baby where it is negatively associated with perinatal death. Factors with particularly strong association with perinatal morality are GA< 37Wks (OR4.9; CI2.7 – 8.9), BW<2500g (OR4; CI2.5 – 7.7), and SVD (OR4.o; CI2.2 – 7.1).

Table 4: Bivariate analysis of Maternal and socio-demographic factors

Variable	Control N=160 (%)	Cases N=80 (%)	c OR (95% CI)	P-value
Hypertension				
No HT	119(74.4%)	39(48.8%)		
Hypertensive (yes)	41(25.6%)	41(51.2%)	3.1 (1.7 – 5.4)	0.000
Diabetes Mellitus				
No DM	155(96.9)	72((90%)		
Had DM (Yes)	5(3.1%)	8(10%)	4.2 (1.1 – 10.9)	0.035
Marital Status				
Single	28(17.5%)	6(7.5%)	0.4(0.15 – 0.97)	0.042
Married	132(82.5%)	74(92.5%)		
Attendance of ANC < x4				
4 or more visits	116(72.5%)	44(55%)		
< 4 visits (Yes)	44(27.5%)	36(45%)	2.2 (1.2 – 3.8)	0.007
Parity of the mother				
<4 pregnancies	118(73.8%)	54(67.5%)		
4 and above (Yes)	42(26.2%)	26(32.5%)	1.4 (0.8 – 2.4)	0.312*
Perinatal deaths* **				
H/o PND (Yes)	23(20.2%)	13(23.7%)		
No H/o PND	91(79%)	46(76.3%)	1.2 (0.6 – 2.6)	0.589*
Birth interval * **				
< 60 months	59(52.2%)	40(69%)		
60 months or more(yes)	54(47.8%)	18(31%)	0.7 (0.4 – 1.3)	0.034
21- 59 months *			0.7 (0.4 – 1.3)	0.233

* p values > 0.05 and are not significant

*** variables are not applicable to prema-para mothers.

All the maternal factors are found to be significantly related to perinatal mortality with P-values <0.05 except parity of the mother and and history of perinatal death. The most significant variable in this univariate analysis is maternal hypertension with (OR3.1;CI 1.7 – 5.4)

Table 5: Multivariate analysis of factors associated with perinatal deaths

Variable	Control N=160 (%)	Cases N=80 (%)		AOR (95% CI)	P-value
Fetal sex					
Female	65(40.6%)	46(57.3%)			
Baby was male (yes)	95(59.4%)	34(42.5%)	0.52	(0.3 – 1.1)	0.053
Gestation Age at Birth					
37 weeks or more	102(63.8%)	21(26.2%)			
GA <37WKs (yes)	58(36.2%)	59(73.8%)	2.53	(1.1 -5.8)	0.030*
Mode of Delivered					
Cesarean	101(63.1%)	24(30%)			
By SVD (yes)	59(36.9%)	56(70%)	3.7	(1.01 – 7.2)	<0.001*
Baby born on Weekend					
No	136(85%)	56(70%)			
Yes (yes)	24(15%)	24(30%)	1.64	(0.7 – 3.7)	0.234
Attendance ANC < x4					
4 or more visits	116(72.5%)	44(55%)			
Less than4 visits (Yes)	44(27.5%)	36(45%)	1.47	(0.7 – 2.9)	0.270
Mother Referral status					
Not Referred	34(21.2%)	8(10%)			
Referred (yes)	126(78.8%)	72(90%)	2.09	(0.8 – 5.6)	0.145
Birth weight					
2500g and above	112(70%)	28(35%)			
Less than 2500g (Yes)	48(30%)	52(65%)	2.33	(1.03 – 5.2)	0.042*
Diabetes Mellitus					
No	155(96.9)	72((90%)			
Mother had DM (Yes)	5(3.1%)	8(10%)	3.44	(1.1 – 16.0)	0.036*

* Independent risk factors for perinatal deaths at MNH.

All varriables with significant p-values were run through the multicolinearity test, none showed tollerance value of <0.10 (VIF>10). All these variables were then included in the multiple regression model.Four Factors showed significant association with the outcome variables with p-values < 0.05. they include GA<37wks (AOR2.53;CI 1.1 – 5.8), SVD delivery (OR3.7;CI 1.01 – 7.2), BW <2500g (OR2.3;CI 1.03 – 5.2), and Diabetes mellitus (OR3.44 ;CI1.1 – 16.0). only one variable showed a particularly significant contribution to the model with P-value <0.001

4.0 DISCUSSION

Perinatal Mortality ratio over the study period was 116/ 1000 live births. This is within the global range of (6 – 240 per 1000 live births)(1). And not far from the Tanzanian average of 99/1000(2). It also compares well with findings of 109 /1000 at a national referral hopital in Neighboring Uganda(2). But slightly lower than the 124/1000 figure reported at MNH by Kidanto 10 years earlier(4)**.**The proportions of SBF, SBM and END was 46.2% , 26.3%, and 27.5% respectively (table2).

