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ASSESSMENT OF FACTORS ASSOCIATED WITH PERINATAL MORTALITY AMONG PUBLIC HOSPITAL DELIVERIES IN ADDIS ABABA, ETHIOPIA

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Table of contents

List of tables

List of figures

List of Annex

Acronym

AAU	Addis Ababa University
AOR	Adjusted Odd Ratio
C/S	Cesarean section
DVT	Deep Vein Thrombosis
EDHS	Ethiopian Demographic and Health Survey
ENND	Early Neonatal Death
HELLP	Hemolysis Elevated Liver Enzyme and low Platelet Count,
HIV	Human Immunodeficiency Virus
ICD	International Classification of Diseases
IUGR	Intrauterine Growth Restriction
MDG	Millennium Development Goal
PMR	Perinatal Mortality Rate
PROM	Premature Rupture of Membrane
REC	Research Ethics Committee
SVD	Spontaneous Vertex Delivery
TT	Tetanus Toxoid
ANC	Antenatal Care
VDRL	Venereal Disease Research Laboratory
WHO	World Health Organization

Abstract

Back ground of the study: Perinatal mortality is a death of fetuses weighing at least 1000gm or 28weeks of gestation or more if weight is not available and death of live newborn before the age of 7 days. It makes three fourth of the deaths of the neonatal period and widely used as a health indicator for newborn care and reflects prenatal, intra partum and newborn care.

Objective: To assess factors associated with perinatal mortality among hospital deliveries in selected hospitals of Addis Ababa, Ethiopia.

Methods: An unmatched case control study using secondary data as a source of information was conducted. A total 1113 samples (376 cases and 737 controls) were recruited from four public hospitals of Addis Ababa. Cases were still births and early neonatal deaths and controls were live births and neonates who were discharged alive from the hospital and did not die before the age of 7 days. The study period was from January 1st up to February 30/ 2015. Epi-Info version 7.0 and SPSS Version 21 were used for data entry and analysis respectively. Descriptive statistics using measure of central tendency and dispersion, frequencies, proportions and diagrams was used to check its distribution and describe the study population in relation to relevant variables. Logistic regression model was used to identify the important factors that are associated with perinatal mortality

Results: The mean age of the mothers for cases and controls were 26.47±4.87 and 26.95±4.68 respectively. Five hundred ninety seven (53.6%) mothers delivered for the first time. Obstetric complication occurred in 64.4% of cases and 43.8% of controls. Factor that are significantly associated with increased risk of perinatal death were birth interval less than 2 years (AOR=4.55; 95%CI(1.79-11.54), preterm delivery (AOR=4.55;95%CI(1.79-11.54)), anemia(AOR= 2.6;95%CI(1.38-4.91) and the others were congenital anomaly, previous history of early neonatal death and low birth weight).Use of partograph was another factor that is associated with decreased risk of perinatal mortality (AOR=0.35; 95%CI (0.18-0.66)).

Conclusion & recommendation: From factors that are associated with perinatal death, some of them can be prevented with early investigation of pregnant mothers up on their follow up to identify abnormalities and manage them accordingly. In addition, appropriate labor follow up and monitoring with regular use of partograph, immediate newborn care and interventions to delay birth interval should be addressed.

1. Introduction

1.1 Background of the study

Perinatal mortality is a death in the perinatal period which includes fetal death (still birth) and early neonatal death (death of live newborn before the age of 7 completed days). The perinatal mortality rate is calculated as total number of perinatal deaths per total number of births (still births + live births)) x 1000[1].

Complications of prematurity, intra partum-related neonatal deaths and neonatal infection causes more than 85% of newborn mortality. Perinatal mortality makes three fourth of the deaths of the neonatal period and the day the baby is born is the most dangerous time for the newborns life[2]. Perinatal mortality is widely used as a health indicator for newborn care and reflects prenatal, intra partum and newborn care. The perinatal mortality rate depends on a number of factors and important determinants that need to be assessed before reaching conclusions about quality-of-care issues[3].

In developed countries, perinatal mortality is a rare event. According to International Comparisons of Fetal and Neonatal Mortality Rates in High-Income Countries, the range of fetal deaths was from 1.6 to 4.7 per 1000 total births and neonatal deaths was 1.1 to 4.3 per 1000 live births using a birth weight cut-off of 1000 grams. Also using gestational age cut-off of 28 weeks, they ranged from 1.7 to 4.9 per 1000 for fetal deaths and 1.3 to 4.0 per 1000 for neonatal deaths[4]. Ninety seven percent of globally reported stillbirths and ninety eight percent of neonatal deaths occurred in developing countries. Many useful interventions can be implemented to avert these high numbers of mortality but weak health delivery systems remain an important barrier[5].

1.2 Statement of the problem

In 2012, globally 2.9 million newborns died and 2.6 million babies are still born. More than three-quarters of the world's newborn deaths occurred in South Asia and sub-Saharan Africa, which have both the highest neonatal mortality rates among regions and the largest number of annual births. The country with the largest absolute number of deaths is in south Asia,

because of large population, whereas countries with the highest mortality rate are found in sub-Saharan Africa. From 1,840,000 newborn deaths in 2012, ten countries including Ethiopia made up for two-third of the total neonatal deaths [6].

The first report of the British perinatal mortality survey found a perinatal mortality rate of 33.1 per thousand live births for England and Wales in 1958[7]. However, now-a-days according to the report of office for national statistics in England and Wales, in 2012 there were 3,558 stillbirths and 1,569 deaths at age under 7 days, resulting in a perinatal mortality rate of 7.0 deaths per 1,000 total births. Since 1982, when the perinatal mortality rate was 11.3 deaths per 1,000 total births, the rate has fallen by more than a third[8].

In developing regions PMR is 5 times higher than developed regions. Consequently intra partum stillbirths are on average 14 times greater in developing than developed regions. Stillbirths accounts for more than half of perinatal deaths and one third of stillbirths occurred during delivery which is largely avoidable through appropriate care during delivery[9]. Even, in a poor community, most babies die without a name or unrecorded. It is because of family insecurity about the life of their babies[10].

Ethiopia like other sub-Saharan countries has a high perinatal mortality. According to WHO report, PMR of Ethiopia in 2004 was 41/1000 total births or 128,000 total deaths (34,000still births and 94, 000early neonatal deaths)[11]. Based on EDHS 2011, PMR is 46/1000 total births[12].Remarkable progress has been made to reduce child mortality, but the rate of decline in neonatal mortality is at a slower rate. As a result the share of neonatal mortality for child mortality increased from 37% in 1990 to 44% in 2012[2]. Therefore assessing factors that are associated with perinatal mortality or factors that predispose to causes of perinatal mortality is essential to minimize neonatal mortality.

1.3 Rationale of the study

Perinatal mortality is one of the major challenges for under-five mortality. Factors affecting perinatal mortality are different in different settings because of the difference in the health care system[10]. Up to the knowledge of principal investigator while searching different literatures, there are limited number of studies done related to perinatal deaths in our country including Addis Ababa. Therefore in order to get a timely and representative data, further research is needed to assess and identify factors that are associated with perinatal mortality. The result and

recommendations of the study can help policy makers and programmers to know the common and avoidable factors and design a feasible and convenient programmatic approach in order to improve PMR.

2. Literature review

2.1. Overview of perinatal mortality

In the International Classification of Diseases-10(ICD-10), perinatal mortality combines death of fetus after 22 completed weeks (154 days) of gestation and ends seven completed days after birth. The legal requirements for registration of fetal deaths and live births vary between and even within countries. WHO recommends that, if possible, all fetuses and infants weighing at least 500 g at birth, whether alive or dead, should be included in the statistics. The inclusion in national statistics of fetuses and infants weighing between 500 g and 1000 g is recommended both because of its inherent value and because it improves the coverage of reporting at 1000 g and over. However for international comparison, 1000 g and/or 28 weeks gestation is recommended[9]. Because perinatal mortality includes both fetal and neonatal death within the first week of life, it avoids the conflict whether the fetus shows sign of life or not and an administrative practice variation whether a death should be counted or not[1].

PMR can be calculated using different methods: population based survey, vital registrations and service statistics. To identify PMR, prospective population based survey of pregnant women provide a better quality of data but it is highly expensive to undertake. Because of these difficulties, the other two probable methods can be used as an alternative[1].

Since 2000 when United Nation Millennium declaration was signed, efforts to reduce < 5 mortality have been accelerated. But it will be difficult to achieve without considering neonatal period. In countries where mortality rate is high, almost 10% of babies don’t survive more than a month [5].

An important issue to consider in order minimize deaths during perinatal period is identifying the common causes and determinant factors that are unique in the first week of life and focus on risk groups. Early neonatal death accounts 75% of all neonatal death and majority of them are during first 24 hours after birth, which accounts 1 million deaths per year. Regarding still birth, the large proportion occurred in the intra partum[10].

2.2 Magnitude and factors related to perinatal mortality

Globally around 2.6 million stillbirths (the death of a baby at 28 weeks' gestation or more) occur each year. At least half of all stillbirths occurred in the intra partum period. Although 98% of these deaths take place in low-income and middle-income countries, stillbirths also continue to affect wealthier nations, with around 1 in every 300 babies stillborn in high-income countries. Among the 133 million babies born alive each year, 2.8 million die in the first week of life[13].

In developing countries, where most of women deliver without a skilled attendant and fewer access to emergency obstetric and newborn care, the perinatal mortality rate is very high[10].Data from 7993 pregnancies in 6 developing countries shows that spontaneous preterm delivery and hypertensive disorders were the most common obstetric events leading to perinatal deaths and prematurity was the main cause of early neonatal deaths[14].