Babies born prematurely were 2.5 times more likely to die compared to those born at term (table 5). The proportion and risk of perinatal death observed are lower than those reported by Kidanto ten years ago(4).but much higher than in Mpembeni's study(29), the pakistani study(30) and kenyan study(31).

The low figures especially that of SBF and END in comparison to kidantos study could mean an improvevment in the intrapartum and neonatal care in the facility over the preceding ten years since the study or a reflection of the streemlining of the referral system that has been implememented across the country in the intervening period which resulted into a significant reduction in the number of normal vaginal deliveries occuring at MNH as most of thenon complicated deliveries now occurr in the peripheries.

The high proportion seen in comparison to the pakistani and kenyan study could be a reflection of the referral status of MNHwhere high risk pregnancies with the associated premature births are sent to deliver but the lower risk implies better quality of maternal and neonatal care. The difference with the Mpembeni's study is probably because the cut off for prematurity in that study was (GA < 35 weeks) hence mortality was higher than ours where the prematurity cut off was 37 weeks.

However our study did not differentiate early neonatal death that occured that occured on delivery and those that occurred in the neonatal unit in order to attribute the intervention of the neonatal unit in preventing the early neonatal deaths.14.5% of prematures in our study sample died in the early neonatal period and almost all were born by SVD(table 2).We noted that distinguishing preterm births that were spontaneous from those that are provider-initiated due to some complication would have shone light on the quality of perinatal care at at MNH during the study period,unfortunately, we did not capture this information in our study. This information would have indicated the quality of

obstetric care and the impact it had in reducing perinatal mortality among prematurely born babies at MNH.

Single mothers made up14% of the participants and their average age was 26.7 years. Babies born to single mothers were less likely to die compared to those born to married mothers(table 4), however, this risk becomes insignificant in the multivariate analysis.This finding contrast sharply with that made by Walraven GELE where he sugested that perinatal death is higher among single mothers because they are often young, lack insurance cover and has higher risk of STD with the associated premature birth(26). This findings however isinconsistent with observation made byRantakallioa where he reported that perinatal mortality was decreasing despite the rising number of young and single mothers after adjusting for other factors(21).Logically though, any support a man gives to his pregnant spouse should lower the risk of perinatal death which is not the case here, this bizarre picture can be explain by either the possibility that husbands interfered negatively with their wives reproductive lives or perhaps most of the mothers who reported to be married might have been single after all. This notion was supported by the findings in a random sample of fifty mothers we surveyed after the study to assess the amount of support they get from their spouses, 80% of the marriages reported turned out to be nominal in terms of the support the men gives to the women. The wrong marital identity could be because of the stigma women here attach to having children out of wedlock. Promoting access to care and targeting unmarried mothers-to-be with the goal of educating, increasing awareness, and providing resources for proper obstetrical and maternal may reduce the risk of perinatal death resulting from a mother being single.

In our study, the overall prevalence of hypertensive disorders was 34.1% (Table 4). This is far higher than the 10% among the pregnant population in Tanzania(23)The difference is probably because Muhimbili is a referral hospital where complicated pregnancies including hypertension are referred.However, hypertension was not an independent risk factor for perinatal death in our study unlike the finding by Buchbindar(24) and Gul(25)hypertensive disorder affects perinatal mortality through complications like IUGR, preterm birth and low birth weights which were significant risk factors for perinatal deaths in this study.

The Proportion of diabetes among participants in this study was 54/1000 births (table 4). And the risk of perinatal death among diabetic mothers was 4.2 times that among non-

diabetics(table 5). This finding is consistent with other studies done by Adams (35) and De-Muylder Xavier(36).It is worth noting that the Risk of perinatal death among diabetic pregnant mothers depend on weather the mother is on treatment or not(31),this study however did not determine if the mothers were on treatment or not hence could not attribute the risk observed in relation to diabetes appropriately.

Only 33.3% of the participating mothers visited ANC clinic less than 4 times and the frequency of ANC visits was not an independent risk factor for perinatal death (table5). This was consistent with Haws et al conclusion that there is no strong evidence linking ANC visits with good pregnancy outcome(32). It is known that the quality of ANC services are far more significant than the number of ANC visits (18),this may explain why ANC visit was not an independent risk factor for perinatal death in the multivariate analysis. Assessing the quality of ANC visits was however outside the scope of this study.

The proportion of babies born by SVD was 48% and proportion of PND among babies born by SVD was 23.5%, 10.4% and 14.8% for SBF, SBM and END respectively (Table 2). The adjusted Odds of perinatal deaths among babies born by SVD was almost 4 times that of babies born by C/S (table 5). This finding are consistent with Kidanto's study(4). However, the high risk of PND among babies born by SVD cannot bewholly attributed to the mode of delivery because some of the SVDs were IUFDs (SBM) which were preferably delivered by SVD.Knowing that both SBF and END have their origins in the intrapartum period(1), their proportion probably correspond to the quality of care during delivery. By this logic and relative to the proportions observed by Kidanto ten years ago (4), it is reasonable to speculate that there has been a remarkable improvement in the quality of care at MNH over the last ten years thogh streamlining of the referral system across the country over the same period of time could have reduced the number of vaginal deliveries at MNH since most of them now deliver in the peripheral hospitals.

Though not independent risk factors for perinatal death, weekend birth and night birth were significant risk factors in the bivariate analysis and babies born on weekendswere twice more likely to die compared to those born on week days ((table 3). This is consistent with a study conducted inwales-UK between 1993 -1998where there was an increased risk of perinatal death among babies born at night and during months of vacations(41). The quality of care at MNH probably deteriorates at night and during weekends because, un-

like the weekdays, only the team on call and often inexperienced residents are available on weekends and night.

The proportion of LBW babiesamong participants in this study was 41.6% of which 12% were born at term (table2) implying intra Uterine Growth Retardation. The proportion of perinatal death among low birth weight babies in our study was 52/100and the proportion of LBW and IUGR is significantly higher in our studies compared to study by Mpembeni(30) this disparity can be attributed to the referral status of Muhimbili hospital where high risk pregnancy with resulting LBW are referred. Low birth weight babies were 2.3 times more likely to die compared to normal weight babies, this is lower butconsistent with the findings by Kidanto 10 years earlier(4)

Baby sex was not an independent risk factor for perinatal death but on bivariate analysis Male babieswere0.51 times more likely to die compared to female babies. This contrast with the findings by Hadad et al where the male sex was an independent risk factor for perinatal death(38) also contrast the study by yeo et al (42) but is consistent with the finding by Casalaz et al(43).

The mean birth interval of the participants was 55.7 months and SD35.27. This is higher than the Tanzania average of 36 months(2)Mothers with Birth interval of 20-59 were less likely to have a perinatal death compared to those outside this bracket and mothers with birth interval of more than 60 month were less likely to have a perinatal death compared to mothers with intervals of less than 60 months(table 4).This implies that perinatal mortality decreases with increasing maternal age up to a certain maximum beyond which it begins to increase. However, when either of the categories were adjusted for other variables, the risk becomes insignificant. This finding was consistent with a systematic review from 17 developing countries(16)in which the risk of perinatal deaths decreases with increasing birth interval up to 36 months. This observation is explained by a theory implicating chronic malnutrition among mothers with shorter birth interval(16).

Perinatal mortality drops with the higher level of **education attained**, but there was no statistically significant difference between cases and controls.(table 1).

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusion

The major risk factors for perinatal mortality at Muhimbili national hospital are premature birth, low birth weight, vaginal delivery and maternaldiabetes. MNH being a referral hospital, it can practically do little to prevent premature birth and low birth weight infants as most of the mothers arrive when they are already in labor. It can only increase the chances of survival of those babies by emphasizing proper intrapartum and post-partum management of premature birth and low birth weights.

5.2 Recommendations

1. There is need for further evaluations of the aspects of vaginal delivery responsible for perinatal mortality Reduce mortality
2. There is need for an in-depth look weather the improvements made in the Neonatal care over the last ten years had impact on perinatal mortality.
3. Although there was no significant difference in the level of education between cases and controls, there is a clear inverse relationship between level of education of the mother and perinatal mortality among both cases and controls hence emphasis of girl child education is important

5.3 Study Limitations

1. Some important independent variables associated with perinatal mortality (e.g. pre-pregnancy BMI) could not be studied because most women did not know their weights before conceiving.
2. It was difficult to establish Gestational diabetes from preexisting diabetes because most mothers come to ANC after20 weeks of gestation. ,
3. Since this was a hospital-based study, it might not be a reliable reflection about the general population.
4. Like any other case control study, this study might have suffered a recall bias since most participants tend to not recall correctly their past experience.

5.4 Mitigation Strategy

- Cross checking the information obtained with ANC record and interviewing a next of kin minimized the recall bias
- We did not include the duration of a medical conditions such as Diabetes and hypertension in our analysis and clearly recognize that limitation in the interpretation of the finding.
- All non-participants discharged before 7 days after delivery were presumed to have survived the perinatal period. This may not be entirely true

REFERENCES

1. World health organization. Neonatal and perinatal mortality [Internet]. world health organisation. 2006. Available from: http//:www.who.int

2. MoHCDGEC. Tanzania Demographic and Health Survey and Malaria Indicator Survey [Internet]. 2015. Available from: https://www.dhsprogram.com/pubs/pdf/FR321/FR321.pdf

3. Musooko M, Kakaire O, Nakimuli A, Nakubulwa S, Nankunda J, Osinde MO, et al. International Journal of Gynecology and Obstetrics Incidence and risk factors for early neonatal mortality in newborns with severe perinatal morbidity in Uganda. Int J Gynecol Obstet [Internet].