According to a registry based study in northern Tanzania from 2000-2010, PMR was 57.7/1000. Of these 35.9/1000 was still births and 21.8/1000 was early neonatal deaths. The major cause for early neonatal death was unexplained perinatal asphyxia[15]. In another prospective cohort study done in same country, 8 72 mothers and their newborns were included. The key associated factors predisposing to perinatal mortality were preterm delivery, small for gestational age and maternal anemia. Adherence to ante natal care was a protective factors[16].

From Perinatal death audits in a peri-urban hospital in Kampala, Uganda in a period of 9 months from a total of 6,041 deliveries, there were 350 perinatal deaths giving a perinatal death rate of 58 per 1000 births[17].Three most important modifiable factors identified during the audit process were: delayed caesarean sections, poor use of partograph and poor resuscitation skills which are identified as major avoidable causes[17].

Findings from a case control study in Jason Sendwe hospital, Lubumbashi, Democratic Republic of Congo shows that primi parity, multiple pregnancy, prematurity in previous pregnancy, onset of ante partum fever, APH, fetal mal presentation, very low birth weight and macrosomia were the main factors that explain perinatal mortality.[18]

In eastern Sudan from 2010 to 2011, there were a total of 761 live births and 62 perinatal deaths, 25 (40.3%) still births and 37 (59.7%) were early neonatal deaths. Perinatal mortality rate was 30.9 per 1000 pregnancies. The predictors for perinatal mortality were home delivery and

parity >3. Whereas, use of antenatal care, use of mosquito net and early trimester iron supplementation of at least 3 months were significant protective factors[19].

In Ethiopia according to EDHS 2011 report, PMR varies depending on mother age at birth, previous pregnancy interval and region. The risky groups in their background characteristics were maternal age between40-49, pregnancy interval less than 15 months and lived in Benishangul – Gumuz [12].

Based on retrospective one-year review to assess major emergency obstetric performances and perinatal-maternal outcomes, from September 2001 to August 2002 in Tikur Anbessa specialized hospital, there were 3583 women who gave birth to 3672 babies. Out of these, 3431(93.4%) were born alive and 241 (6.6%) were dead. Fourteen (5.8 %) of the stillbirths occurred ante partum and intra partum among mothers admitted to ward as high-risk (including intentionally terminated severe preeclampsia cases remote from term). Among the live births, 96(2.7%) died of various causes in the early neonatal period in the hospital. The gross and corrected perinatal mortality rates of the year were 91.8 and 77.6/1000 total births (98.2 and 83.1/1000 live births) respectively[20].

In a case control study conducted in university hospital of southern nation, national and peoples regional states of Ethiopia from 2008 to 2010, from a total of 1356 newborns (452 cases and 904 controls) , the overall gross and corrected PMRs (excluding congenital anomaly incompatible with life) were found to be 90/1000 and 85/1000 total births respectively. The proportion of hospital perinatal deaths was 26% and stillbirths accounted for 87% of total perinatal mortality. Still birth rate was highest among mothers who had no ANC follow up and very low birth weight and low birth weight newborns had a high risk of still birth and early neonatal death. [21].

In another prospective longitudinal study at Dabat Demographic and Health Surveillance Site, which was conducted from November 2009 to August 2011, PMR was 50.22 per 1000 total births. Twin birth, previous still birth , not receiving TT vaccine during the index pregnancy, short birth interval of less than 24 months, maternal illiteracy and mothers' running own business were the main predictors associated with increased risk of perinatal death[22].

Based on from systematic review from sixteen hospital and community based perinatal mortality studies, which were conducted between 1974 and 2013 using data concerning Ethiopia accessed either electronically or from local journals. The trend of the PMR was with the range of

40 and 90 per 1000 births in the included hospitals and community settings, respectively. Among obstetric complications attributed to perinatal mortality, obstructed labor accounted for more than 1/4 of perinatal deaths. Mal presentation, hypertensive disorders of pregnancy and prematurity were the other commonest identified causes for perinatal mortality [23] .

Limited numbers of researches are done on perinatal mortality in our country including Addis Ababa while searching in different journals. Since perinatal mortality contributes ¾ for neonatal deaths and in Ethiopia the share of neonatal death for < 5 years mortality is in an increasing trend, conducting a study on factors associated with perinatal mortality will help to identify timely and necessary information for decision making and institute appropriate intervention.

Research question:

- What are the factors that are associated with perinatal mortality?

Hypothesis of the study:

- Factors affecting perinatal mortality are not homogenously distributed.

3. Objectives

3.1 General objective

- To assess factors associated with perinatal mortality among hospital deliveries in public hospitals of Addis Ababa, 2014

3.2 Specific objectives

- To determine socio demographic factors associated with perinatal mortality among mothers who deliver in public hospital of Addis Ababa
- To identify obstetric and medical risk factors associated with perinatal mortality among mothers who deliver in public hospital of Addis Ababa
- To identify newborn and health care factors associated with perinatal mortality among mothers who deliver in public hospital of Addis Ababa

4. Methodology

4.1 Study design

Hospital based unmatched case control study design using secondary data as a source of information.

4.2 Study area

Addis Ababa is the capital city of Ethiopia and is located in the heart land of the country with a total area of 527 km^2. This region has an estimated density 5,535.8 people per square kilometer. Based on 2007 figure from Central Statistics Agency of Ethiopia, Addis Ababa has an estimated total population of 3.2 million projected for the year 2014[24]. The city has ten sub city and 116 woredas. There are 51 hospitals of which 6 are owned by Addis Ababa City Administration Health Bureau, 4 by Federal Ministry of Health, 1 by Addis Ababa University, 3 by Nongovernmental organization, 3 by Defense Force and Police and 34 by private owners. There are about 84 health centers and around 700 private clinics out of which 75 are higher clinics.

This study was conducted in delivery and neonatology wards of four public hospitals of Addis Ababa; Tikur Anbessa, Gandhi memorial, Zewditu memorial and St. Paul hospitals. All these hospitals serve as a referral and teaching hospital both at city administration and federal level.

4.3 Study period

The study was conducted from January 1st up to December 31/ 2014

4.4 Population

4.4.1 Source population

All deliveries conducted in the study hospital from January 1/ 2014-Dec 31/ 2014.

4.4.2 Study population

Cases: still births and early neonatal deaths.

Controls: live births that were discharged from the hospital alive and did not die before the age of 7 days.

4.5 Sample size

The required sample size was calculated by the statistical program of Epi-info stat calc tool by considering different factors that are strongly associated with perinatal mortality (from a similar study done in Addis Ababa teaching hospital in 2008) [25]

Formula: Comparison of two proportions

Let $P = \frac{P_1 + rP_2}{1 + r}$

$$n_1 = \frac{\left[Z\alpha/2 \sqrt{\left(1 + \frac{1}{r}\right) P(1-P)} + Z\beta \sqrt{P1(1-p1) + \frac{p2(1-p2)}{r}} \right]}{(p1 - p_2)^2}$$

Where r is ratio of control to case =2

P_1= proportion of exposure weight among cases

p_2 = proportion of exposure among controls

Z α/2 = the standard normal deviate for type I error

Z β = the standard normal deviate for an type II error

n1=sample size of cases

n2 = sample size of controls

The following assumption are taken in to consideration to come up with the final sample size

- 95% confidence level
- Power of 80%
- Odds ratio of 2

Factors that affect perinatal mortality	Frequency of exposure among controls	Sample size
Age <20 and >35	11.9%	582(194 cases and 388 controls)
Parity ≥V	11.5%	420(140 cases and 280 controls)
Past history of perinatal death	6.3%	984(328 cases and 656 controls)
No history of antenatal care follow up	5.4%	1128(376 cases and 752 controls)
Low birth weight(<2500gm)	5.4%	1128(376 cases and 752 controls)

- Based on the above assumptions and taking the maximum sample size, the total sample size for this study became 1128(376 cases 752 controls).

4.6 Sampling procedures

Public hospitals in Addis Ababa were identified based on the following criteria

- ✓ Availability of delivery service during the study period.
- ✓ Availability of neonatal intensive care unit during the study period
- ✓ Patient flow

Based on the above criteria four hospitals became illegible for this study. Sample size was assigned to the study hospitals proportionally based on average delivery rate of three months before data collection. Then from 2014 delivery report, using delivery and neonatology log books; perinatal deaths were randomly selected. For each case 2 neonates who were born in the same day as of the cases, discharged alive, were selected as a control group. Then from maternal cards phone number were identified and a phone call was conducted to prove that discharged neonates were alive up to seven completed days. For a neonate discharged alive and died before seven completed days the next alive neonate was taken as a control group. Similarly for alive neonates who were randomly selected in the log book and then found that the phone number was

not stated in the card, had incorrect phone number or come from outside Addis Ababa, the next alive neonate was taken as a control group .