4. Kidanto HL, Massawe SN, Nystrom L, Lindmark G. Analysis of Perinatal mortality at a teaching hospital in Dar es Salaam, Tanzania, 1999-2003. Afr J Reprod Health [Internet]. 2006 [cited 2017 May 19];10(2).

5. Stanton C, Lawn JE, Rahman H, Wilczynska-Ketende K, Hill K. Stillbirth rates: delivering estimates in 190 countries. Lancet. 2006;367(9521):1487–94.

6. McClure EM, Nalubamba-Phiri M, Goldenberg RL. Stillbirth in developing countries. International Journal of Gynecology and Obstetrics. 2006. p. 82–90.

7. Sisay MM, Yirgu R, Gobezayehu AG, Sibley LM. A Qualitative Study of Attitudes and Values Surrounding Stillbirth and Neonatal Mortality Among Grandmothers , Mothers , and Unmarried Girls in Rural Amhara and Oromiya Regions , Ethiopia : Unheard Souls in the Backyard. 2014;

8. State THE, The OF. THE STATE OF THE WORLD ' S CHILDREN 2009 Maternal and. 2009.

9. Smith GC, Fretts RC. Risk factors for Stillbirth in the UK. Lancet. 2007;370(9600):1715–25.

10. Ngoc NTN, Merialdi M, Abdel-Aleem H, Carroli G, Purwar M, Zavaleta N, et al. Causes of stillbirths and early neonatal deaths: Data from 7993 pregnancies in six developing countries. Bulletin of the World Health Organization. 2006. p. 699–705.

11. Thi N, Ngoc N, Merialdi M, Abdel-aleem H, Carroli G, Purwar M. Causes of stillbirths and early neonatal deaths: data from 7993 pregnancies in six developing countries. 2006;27300(5):699–705.

12. Qazi G. Obstetric and perinatal outcome of teenage pregnancy. J Coll Physicians Surg Pakistan. 2011;21(3):142–5.

13. A TS, Kumar N. Socio demographic factors affecting perinatal mortality- A study in a rural setup. 2012;2(4):43–6.

14. Muganyizi PS, Kidanto HL. Impact of change in maternal age composition on the incidence of Caesarean section and low birth weight: analysis of delivery records at a tertiary hospital in Tanzania, 1999-2005. BMC Pregnancy Childbirth. 2009;9:30.

15. Tanzania Bureau of Statistics and Macro International. Tanzania Demographic and Health Survey 2010 [Internet]. National Bureau of Statistics Dar es Salaam, Tanzania ICF Macro Calverton, Maryland, USA. 2010.

16. Conde-agudelo A, Rosas-bermúdez A, Kafury-goeta AC. Birth Spacing and Risk of Adverse Perinatal Outcomes. 2008;

17. Gage TB, Fang F, O'Neill E, DiRienzo G. Maternal Education, Birth Weight, and Infant Mortality in the United States. Demography. 2013;50(2):615–35.

18. Kc A, Nelin V, Wrammert J, Ewald U, Vitrakoti R, Baral GN, et al. Risk factors for antepartum stillbirth: a case-control study in Nepal. BMC Pregnancy Childbirth [Internet]. BMC Pregnancy & Childbirth; 2015;1–10.

19. Kravdal Ø. Child mortality in India: the community-level effect of education. Popul Stud (NY) [Internet]. 2004;58(2):177–92.

20. Walraven GELEL, Mkanje RJB, Roosmalen J, van Dongen PWJ, Dolmans WMV, Mkanje " RJB, et al. Perinatal mortality in home births in rural Tanzania. Eur J Obstet Gynecol Reprod Biol [Internet]. 1995 Feb [cited 2017 May 19];58(2):131–4.

21 Rantakallioa P, Ojab H. Perinatal risk for infants of unmarried over a period of 20 years. 1990;22:157–69.

22. Amini SB, Catalano PM, Mann LI. Births to unmarried mothers: Trends and obstetric outcomes. Women's Heal Issues. 1996;6(5):264–72.

23. Hutcheon JA, Lisonkova S, Joseph KS, Al. E. Epidemiology of pre-eclampsia and the other hypertensive disorders of pregnancy. Best Pract Res Clin Obstet Gynaecol [Internet]. McGraw Hill Medical, Toronto; 2011 Aug [cited 2017 May 26];25(4):391–403.

24. Buchbinder A, Sibai BM, Caritis S, MacPherson C, Hauth J, Lindheimer MD, et al. Adverse perinatal outcomes are significantly higher in severe gestational hypertension than in mild preeclampsia. Am J Obstet Gynecol [Internet].