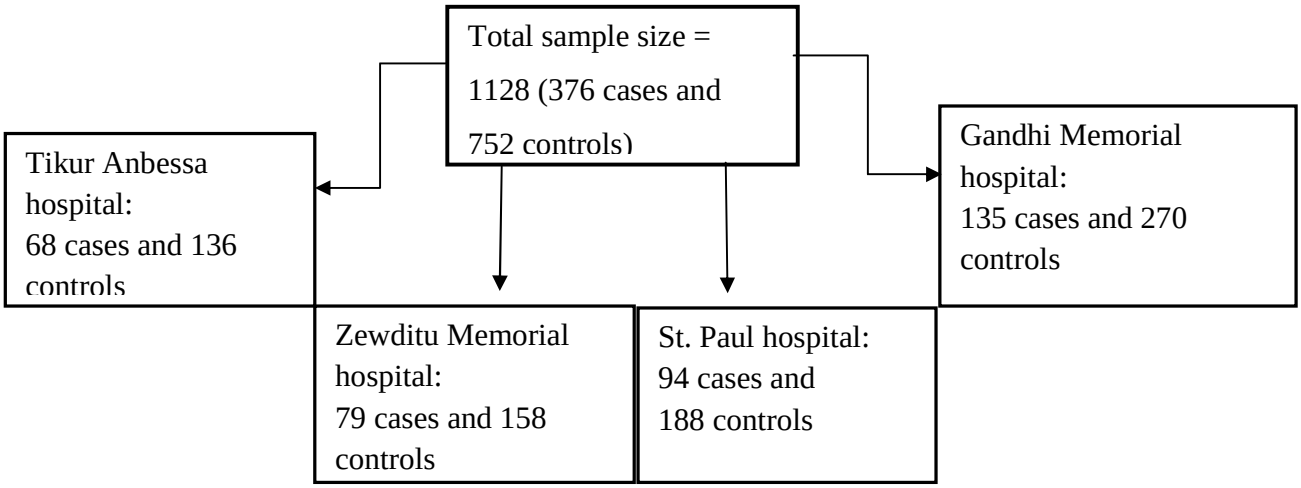

Figure 1 Schematic presentation of sampling procedure.

Inclusion criteria

- ✓ When the mother delivered in the study hospitals
- ✓ When the maternal address is Addis Ababa

Exclusion criteria

- ✓ When the mother was referred for delivery from outside Addis Ababa
- ✓ Study units for which the card number was not stated in the log book or lost cards
- ✓ Study units for which the phone number was not stated in the cards or having incorrect phone number (for neonates who were discharged alive)

4.7 Data collection methods

4.7.1 Data collection instruments and procedures

Data was collected using structured questionnaire from medical records of mothers and neonates. A phone call to maternal address was conducted to assess the status of neonates after discharged from the hospital. Admission history, labor follow up sheet, delivery summary and

antenatal care (ANC) follow up sheet used to get information for the study variables. This includes socio demographic, maternal, medical, newborn and health care factors. The questionnaire was pre-tested in around 5% of study subjects in Yekatit 12 hospital by taking perinatal deaths of October and November/2015.A total of 18 cases and 36 controls were taken prior to the actual data collection.

Eight data collectors who are health professionals were recruited from the study site by their experience of working in delivery and neonatology ward. Beside principal investigator there was one supervisor. The supervisor and data collectors were trained for a day on basic principles of data collection, on the questionnaire and how to do other related procedures during data collection by the principal investigator. An additional training on data completeness, cross-checking and correction actions was given to the supervisor. Accordingly the supervisor continuously followed and supervised data collectors by collecting and cross-checking the completeness of questionnaires received from data collectors and took corrective measures accordingly. And also reported and communicated with the principal investigator on daily basis throughout the data collection period.

4.7.2 Study Variables

4.7.2.1Dependent variable

- Perinatal mortality

4.7.2.2 Independent variables

Socio demographic factors

- ✓ Maternal age
- ✓ Marital status
- ✓ Occupational status
- ✓ Educational status

Obstetric factors

- ✓ parity
- ✓ birth interval for index child
- ✓ previous history of abortion
- ✓ previous history of still birth

- ✓ ANC follow up
- ✓ maternal TT vaccine
- ✓ Mothers referred for delivery
- ✓ Gestational age
- ✓ Mode of delivery

Medical factors

- ✓ obstetric complication
- ✓ chronic illness
- ✓ HIV
- ✓ VDRL
- ✓ Hepatitis B
- ✓ Anemia

Newborn factors

- ✓ Type of delivery
- ✓ Fetal presentation
- ✓ Sex of newborn
- ✓ Weight of newborn
- ✓ Congenital anomaly

Health care factors

- ✓ Intra partum care
- ✓ Newborn care

4.8 Definition of terms

Perinatal mortality: is the summation of still births and early neonatal deaths.

Still birth- the death of fetuses weighing at least 1000gm or 28weeks of gestation or more if weight is not available

Early neonatal mortality - death of live newborn before the age of 7 completed days..

Perinatal mortality rate- the number of perinatal deaths per 1000 total births

Gross perinatal mortality rate-total perinatal mortality rate without any exclusion

Corrected perinatal mortality rate- perinatal mortality rate after excluding for extreme prematurity and congenital anomaly incompatible with life.

Birth interval- the time interval from one child's birth date until the next child's birth date

Term- gestational age between 37-41weeks and 6 days

Post term –gestational age ≥42 weeks

Pre term – gestational age of ≤37 weeks

Parity- the number of pregnancy carried to viable gestational age (≥28 weeks).

Abortion- termination of pregnancy by removal or expulsion from the uterus of a fetus or embryo before viability (28 weeks)

Regular ANC-is a primary health care, for pregnant women, which is comprehensive, coordinated and continuous with the aim of improving maternal and perinatal outcome

Anemia- hemoglobin level <11gm/dl

Low birth weight- birth weight between 1500gm and 2500gm

Very low birth weight-birth weight < 1500gm

Normal birth weight- birth weight 2500gm-3999gm

4.9 Data quality management

To maintain data quality, from each hospital two midwives/ nurse /health officer who are working in delivery and neonatology ward were recruited and trained by the principal investigator. The questionnaire was pre-tested to check for the accuracy of responses and appropriateness of data collection tool, estimate time required and the necessary amendment was considered. The collected data were reviewed and checked for omissions, legibility of handwriting, completeness and consistency by principal investigator and supervisor on daily bases during data collection time.

4.10 Data Analysis procedures

The data were coded, checked and entered using Epi-Info version 7.0. It was cleaned and edited accordingly and exported to SPSS Version 21.0 and checked for missing values before analysis. Descriptive statistics using measure of central tendency and dispersion, frequencies, proportions and diagrams were used to check its distribution and describe the study population in relation to relevant variables. Cross tabulation was also performed to see the distribution of different variables in relation to outcome variable. Bivariate logistic regression analysis was used to assess the degree of association between dependent and independent variables and test significance of the association. Odds ratio with 95% confidence interval was used to measure strength of

association. Those variables associated at bivariate logistic regression with significance level of p value < 0.2 were entered into multivariate logistic regression model to identify the important determinants by controlling possible confounding effects.

4.11 Ethical consideration

Ethical clearance was obtained from Research ethics committee (REC) of School of Public Health in Addis Ababa University. Following the endorsement by the REC, Addis Ababa regional health bureau and selected federal hospitals were informed about the objectives of the study through a support letter from School of Public Health in AAU and then written permission from Addis Ababa regional health bureau was presented to the Addis Ababa city hospitals in which the study is conducted.

Since this study is from medical records except one question that was responded by phone call, it doesn't require informed consent for the card review but during a phone call:
Informed verbal consent was obtained from each selected participants for a phone call to confirm willingness. Each woman had been informed about the purpose of the study and participation was voluntary .Confidentiality of information and privacy of participants' interview was respected; the mother was told that information that she provided was only for the purpose of this study. The names of the informants were not included in the questionnaire.

4.12 Dissemination of results

After completion of research, the results of the study will be presented during thesis defense and the final result will be submitted to Addis Ababa University School of Public Health. In addition to this the final result document will be presented to Addis Ababa regional health bureau, federal ministry of health, IFHP/ JHI Ethiopia and other responsible bodies. Beside to this, the findings of the study will be disseminated through publications and presentation in scientific conferences and workshops.

5. Result

5.1 Socio demographic characteristics

A total of 1113 (376 cases and 737 control) maternal cards from a total of 1128 were reviewed, which make the response rate of 98.7%. The mean age of the mothers for cases and controls was 26.47±4.87 and 26.95±4.68 respectively. From the total mothers, 39.1% in cases and 39.2% in controls were between the age group of 25-29 years followed by 20-24 years (28.9% in control and 25.5% in cases). Six hundred seventy six (91.7 %) of cases and 336(89.4%) of controls were married. One hundred seventy five (46.5%) of cases and three hundred fifty two (47.8%) of controls were house wives where as private and government employee accounts for 17.6% and 14.4% in cases and 15.6% and 15.1% in controls respectively. Mothers who completed secondary education and more were 53.7% in cases and 61.7% in controls (Table 1).

Table 1.Socio demographic characteristics of mother's with perinatal deaths (cases) and controls among public hospital deliveries in Addis Ababa, Ethiopia.2014

variable	category	PERINATAL OUTCOME		Total
		control	case	
Maternal age	15-19	40(5.4%)	16(4.3%)	56(5.0%)
	20-24	213(28.9%)	96(25.5%)	309(27.8%)
	25-29	289(39.2%)	147(39.1%)	436(39.2%)
	30-34	135(18.3%)	87(23.1%)	222(19.9%)
	35-39	55(7.5%)	26(6.9%)	81(7.3%)
	40-44	5(0.7%)	4(1.1%)	9(100.0%)
Marital status	Married	676(91.7%)	336(89.4%)	1012(90.9%)
	Single	23(3.1%)	13(3.5%)	36(3.2%)
	Widowed	1(0.1%)	1(0.3%)	2(0.2%)
	Divorced	13(1.8%)	10(2.7%)	23(2.1%)
	Not registered	24(3.3%)	16(4.3%)	40(3.6%)
Occupational status	House wife	352(47.8%)	175(46.5%)	527(47.3%)
	Private employee	115(15.6%)	66(17.6%)	181(16.3%)
	Government employee	111(15.1%)	54(14.4%)	165(14.8%)
	Daily laborer	28(3.8%)	19(5.1%)	47(4.2%)
	Merchant	37(5.0%)	14(3.7%)	51(4.6%)
	Student	23(3.1%)	11(2.9%)	34(3.1%)
	Others*	1(0.1%)	2(0.5%)	3(0.3%)
	Not registered	70(9.5%)	35(9.3%)	105(9.4%)
Educational status	Not educated	55(7.5%)	48(12.8%)	103(9.3%)
	Primary level completed	128(17.4%)	85(22.6%)	213(19.1%)
	Secondary level and above	455(61.7%)	202(53.7%)	421(59.0%)
	Not registered	99(13.4%)	41(10.9%)	140(12.6%)

Others *- live in street, unemployed

5.2 Obstetrics characteristics

Of the total respondents, 597(53.6%) delivered for the first time. From 516 mothers who had previous history of delivery, 74% of controls and 40.6% of cases delivered after two years from previous delivery. The proportion of mothers who delivered within two years of previous delivery was 24.1% in cases and 8.4% in controls. Mothers who had regular ANC follow up and took TT vaccination for the current delivery accounts 96.9% and 95.4% respectively. Nine thousand sixty eight (87%) of the mothers were referred from other health facilities for delivery but the rest had a follow up in the respective hospitals.

Nearly two-third of the mothers (68.3%) delivered at term. The proportion of preterm delivery was 37.0% in cases and 8.0% in controls. More than half (58.5%) of mothers delivered normally by SVD, 31% by cesarean section and 5.9% were instrumental deliveries (forceps or vacuum). The proportion of assisted breach delivery and hysterectomy in cases was 7.2% and 4.8% respectively while assisted breach delivery accounts 0.8% and there was no case of hysterectomy in the control group. Two hundred sixty three (23.6%) of the mothers had previous history of abortion, of these 45.2 % had induced abortions 42.6% had spontaneous abortions, 3.8% had both types and 8.4 % unknown type of abortion. The mean number of abortion was 1.25 with a minimum of 1 and maximum of 4. From the total respondents, 5.3% and 2.9% of cases and 3.3% and 0.7% of controls had previous history of stillbirth and early neonatal death respectively (Table 2).

Table 2.Obstetric characteristics of perinatal deaths (cases) and controls among public hospital deliveries in Addis Ababa, Ethiopia, 2014

Variables	Category	Perinatal Outcome		Total
		Control	Case	
Parity	1	391(53.1%)	206(54.8%)	597(53.6%)
	2-4	330(44.8%)	163(43.4%)	493(44.3%)
	≥5	16(2.2%)	7(1.9%)	23(2.1%)
Birth interval	<2 years	29(8.4%)	41(24.1%)	70(13.6%)
	≥ 2 years	256(74%)	69(40.6%)	325(63.0%)
	Not registered	61(17.6%)	60(35.3%)	121(23.4%)
ANC follow up	yes	724(98.2%)	354(94.1%)	1078(96.9%)
	No	13(1.8%)	22(5.9%)	35(3.1%)
TT vaccination	Yes	714(96.9%)	348(92.6%)	1062(95.4%)
	No	12(1.6%)	18(4.8%)	30(2.7%)
	Not registered	11(1.5%)	10(2.7%)	21(1.9%)
Referral status	Referred	638(86.6%)	330(87.8%)	968(87.0%)
	Not referred	99(13.4%)	46(12.2%)	145(13.0%)
Gestational age	37-41	572(77.6%)	188(50.0%)	760(68.3%)
	28-36	59(8.0%)	139(37.0%)	198(17.8%)
	>42	83(11.3%)	23(6.1%)	106(9.5%)
	Not registered	23(3.1%)	26(6.9%)	49(4.4%)
Mode of delivery	SVD	404(54.8%)	247(65.7%)	651(58.5%)
	Forceps delivery	41(5.6%)	8(2.1%)	49(4.4%)
	Vacuum delivery	14(1.9%)	3(0.8%)	17(1.5%)
	Cesarean section	272(36.9%)	73(19.4%)	345(31.0%)
	Assisted breach delivery	6(0.8%)	27(7.2%)	33(3.0%)
	Hysterectomy	0(0.0%)	18(4.8%)	18(1.6%)
History of abortion	yes	169(22.9%)	94(25.0%)	263(23.6%)
	No	568(77.1%)	282(75.0%)	850(76.4%)
Number of abortion	≤ 2	162(95.9%)	92(97.9%)	254(96.6%)
	≥3	7(4.1%)	20(21.3%)	47(3.4%)

Type of abortion	Spontaneous	81(47.9%)	31(33.0%)	112(42.6%)
	Induced	67(39.6%)	52(55.3%)	119(45.2%)
	Both types	4(2.3%)	6(6.4%)	10(3.8%)
	Unknown	17(10%	5(5.3%)	22(8.4%)
Previous history of stillbirth	Yes	24(3.3%)	20(5.3%)	44(4.0%)
	No	713(96.7%)	356(94.7%)	1069(96.0%)
Previous History of ENND	Yes	5(0.7%)	11(2.9%)	16(1.4%)
	No	732(99.3%)	365(97.1%)	1097(98.6%)

5.3 Coexisting medical and obstetric conditions

One thousand ninety three mothers were screened for HIV of which 1045 were non reactive and 48 were reactive. Ninety five percent of mothers were non reactive for Venereal Disease research Laboratory (VDRL) test. Regarding hepatitis B, 88.1 % were negative and 3.3% were positive for hepatitis B surface antigen testing. The distribution of these medical conditions among cases and controls are comparable (Table 3).

Table 3.HIV, VDRL and Hepatitis B status of mothers with perinatal deaths (cases) and controls among public hospital deliveries in Addis Ababa, Ethiopia, 2014

Variable	Category	Perinatal Outcome		Total
		Control	Case	
HIV	Reactive	37(5.0%)	11(2.9%)	48(4.3%)
	Non-reactive	683(92.7%)	362(96.3%)	1045(93.9%)
VDRL	Reactive	3(0.4%)	1(0.3%)	4(0.4%)
	Non reactive	699(94.8%)	358(95.2%)	1057(95.0%)
Hepatitis B	Positive	26(3.5%)	11(2.9%)	37(3.3%)
	Negative	650(88.2%)	331(88.0%)	981(88.1%)

Hemoglobin was done for 74.2% of mothers during ANC follow up or before delivery. The minimum level of hemoglobin was 3 gm/dl and maximum of 17gm/dl. Proportion of anemia was 15.4% in cases and 8.0% in controls (Figure 2).

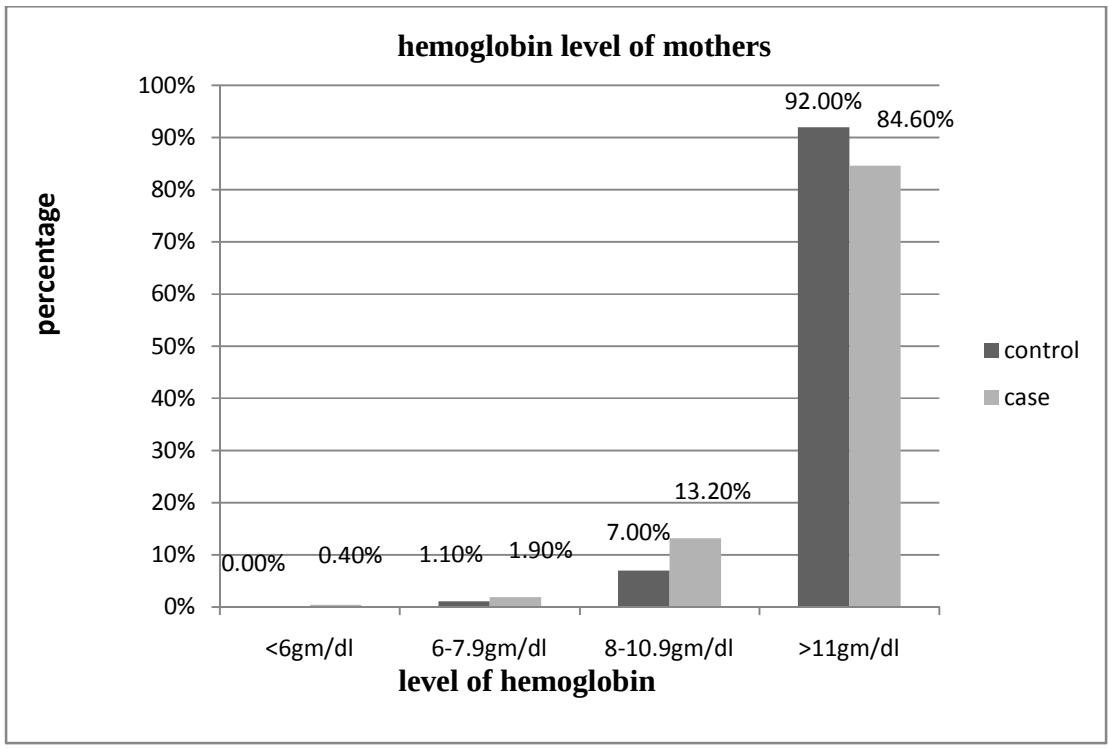

Figure 2.Hemoglobin level of mothers with perinatal deaths (cases) and controls among public hospital deliveries in Addis Ababa, Ethiopia, 2014.