25. Gul A, Cebeci A, Aslan H, Polat I, Ozdemir A, Ceylan Y. Perinatal outcomes in severe preeclampsia-eclampsia with and without HELLP syndrome. Gynecol Obstet Invest. 2005;59(2):113–8.

26. Mpembeni RN, Mpembeni R. Perinatal Mortality and Associated Factors Among Deliveries in Three Municipal Hospitals of Dar Es Salaam, Tanzania. J Pediatr Neonatal Care

27. Jehan I, Harris H, Salat S, Zeb A, Mobeen N, Pasha O, et al. Neonatal mortality, risk factors and causes: A prospective population-based cohort study in urban Pakistan. Bull World Health Organ. 2009;

28. Marchant T, Willey B, Katz J, Clarke S, Kariuki S, ter Kuile F, et al. Neonatal Mortality Risk Associated with Preterm Birth in East Africa, Adjusted by Weight for Gestational Age: Individual Participant Level Meta-Analysis. PLoS Med.

2012;9(8).

29. Adams KM, Li H, Nelson RL, Ogburn PL, Danilenko-Dixon DR. Sequelae of unrecognized gestational diabetes. Am J Obstet Gynecol [Internet]. 1998;178(6):1321–32.

30. Muylder X De. Perinatal complications of gestational diabetes : the influence of the timing of the diagnosis. 1984;18:35–42.

31. Vitoratos N, Vrachnis N, Valsamakis G, Panoulis K, Creatsas G. Perinatal mortality in diabetic pregnancy. Annals of the New York Academy of Sciences [Internet]. Blackwell Publishing Inc; 2010 [cited 2017 May 27]. p. 94–8.

32. Haws RA, Yakoob MY, Soomro T, Menezes E V, Darmstadt GL, Bhutta ZA. Reducing stillbirths: screening and monitoring during pregnancy and labour. [cited 2017 May 21];

33. Both C Von, Fle S, Makuwani A, Mpembeni R, Jahn A. BMC Pregnancy and Childbirth How much time do health services spend on antenatal care ? Implications for the introduction of the focused antenatal care model in Tanzania. 2006;9:1–9.

34. Gould JB, Qin C, Marks AR, Chavez G. Neonatal mortality in weekend vs weekday births. JAMA. 2003;289(22):2958–62.

35. Stephansson O, Dickman PW, Johansson AL V. Time of Birth and Risk of Intrapartum and Early Neonatal Death. 1997;218–22.

36. Stewart JH, Andrews J, Cartlidge PH. Numbers of deaths related to intrapartum asphyxia and timing of birth in all Wales perinatal survey, 1993-5. BMJ [Internet]. 1998;316(7132):657–60.

37. Luo ZC, Liu S, Wilkins R, Kramer MS. Risks of stillbirth and early neonatal death by day of week. CMAJ. 2004;170(3):337–41.

38. Haddad B, Mercer BM, Livingston JC, Sibai BM. Obstetric antecedents to apparent stillbirth (Apgar score zero at 1 minute only). ObstetGynecol. 2001;97(6):961–4.

39. Grav HJ. Tromso, Tromso,. 1979;204(APRIL):89–91.

40. Gordon A, Raynes-greenow C, Mcgeechan K, Morris J, Jeffery H. Risk factors for antepartum stillbirth and the influence of maternal age in New South Wales Australia: A population based study. 2013 [cited 2017 May 27];1–10.

41. Siersted HC, Stewart JH, Andrews J, Cartlidge PHT. Commentary : Improving the diagnostic rate in asthma : a community issue Numbers of deaths related to intrapartum asphyxia and timing of birth in all Wales perinatal survey , 1993-5. 1998;657–60.

42. Yeo CL, Tudehope DI. Outcome of resuscitated apparently stillborn infants : A ten year review. 1993;(November):129–33.

43. Casalaz DM, Marlow N, Speidel BD. Outcome of resuscitation following unexpected apparent stillbirth. 1998;112–6.

APPENDICES

Appendix I: Questionnaire English Version

S/N^{0} {key: case=Cs Control 1=Ct1 Control2= Ct2}

TEL: OF RESPONDENT…… Date .....

For (a) above state the Recorded cause of death.....

Q #	Question	Answers	Code
1. 1.	Age	State Current age in complited years_____ <16 ☐ 17-20 ☐ 21-25 ☐ 26-30 ☐ 31-35 ☐ >35 ☐ State Age at first pregnancy _____ <16 ☐ 17-20 ☐ 21-25 ☐ 26-30 ☐ 31-35 ☐ >35 ☐	
2.	How did you come to MNH	Referral status : Referred C☐me from home ☐ Means of Arrival; Amblance ☐ Private ☐Public ☐ walking ☐	
3.	What is the highest grade you have completed?	no school ☐ primary school: ☐ Completed ☐ not completed Sec School ☐ Completed ☐ not completed University ☐ Completes ☐ Not completed Madrassa ☐ Completed ☐ not completed Specify standard.....	
4.	What is the Education status of the father	no school ☐ primary school: ☐ Completed ☐ Not completed Sec School ☐ Completed ☐ Not completed University ☐ Completes ☐ Not completed Madrassa ☐ Completed ☐ Not completed Specify standard	