The proportion of mothers who have chronic illnesses was almost similar within the two groups of population, 5.6% in cases and 5.0% in controls with an average of 5.2% (Figure 3)

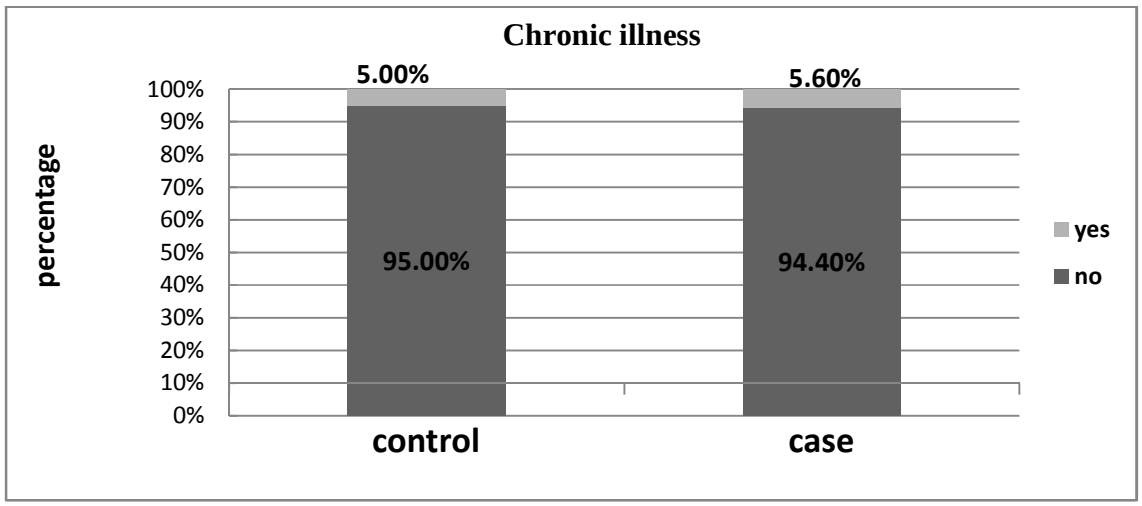

Figure 3.Chronic illness of mothers with perinatal deaths (cases) and controls among public hospital deliveries in Addis Ababa, Ethiopia, 2014

Two hundred forty two (64.4%) mothers of the cases and 323(43.8%) mothers of the controls had at least one type of obstetric complication (Figure 4).

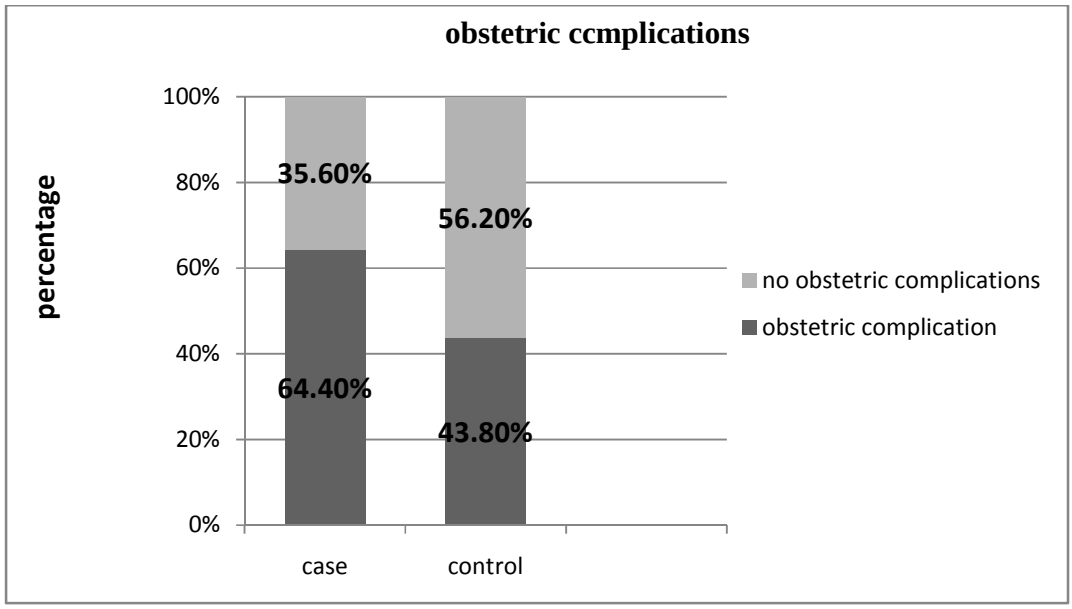

Figure 4.Obstetric complication of mothers with perinatal deaths (cases) and controls among public hospital deliveries in Addis Ababa, Ethiopia, 2014

Most of the obstetric complications were common in the cases except gestational diabetes mellitus, post term pregnancy, previous cesarean section scar and PROM which were more common among controls. From all obstetric complications, preeclampsia and preterm labor accounts for 34.3% and 43% of cases and 21.7% and 13% of controls respectively (Table 4).

Table 4.Type of obstetric complications of mothers with perinatal deaths (cases) and controls among public hospital deliveries in Addis Ababa, Ethiopia, 2014

Obstetric complications	Perinatal outcome	
	Control	case
Preeclampsia	70(21.7%)	83(34.3%)
Eclampsia`	5(1.5%)	11(4.5%)
Ante partum hemorrhage	26(8.0%)	38(15.7%)
Post partum hemorrhage	1(0.3%)	7(2.9%)
Obstructed labor	3(0.9%)	6(2.5%)
Gestational diabetes mellitus	4(1.2%)	1(0.4%)
Polyhydraminos	1(0.3%)	10(4.1%)
Oligohydraminos	21(6.5%)	9(3.7%)
Post term	66(20.4%)	16(6.6%)
PROM	64(19.8%)	23(9.5%)
Preterm labor	42(13.0%)	104(43.0%)
Previous c/s scar	63(19.5%)	13(5.4%)
HEELP syndrome	3(0.9%)	15(6.2%)
Others*	9(2.8%)	20(8.3%)

Others*-cord prolapsed, DVT, chorioaminitis, IUGR, tumor previa, uterine rupture

5.4 Newborn characteristics

Presentation of 680 (92.3%) controls and 333 (88.6%) cases was cephalic. Concerning the type of delivery 95.8% of mothers delivered a single newborn and 4.2% delivered multiple newborns with comparable proportion between cases and controls. More than half of newborns (56.7%) were male. The mean birth weight of newborns was 2855±724 gm with a minimum of 1000 and maximum of 4600gm. Very low birth weight and low birth weight newborns were more common in cases accounts 18.1% and 36.2% respectively. Congenital anomaly occurred 20 times more likely in cases than controls.

Table 5.Newborn characteristics of perinatal deaths (cases) and controls among public hospital deliveries in Addis Ababa, Ethiopia, 2014

variable	Category	Perinatal outcome		Total
		Control	case	
Fetal Presentation	Cephalic	680(92.3%)	333(88.6%)	1013(91.0%)
	Breech	42(5.7%)	34(9.0%)	76(6.8%)
	Transverse	12(1.6%)	5(1.3%)	17(1.5%)
	Others*	3(0.4%)	4(1.1%)	7(0.6%)
Type of delivery	Single	708(96.1%)	358(95.2%)	1066(95.8%)
	Multiple	29(3.9%)	18(4.8%)	47(4.2%)
Sex	Male	424(57.5%)	207(55.1%)	631(56.7%)
	Female	313(42.5%)	169(44.9%)	482(43.3%)
Weight	2500-3999gm	655(88.9%)	161(42.8%)	816(73.3%)
	1000-1499gm	0(0.0%)	68(18.1%)	68(6.1%)
	1500-2499gm	45(6.1%)	136(36.2%)	181(16.3%)
Congenital anomaly	Yes	3(0.4%)	60(16.0%)	63(5.7%)
	No	734(99.6%)	316(84.0%)	1050(94.3%)

Others*- shoulder, brow or face

5.5 Health care related factors

Partograph was used in 816(73.3%) of total study subjects. The proportion of mothers who delivered without partograph follow up was 79(21.0%) in cases and 66(9.0%) in control groups. For 13.7% of mothers partograph was not indicated because of different obstetric factors that didn't allow the mother to labor (Table 6).

Table 6.Use of partograph for mothers of perinatal deaths (cases) and controls among public hospital deliveries in Addis Ababa, Ethiopia, 2014

Variable	category	Perinatal outcome		Total
		control	Case	
Use of partograph	Yes	564(76.5%)	252(67.0%)	816(73.3%)
	No	66(9.0%)	79(21.0%)	145(13.0%)
	Not indicated	107(14.5%)	45(12.0%)	152(13.7%)

From two hundred sixty five stillbirths, 57(21.5%) of them were admitted to the hospital with positive fetal heart beat and later reported as stillbirth during the course of labor and delivery and the rest 208(78.5%) were admitted with intra uterine fetal death (Figure 5).

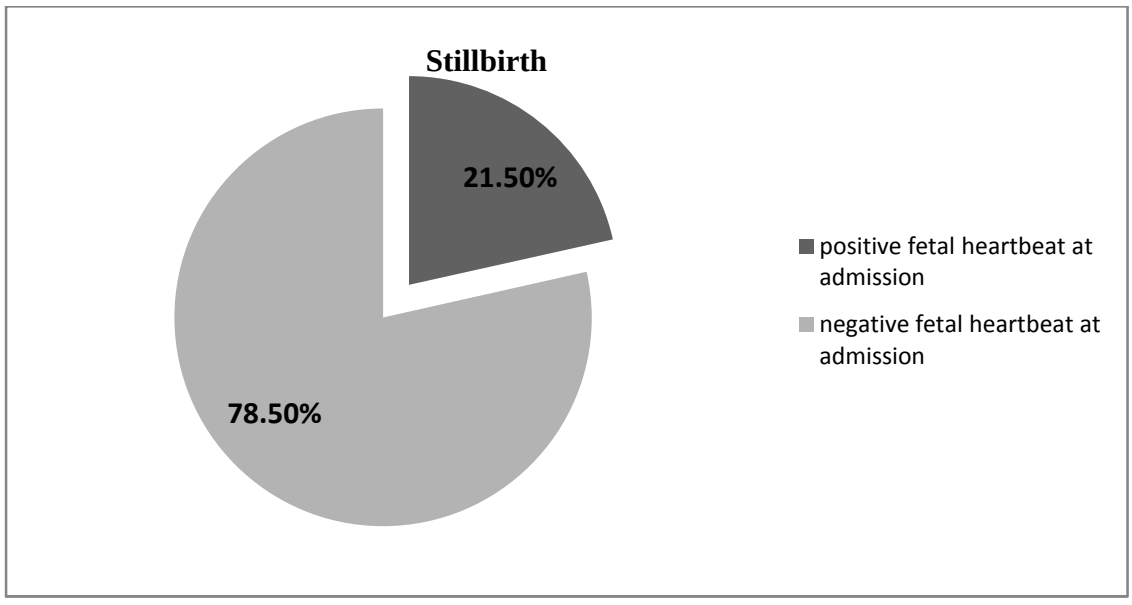

Figure 5.Fetal heartbeat at admission of still births among public hospital deliveries in Addis Ababa, Ethiopia, 2014

Of early neonatal deaths, majority of the neonates first minute Apgar score was low (4-6) accounts for 55%, followed by very low Apgar score (0-3) accounts 43.2%. While looking fifth minute Apgar score 47.7% of neonates Apgar score was 0-3 followed by Apgar score of 4-6 accounts 45.9%. Apgar score of 7-10 was 1.8% in first minute and 6.3% in fifth minute (Figure 6)

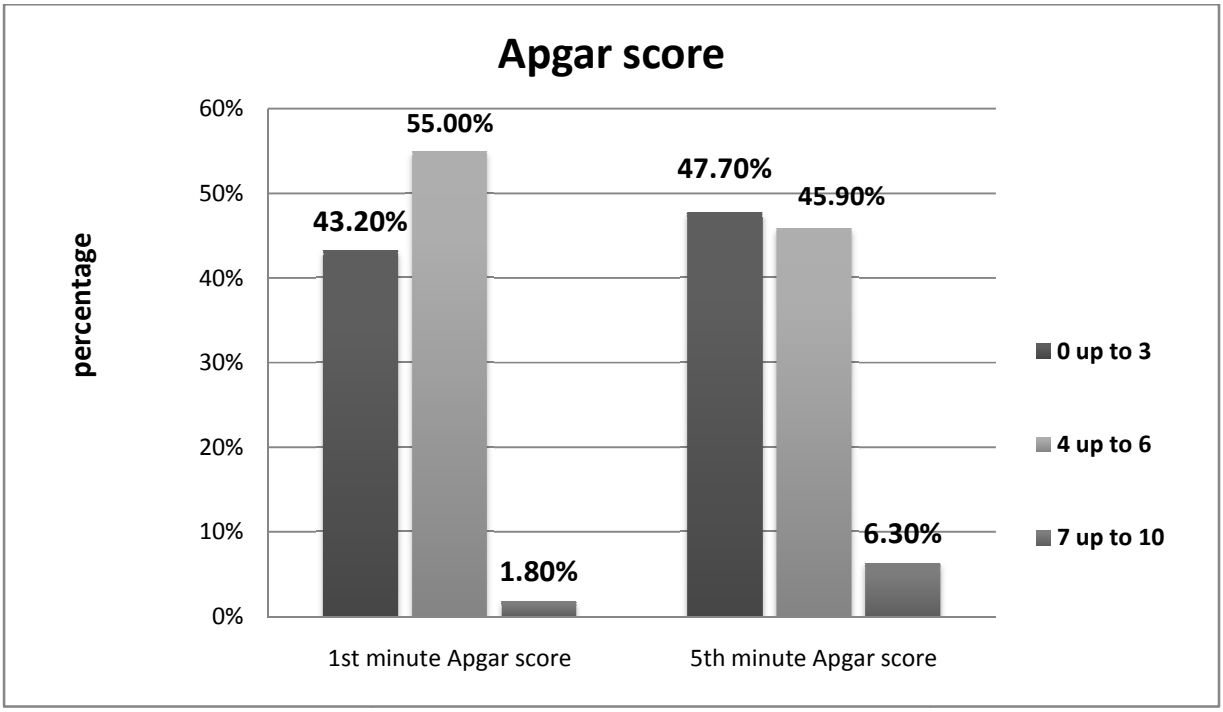

Figure 6.Apgar score of perinatal death among public hospital deliveries in Addis Ababa, Ethiopia, 2014

5.6 Associated factors related with perinatal mortality

Binary logistic regression was done to see the association of perinatal mortality with different factors. According to bivariate analysis educational status, birth interval, ANC follow up, TT vaccination, gestational age, mode of delivery, history of early neonatal death, level of hemoglobin , history of obstetric complications, mal presentation, newborns weighing <2500gm newborns delivered with congenital anomaly and use of partograph showed significant association.

After controlling all other variables educational status, ANC follow up, TT vaccination, history of obstetric complications and mal presentation of the fetus were not significant factors associated with perinatal mortality. However birth interval, gestational age, mode of delivery, previous history of ENND, level of hemoglobin, newborn weight, congenital anomaly and use of partograph remained significantly associated with perinatal mortality. The odds of perinatal mortality were 4.6 times higher among mothers whose previous delivery was within two years of current delivery compared to mothers whose previous delivery was more than or equal to two years (AOR 4.55; 95% CI (1.79-11.54)). The odds of perinatal mortality were two times higher among preterm deliveries than term deliveries (AOR 2.02; 95%CI (1.08-3.77)). The odds of perinatal mortality were less likely among mothers who delivered by instrument or cesarean section than mothers who delivered by SVD with (AOR 0.21; 95% CI (0.05-0.86) and AOR 0.48; 95%CI (0.27-0.86) respectively. The odds of perinatal mortality were higher among mothers who had previous ENND than mothers with no previous history of ENND (AOR 6.36; 95%CI (1.51-26.76)).

Among co existing medical conditions, perinatal mortality was 2.6 times more likely among anemic mothers than mothers with normal hemoglobin/hematocrit level (AOR 2.6; 95%CI (1.38-4.91)). The odds of perinatal mortality were higher among low birth weight newborns than normal weighing newborns (AOR 16.45; 95%CI (9.57-28.26)). The odds of perinatal mortality for newborns with congenital anomaly were higher than newborns with no congenital anomaly (AOR 34.04; 95%CI (7.14-162.41)). Use of partograph was protective factor for perinatal mortality. The odds of perinatal mortality were 65% less likely among mothers whose labor was followed using partograph compared with mothers whose labor is not followed by partograph (AOR 0.35; 95%CI (0.18-0.66))(Table 7).

Table 7.The association between different factors and perinatal mortality among public hospital deliveries in Addis Ababa, Ethiopia, 2014

variables	category	Perinatal outcome		Crude odd ratio(95%CI)	Adjusted odd ratio(95%CI)
		case	control		
Educational status	Not educated	48(12.8%)	55(7.5%)	1	1
	Primary	85(22.6%)	128(17.4%)	0.76(0.47-1.22)	0.82(0.37 - 1.81)
	Secondary and above	202(53.7%)	455(61.7%)	0.51(0.33-0.76)*	0.54(0.27 - 1.11)
	Not registered	41(10.9%)	99(13.4%)	0.48(0.28 - 0.81)*	0.39(0.16 - 0.98)
Birth interval	≥2 Years	69(18.4%)	256(34.7%)	1	1
	<2 Years	41(10.9%)	29(3.9%)	5.25(3.04 - 9.05)*	4.55(1.79 -11.54)*
	Not registered	60(16.0%)	61(8.3%)	3.65(2.34 -5.69)*	2.62(1.14-6.01)**
ANC follow up	Yes	354(94.1%)	724(98.2%)	1	1
	No	22(5.9%)	13(1.8%)	3.46(1.72 -6.95)*	6.15(0.31 -122.04)
TT vaccination	Yes	348(92.6%)	714(96.9%)	1	1
	No	18(4.8%)	12(1.6%)	3.08(1.47 - 6.46)*	0.19(0.01-4.70)
Gestational age	Term	188(50.0%)	572(77.6%)	1	1
	Preterm	139(37.0%)	59(8.0%)	7.168(5.07 -10.13)*	2.02(1.08-3.77)*
	Post term	23(6.1%)	83(11.3%)	0.84(0.52 -1.38)	1.16(0.57 - 2.35)
	Not registered	26(6.9%)	23(3.1%)	3.44(1.92-6.17)*	2.63(0.95 -7.26)
Mode of delivery	Svd	247(65.7%)	404(54.8%)	1	1
	Instrumental	11(2.9%)	55(7.5%)	0.33(0.17 - 0.64)*	0.21(0.05 - 0.86)*
	Cesarean Section	73(19.4%)	272(36.9%)	0.44(0.32 - 0.59)*	0.48(0.27 - 0.86)*
	Breach delivery	27(7.2%)	6(0.8%)	7.36(2.99 -18.08)*	1.94(0.47 -8.03)
	Hysterectomy	18(4.8%)	0(0.0%)	-	-
Previous history of ENND	No	365(97.1%)	732(99.3%)	1	1
	Yes	11(2.9%)	5(0.7%)	4.41(1.52-12.79)*	6.36(1.51 - 26.76)*
Level of hemoglobin	≥11 gm/dl	225(84.6%)	515(92.0%)	1	1
	< 11 gm/dl	41(15.4%)	45(8.0%)	2.09(1.33 - 3.28)*	2.6(1.38 - 4.91)*
Obstetric complications	No	134(35.6%)	414(56.2%)	1	1
	Yes	242(64.4%)	323(43.8%)	2.32(1.79 - 2.99)*	1.38(0.84 - 2.27)
Fetal presentation	vertex	333(88.6%)	680(92.3%)	1	1
	Mal presentation	43(11.4%)	57(7.7%)	1.54(1.02-2.34)*	1.52(0.65 - 3.59)

Weight of the newborn	2500-3999gm	161(42.8%)	655(89.9%)	1	1
	<2500gm	204(54.3%)	45(6.1%)	18.44(12.79 - 26.59)*	16.45(9.57 - 28.26)*
	≥4000 gm	11(2.9%)	37(5.0%)	1.210(.604-2.423)	2.24 (0.89 - 5.67)
Congenital anomaly	No	316(84.0%)	734(99.6%)	11	1
	Yes	60(16.0%)	3(0.4%)	46.46(14.46-149.23)*	34.04(7.14 - 162.41)*
Partograph use	No	79(21.0%)	66(9.0%)	1	1
	Yes	252(67.0%)	564(76.5%)	0.37(0.26 - 0.54)*	0.35(0.18 - 0.66)*
	Not Indicated	45(12.0%)	107(14.5%)	0.35(0.22 - 0.57)*	0.37(0.14 - 0.98)*

*- p-value < 0.05.