5.	What is your marital status now?	Single ☐ married/inunion ☐ widowed ☐ Divorced ☐ Separated ☐	
6.	What is the main material of the floor Record observation	Items yes no Earth/sand Floor1 2 ☐ ☐ Dung Floor 12 ☐ ☐ Wood planksfloor 1 2 ☐ ☐ Palm/bamboo floor 1 2 Polished wood ☐ ☐ 1 2 ☐ ☐ Ceramic tiles 1 2 ☐ ☐ Cement 1 2 ☐ ☐ Carpet 1 2 ☐ ☐ Other (specify) ..... 1 ☐ 2 ☐	
7.	What is the principle wall material of your house	Palm trunks 1 ☐ 2 ☐ Tin 1 2 ☐ ☐ Brics, cement blocks, 1 ☐ 2 ☐ Other materials 1 ☐ 2 ☐	
8.	What is the priciple roofing material of your house ?	Grass, palm frons 1 ☐ 2 ☐ Iron sheet/tiles/concrete 1 ☐ 2 ☐ Other materials 1 2 ☐ ☐	
9.	Do members of your family own	Agricultural land 12 ☐ ☐ Residential house 1 2 ☐ ☐	
10.	What is the main source of drinking water for Members of your household?	piped into dwelling 1 2 ☐ ☐ piped into yard/plot 1 2 ☐ ☐ public tap 1 2 ☐ ☐ open well in yard/plot 1 2 ☐ ☐ open public well 1 2 ☐ ☐ yard/plot 1 2 ☐ ☐ protected public well 1 2 ☐ ☐ surface water 1 2 ☐ ☐ spring 1 2 ☐ ☐ river/stream 1 2 ☐ ☐ pond/lake 1 2 ☐ ☐ dam 1 2 ☐ ☐ rainwater 1 2 ☐ ☐ tanker truck 1 2 ☐ ☐ bottled water 1 2 ☐ ☐	

11.	What type of fuel do you mainly use for cooking in your household?	electricity 1 2 lpg/natural gas 1 2 biogas 1 2 kerosene 1 2 charcoal 1 2 firewood, straw 1 2 dung 1 2	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	
12.	What is the principle type of toilet used by your family	Septic tank/Siphone 12 Pit Latrin 12 Hanging Latrin 12 Bush Field 12 Other type 12	☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐	
13.	Do you or any member of your household own:	yes no radio 1 2 Television 1 2 bicycle 1 2 motorcycle/scooter 1 2 car/truck 1 2 tractor 1 2 animal-drawn cart 1 2	☐ ☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐ ☐	
14.	How many children (both live and stillborn) did you give birth to?	Total No of pregnancies .....Children alive..... Pregnancies below 28 weeks..... above 28 Weeks..... Live births ..... Still births..... SBF .....SBM.....END.....			
15.	What is the mode of delivery and weight of the baby	Mode of delivery.....☐SVD C/S ☐ A-VD ☐ State the weight of baby in grams _____			
16.	What is the sex of the Baby	Male..... 1 ☐ Female.....…2 ☐			
17.	What is the interval between the current baby and the birth of the last	State the interval in Months_____ ☐<12months12 to 18 month ☐ 19 to 36 month ☐			

	baby (carried beyond 28 weeks)	☐ 37 to 48 month 49 to 60 month ☐ ☐60 month		
18.	For how long did you carry the current pregnancy	LNMP..... Date of birth..... ☐<28 weeks ☐ 28 to 36 37 to 40 weeks2 ☐ ☐40 to 42 weeks More than 42 weeks ☐		
19.	Was this your first pregnancy	Yes No ☐ ☐		
20.	Have you ever lost a pregnancy before	Yes No ☐ ☐ IF yes at what gestation age:< 2828 ☐ ☐		
21.	In the previos pregnancy did you have: (tick)	Syphilis ☐ Gonorrhea, ☐ Malaria ☐ Others_____		
22.	At what time was your baby born (current baby)	Write the exact time here _____ Between 8am and 8 pm ☐etween 8 pm and 8 am ☐		
23.	What date of the week was the baby born	Between Monday 8am and Saturday 8am ☐ Between Saturday 8 am and Monday 8 am ☐		
24.	During this pregnancy, did you suffer from any of these problems? (check ANC card)	a-Hypertension: Ye☐ No ☐ If Yes state,P/Eclampsia☐ Eclampsia ☐ CrHT PIH☐ ☐ b- Diabetes melitus: ☐Yes No ☐ ☐Before 20wks ☐20+wks c- HIV infection ☐Yes ☐		
25.	Many times did you atend ANC (Check card)	Not at all ☐ Once ☐ twice ☐ thrice ☐ four times ☐ five times or more ☐		

Appendix II: Questionnaire (Kiswahilli Version)

				ID CODE

NAMBA YA SIMU YA ANAYEJIBU ……

HII NI: (a) A CASE…… (b) A CONTROL …….