6. Discussion

This study has identified different factors that are associated with perinatal mortality. Knowing those factors will help to focus on group of people who are at risk in order to minimize perinatal deaths. Of different factors that were investigated, birth interval, gestational age, previous history of ENND, level of hemoglobin, birth weight, congenital anomaly and use of partograph for labor follow up were factors associated with perinatal mortality.

Birth interval less than two years was associated with perinatal mortality as it is 4.5 times high likely among perinatal death (AOR 4.55; 95% CI (1.80-11.54)). This is consistent with different researches done in different parts of the country and explained that it is because of increased risk of obstetric complications that can affect the perinatal outcome [21, 22, 25].

In this study parity doesn't show association with perinatal death. This is also supported by a study done on reproductive performance and its correlation with perinatal mortality in teaching hospital of Addis Ababa[25]. However a study done in Democratic Republic Congo found that primi parity, and other studies done in eastern Sudan and Nigeria showed that parity $\geq$ 4 increase the risk of perinatal death[18, 19, 26]. The difference in the association might be because of difference in the study design, study populations or sample size.

Mothers with previous history of ENND were independently related with perinatal deaths. This is similar to a study done on past reproductive performance with its correlation with perinatal outcome which was done in teaching hospitals of Addis Ababa [25], in which the risk of perinatal death was 10.6 times higher when there was previous history of perinatal loss. The study also identified that anemic mothers were 2.6 times more likely to have perinatal death compared with mothers with normal hemoglobin level. This can be explained by the fact that anemia can result an increase in maternal morbidities, poor pregnancy outcome including perinatal mortality [28].

According to the finding of this study obstetric complication didn't show an association while controlling the confounders .However studies done in Hawassa university hospital of southern nations, nationality and regional state of Ethiopia showed that obstetric complication mainly obstructed labor were strongly associated with perinatal mortality with a case fatality rate of 73.5%[21] . The association didn't occur in this study is may be because of low proportion of obstructed labor (0.9% in controls and 2.5% in cases). This low proportion can be due to high

percentage of mothers who had ANC follow up accounts 96.9% and most of the causes for obstructed labor can be identified during their follow up time and it enables to take appropriate measures before they experienced obstructed labor. The other reason is may be because of skilled health professionals with a quality of care during ANC and labor.

Based on the findings of this study, perinatal mortality were 2 times more likely among preterm newborns compared with term babies but post term delivery doesn't show any association with perinatal outcome. This is similar with study finding done in Hawassa university hospital in which perinatal mortality were 3 times higher among preterm babies than term babies[21]. The association of preterm babies with perinatal mortality is mainly because of prematurity and Save the children report shows that one of the commonest causes of perinatal death is preterm birth and its complications [6]. Low birth weight newborns had a risk for perinatal mortality than normal weight babies. The weight of newborns was related with gestational age. In which 26.8% of preterm deliveries were very low birth weight and 41.9% were low birth weight. This finding is comparable with different researches done in Ethiopia and African country [22, 27]

Congenital anomaly had poor outcome for neonates. Perinatal mortality was much higher among neonates with congenital anomaly. which is similar with a study done in Zimbabwe that showed 5 times risk of perinatal death[27]. Large odds ratio with wide confidence interval could be due to the small number of congenital anomalies found in the control groups with a case control ratio of 20:1 or the sample size may not be enough.

Use of partograph was protective factor for perinatal death by 65%. This is supplemented with a study on perinatal death audit in peri-urban hospital in Kampala, Uganda[17] . Since partograph is a labor follow up chart recommended by WHO, appropriate use of partograph can help health professionals to pick any abnormalities during the course of labor. Therefore it can prevent perinatal loss that can be managed if early diagnosis is done. It also tells us the quality of intra partum care. From stillbirth found in this study majority (78.5%) of them were admitted to the hospital with negative fetal heart beat. This is supported by systematic review done from sixteen hospitals and community based perinatal mortality studies[23]. Even though there was a large amount of stillbirth occurs before arrival to hospital, 21.5% of stillbirths occurred during intra partum period that can be averted with appropriate intra partum care.

For neonates who were delivered alive with low Apgar score, < 7 appropriate and timely newborn care is mandatory to save their lives. According to the finding of this study the large numbers of newborns in their first minute of life were found within Apgar score range of 4-6 but in the fifth minute the large number were found in the range of 0-3. This shows that the newborn care is not satisfactory even though there was a slight increment in Apgar score range of 8-10 from first to fifth minute.

According to the finding of this study, perinatal death were less likely among mothers who delivered by instruments (forceps or vacuum) or cesarean section than SVD. Since this kind of delivery was commonly conducted when there was an obstetric complication and when adjusting obstetric complications for mode of delivery, the association didn't occur. The finding of a case control study in Marondera district, East of Zimbabwe in 2009 also showed that normal SVD is a protective factor for perinatal death compared with instrumental delivery or cesarean section [27].

7. Strength

- The type of study design used is strong to see an association of exposures towards the outcome variable and it is a better study design to look multiple exposures for perinatal mortality.

8. Limitation

The main limitation of this study is, it used secondary data as a source of information. Since this data was gathered for other purpose, it was difficult to gather all necessary variables and some variables did not get in some of the cards. This may affect the association of outcome variable and the exposure. The confounding effect of unmeasured variables cannot be controlled.

9. Conclusion

The study has revealed that birth interval less than two years, preterm delivery, previous history of ENND, anemia, low birth weight and congenital anomaly were found to be factors that increases the risk of perinatal mortality. Use of partograph for labor follow up decreases the risk of perinatal death.

From factors that are mentioned above, some of them can be prevented with early investigation of pregnant mothers up on their follow up to identify abnormalities and manage them accordingly. The other factor is poor quality of intra partum care, reflected by not using partograph for labor follow up which is one of the important determinant factors for perinatal loss. Considering the Apgar score, fifth minute Apgar score is generally lower than first minute Apgar score for most of the early neonatal deaths. This can be improved by optimizing immediate newborn and neonatal resuscitation.

10. Recommendation

With respect to the findings and objectives of the study, some recommendations have been made at different levels.

Government level

Government should be able to improve the level of awareness of health care providers on routine investigations, supplementations and management of pregnant women during ANC follow up. In addition, appropriate labor follow up and monitoring using partograph and immediate newborn care should be improved. This can be achieved by capacity building methods at different level of providers. Special attention should also be given to interventions in order to delay birth interval.

Facility level

Health care providers should give special attention for early recognition of abnormalities and manage accordingly while doing ANC and labor follow up. They should also use partograph regularly while following labor and do immediate newborn care with special attention to newborns with low Apgar score. Mothers should be counseled about the benefits of delaying next pregnancy in all possible contacts.

Researchers

- Community based longitudinal study would be helpful to get other unmeasured risk factors.

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12. Annex

12.1 Annex I. Conceptual frame work for perinatal mortality

Two kinds of variables are used to assess factors associated with perinatal mortality. The independent variables are socio demographic factors, newborn factors, obstetric factors, medical factors and health care system. The dependent variable is perinatal mortality