Swali Na.	**Swali**	**Codes**	**Nenda**
1. 1.	Una umri gani sasa?	Andika miaka katika namba nzima	
2.	Ulishawahi kwenda shule?	Ndio .....1 Hapana.....2	Kama ni Hapana nenda na.4
3.	Ni kiwango gani cha juu cha elimu ulichomaliza?	Hujaenda shule.....1 Hujamaliza elimu ya msingi.....2 Umemaliza elimu ya msingi.....3 Hujamaliza shule ya sekondari.....4 Umemaliza sekondari.....5 Chuo Kikuu.....6 Madrasa.....7 Vyingine.....8 (Eleza)	
4.	Baba yako amefikia kiwano kipi cha elimu?	Hajaenda shule.....1 Hajamaliza elimu ya msingi.....2 Amemaliza elimu ya msingi.....3 Hajamaliza shule ya sekondari.....4 Amemaliza shule ya sekondari.....5 Chuo Kikuu.....6	

		Madrasa.....7 Nyingine.....8	
5.	Je Umeoa/kuolewa au la?	Hujaoa/hujaolewa.....1 Nimeolewa/.....2 Mjane.....3 Taraka.....4 Tumeachana 5	
6.	Ni nini kifaa kikuu cha sakafu? Nakili yaonekanayo	NDIO HAPANA Jumla Sakafu halisi Mchanga1 2 Mbolea1 2 Sakafu ya muda Mbao1 2 Miti1 2 Sakafu iliyomalizika Sakafu ya paraquet au Sakafu iliyong'arishwa Mbao1 2 mistari ya lami1 2 vigae vya kauri1 2 simenti1 2 kapeti 1 2 NYINGINEYO (ELEZEA).....	
7.	Ni kipi chanzo kikuu cha maji ya kunywa kwa wanafamilia wako?	Maji ya kusukumwa kwenye mpira Maji ya kusukuma mpaka nyumbani ..... 11 Maji ya kusukuma hadi kiwanjani ..... 12 Bomba ya jamii ..... 13 Maji kutoka kisimani Kisima wazi kiwanjani ..... 21 Kisima wazi cha jamii nzima ..... 22 Maji kutoka kisima kilichositirika/kufunikwa kwenye Kiwanja ..... 31 Kisima cha jamii kilichositiriwa..... 32 Maji ya juu ya ardhi Chemichemi..... 41 Mto ..... 42 Ziwa ..... 43 bwawa ..... 44 Maji ya mvua ..... 51 Gari lenye tenki 61	

		Maji ya chupa 71	
8.	Unatumia chanzo kipi cha moto kupikia nyumbani kwako?	Umeme ..... 01 Gesi..... 02 Biogesi..... 03 Mafuta ya uto ..... 04 Mkaa ..... 05 Kuni ..... 06 samadi..... 07 nyingineyo..... 08 (elezea)	
9.	Je, yeyote katika familia yako anamiliki :	Ndio hapana Redio..... 1 .....2 Simu ya mkononi..... 1 ..... 2 Baiskeli ..... 1 ..... 2 Pikipiki.....1 ..... 2 Gari/lori ..... 1 ..... 2 Trekta ..... 1..... 2 Gari za wanyama..... 1..... 2	
10.	Je, umezaa watoto wangapi? Wangapi wako hai sasa?	Idadi ya watoto ..... Idadi ya walio hai	
11.	Ni upi uzito wa mtoto?	Uzito wa mtoto ni	
12.	Ni ipi jinsia ya mtoto ?	Mume ..... 1 Mke 2	
13.	Je, mtoto wako wa sasa na wa mwisho wanapishana muda	Chini ya miezi 6 .....1 Miezi 6 na 12 2	

	gani (kuzaliwa baada ya wiki 28)	Miezi 13 hadi 24 .....3 Miezi 25 hadi 48 .....4 Miezi 48 hadi 72 .....5 Zaidi ya miezi 72 6	
14.	Umebeba ujauzito huu kwa muda gani sasa?	Wiki 28 hadi 36 ..... 1 Wiki 37 hadi 40..... 2 Wiki 40 hadi 42..... 3 Zaidi ya wiki 42..... 4	
15.	Je, huu ni ujauzito wako wa kwanza?	Ndio ..... 1 Hapana 2	
16.	Ulishawahi kupoteza mimba hapo awali?	Ndio ..... 1 Hapana 2	
17.	Mimba uliyopoteza:	Ilikuwa juu ya wiki 28 ? ..... 1 Chini ya wiki 28 2	
18.	Mtoto wako alizaliwa katika muda gani? (mwanao wa sasa)	Andika muda hapa ☐ Kati ya saa 2 alfajiri na saa 2 alasiri Kati ya saa 2 alasiri na saa 2 alfajiri	
19.	Mtoto alizaliwa kwenye siku gani	Kati ya saa 2 alfajiri Jumatatu na saa 2 alfajiri Jumamosi 1	

	ya wiki?	Kati ya saa 2 Jumamosi alfajiri na saa 2 alfajiri Jumtatu 2	
20.	Wakati wa ujauzito huu, je, ulisumbuliwa na machafuko ya damu? (Kagua kadi ya ANC)	Ndio ..... 1 Hapana 2	
21.	Katika ujauzito uliopita, je, ulisumbuliwa na kisukari melitus	Ndio ..... 1 Hapana 2	

Appendix III: Consent Form English Version

Introduction

I am Dr. Alunyo Alfred Lukoya, a student at MUHAS, Tel+255(0)752 365 988. I am conducting a study titled **'Risk factors for perinatal mortality at Muhimbilli National hospital** with the objective of **determining the risk factors for perinatal mortality for babies born to mothers delivering at Muhimbilli national hospital.**

Participation in the study

You are kindly requested to participate in this study and will involve the following: Taking your records from clinical notes, interviewing you on specific information regarding your home and level of eduction. You may as well be called through your phone number during the follow up period.

Confidentiality

You are strongly assured of the confidentiality that the information obtained will only be used for the purpose of this research. Anonymity will be highly observed when collecting data and compiling report even your name will not be required.

Risk to participant

You are here by assured that this study do not involve any physical harm to you or the baby.

Right of participation in the study. Your participation is absolutely voluntary and there is no penalty for refusing to participate. You are free to ask any question and you may stop to participate in this study any time.

Signing of the consent

If you agree to participate in this study please sign in the spaces provided below.

I (initials)…… have read and understood the contents of this form and I have been given satisfactory explanation with all my questions answered. I therefore consent to participate in this study.

Sign of interviewee .....…Date.....Signature of interviewer .....Date ……

Appendix IV: Consent form Kiswahili version

FOMU YA RIDHAA KUSHIRIKI KATIKA UTAFITI YA KISWAHILI

Utangulizi

Mimi naitwa Dkt. Alunyo Alfred Lukoya, mtafiti kutoka Chuo Kikuu cha Sayansi ya Tiba Muhimbili Namba ya simu: +255(0)752 365 988. Ninafanya utafiti kuhusiana na wa mama waje wazito kuhusu **'.....'**

Lengo la utafiti huu ni kubaini fahamu wa vitu ambaye wanasabisha vidonda kuhoza kwa kina mama bada ya kufanyiwa upasuaji wa kutoa mtoto katika hospitali ya Taifa Muhimbili, Dar es Salaam, Tanzania.

Kushiriki katika utafiti huu

Tafadhali unaombwa kushiriki katika utafiti huu, na mara tu utakapo ridhia ,unahakikishiwa kuwa habari zako na maelezo utakayotoa yatatumika kwa makusudio na malengo ya utafiti huu tu na kuwa hii haitakuletea usumbufu wowote.

Usiri wa taarifa za mshiriki

Unahakikishiwa tena kuwa taarifa zozote zitakazopatikana kutoka kwako wakati wa utafiti huu zitapewa usiri mkubwa sana na hazitatumika kwa malengo mengine yeyote tofauti na utafiti husika. Kuhakikisha hilo dodoso litakalo husika halitakuwa na jina lako wakati wote wa utafiti na hata baada ya utafiti.

Athari za utafiti huu kwa mshiriki

Hakuna athari au madhara yeyote yatakayokupata kutokana na kushiriki katika utafiti huu.

Haki ya kushiriki au kutoshiriki katika utafiti huu

Ushiriki wako katika utafiti huu ni wa hiari kabisa.unayohaki ya kushiriki au kutoshiriki bila kulazimika. Pia unayo haki ya kukataa kuendelea kushiriki/kuacha kujibu maswali wakati wowote utakapojisikia kufanya hivyo na hakutakuwa na hatua yeyote itakayochukuliwa dhidi yako au kulaumiwa kwa kufanya hivyo.

Kukubali kushiriki

Ukikubali kushiriki tafadhali thibitisha kwa kujaza na kusaini sehemu ya fomu hii hapa chini.

Mimi …….nimesomewa na kuelewa yaliyomo kwenye form hii na maswali yangu yote yamejibiwa vizuri. Hivyo ninakubali mwenyewe kwa hiari yangu bila kushurutishwa au kushawishiwa kushiriki katika utafiti huu.

Sahihi ya mhojiwa……..……..... Tarehe…….....…….....

Sahihi ya mhoji. ……....…Tarehe …….