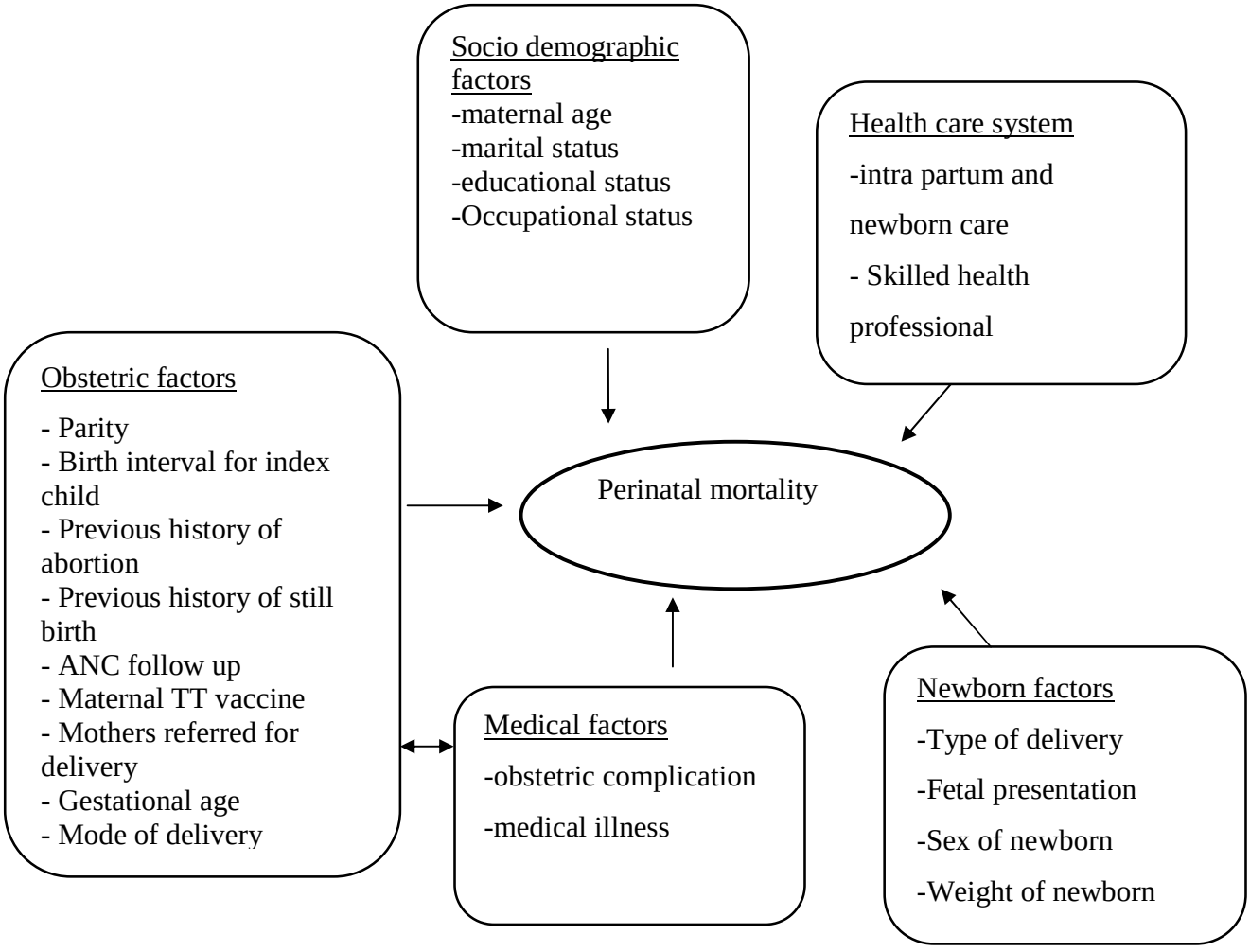

Figure 7.Conceptual framework of perinatal mortality.

12.2 AnnexII. Structured Questionnaire English version

I-Information sheet

For a phone call:

Greeting: Good morning/afternoon!

Hello. My name is _____. I am a principal investigator/ supervisor for master of public health student project in Addis Ababa University to conduct a study with the aim of identifying factors associated with perinatal mortality among hospital deliveries in Addis Ababa. The permission is received from Addis Ababa University to conduct this study. Now you are randomly selected for this study. The question that is going to be asked usually takes about 2-3 minutes.

Objective of the study: To assess factors associated with perinatal mortality among hospital deliveries in public hospitals, Addis Ababa.

Benefit of the study: there is no direct benefit to the participant of the study. However the result of the study will be helpful to the study population as well as the study participants by identifying factors that determine and contribute to perinatal mortality

Risk of the study: Participating in this study will not have any risk or harm.

Rights of Participants: You have full right to respond or not and you can ask question if it is not clear for you.

Confidentiality: Any information forwarded will be kept confidential and names will not be written or specified.

II-Informed oral Consent

As to the information given ahead, Participating in this study has no any risk. Your name will not be written on this form and the information you give will never be shared to others. Your genuine response to the interviews will be very important for the purpose of the study. At the same time we would like to appreciate your voluntarily participation after a thorough understanding of the information given to you.

Are you willing to participate in this study?

1- No (say thank you) 2- Yes (continue asking)

Name of principal investigator: Yemisrach Getiye

Cell phone No –0912022669

E-mail: mesir19@gmail.com.

Name of data collector_____ signature_____

Date of data collection (Ethiopian calendar) _____/_____/_____

Result of data:

1- Completed……

3- Partially completed …….

Checked by supervisor;

Name …….. Signature …… Date ……...

Instruction: for each of the following questions, please carefully review the charts and provide answers as appropriate. (For number categories, circle the number of coding categories and for open categories, write the information needed in the provided space)

A. Identification (to be conducted and filled by principal investigator and supervisor)

Q. No	Questions	Answer	skip
001	Questionnaire ID no.		
002	Name of the hospital	1.Gahndi memorial hospital 2.Zewditu memorial hospital 3.Tikur Anbessa hospital 4.St.paul hospital	
003	Medical record no. of the mother		
004	Outcome of the newborn	1.Alive 2.dead	If dead, skip to Q.101
005	If alive, what was the status after delivery?	1.Refer to neonatal ICU 2.Discharged alive 3.Died immediately after birth	-If discharged alive, skip to 007 -if dead immediately after birth, skip to Q 101
006	If your answer to question no. 005 is referred to neonatal ICU, what was the outcome of the neonate?	1.Alive up to 7 completed days 2. Died before 7 completed days	
007	If your answer to question no. 005 is discharged alive, write the maternal address: phone number	_____	
008	conduct phone call and ask the respondent about whether a baby took 2^{nd} immunization(at 45^{th} day) or not as an entry point for conversation to confirm that they are alive after discharge up to the age of 7 completed days	1. Alive up to 7 completed days 2. Died before 7 completed days	

B. socio demographic variable

Q.no	Question	answer	skip
101	Age of the mother (in years)		
102	Marital status	1.Married 2.Single 3.Widowed 4.Divorced 5.Not registered	
103	Occupational status	1.Housewife 2.Private employee 3.Government employee 4.Daily laborer 5.Merchant 6. Student 7.Others (specify)_____ 8. not registered	
104	Educational status:	1.not educated 2. educated(write in completed grades)_____ 3. not registered	

C. Obstetric factors

Q.no	Question	answer	Skip
201	parity	_____	If parity is 1,skip to 203
202	When was her last delivery?	1. Within 2 years (24 months) of the current delivery. 2.Before or equal to2 years(24 months) 3.Not recorded	
203	Did the mother have regular antenatal care follow up?	1.Yes 2.No 3.Not recorded	

204	Did the mother take Tetanus Toxoid vaccination?	1. Yes 2. No 3. Not recorded	
205	Did the mother have a follow up in this hospital or referred from other health facility for delivery?	1. Referred . Not referred	
206	Gestational age(in weeks)	_____	
207	What was mode of delivery?	1.spontaneous vertex delivery .forceps delivery 3.vacuum delivery 4.cesarean section 5.Assisted breech delivery 6.other, specify_____	
208	History of abortion	1.yes 2. no	If no, skip to Q.211
209	If yes, how many?	_____	
210	What was the type of abortion	1.spontaneous abortion 2. induced abortion 3.both types 4.unknown	
211	History of still birth	1.Yes 2.No	
212	History of neonatal death before 7 completed days	1.yes 2.no	

D. medical factors

Q.no	Question	answer	Skip
301	What was the HIV status of the mother	1.reactive 2.non reactive 3.unknown	
302	What was VDRL test result of the mother?	1.reactive 2.non reactive 3.unknown	
303	What was hepatitis B result of the mother?	1.positive 2.negative 3.not registered	
304	Was hemoglobin/ hematocrit done during ANC or during	1.yes 2.no	
305	What was the level of hemoglobin	_____	
306	Does the mother have any chronic illnesses	1.Yes 2.No	If no, skip to Q. No 308
307	If yes to question no. 302, What was the illness? (multiple answers possible)	1.Diabetes mellitus 2.Chronic renal disease 3.Cardiac disease 4.Chronic hypertension 5.Other, specify_____	
308	Did the mother have any obstetric complication?	1.Yes 2.No	If no skip to Q 401
309	If yes to question no. 304, what was the complication?(multiple answers possible)	1.Preeclampsia 2.Eclampsia 3.Ante partum hemorrhage 4.Postpartum hemorrhage 5.Obstructed labor 6. Uterine rupture	

		7. Gestational diabetes mellitus 8. Polyhydraminos 9. Oligohydraminos 10. Post term 11. Premature rupture of membrane 12. Preterm labor 13.Others(specify)_____	

E. Newborn factors

Q.no	Questions	answer	Skip
401	What was the presentation of the fetus	1. cephalic 2. breech 3. transverse 4. other, specify____	
402	What was type of delivery	1. Single 2. multiple	
403	What was sex of newborn	1. male 2. female	
404	What was weight of newborn (In gram)	_____	
405	Was there any congenital malformation diagnosed during birth?	1.yes 2.no	

F. health care factors

Q.no	Question	answer	Skip
501	Use of partograph	1. Yes 2. No 3. Not indicated	If your answer to Q 006 &008 is alive up to 7 completed days end now.
502	For perinatal deaths, what was the type of perinatal deaths	1. still birth 2. neonatal death before 7 completed days of age	If neonatal death before 7 completed days skip to Q 504

503	For still birth, was the fetal heart beat positive during admission?	1. Yes 2. no	
504	If the answer for question no.501 is neonatal death before 7 days, what was the Apgar score at 1st and 5th minute?	1. APGAR score at 1st minute_____ 2. APGAR score at 5th minute_____	

12.3 Annex III. Amharic version information sheet, consent form and identification part of the questionnaire

የአማርኛ ቋንቋ መጠይቅ

I. የመረጃ መስጫ ወረቀት

ለሰልክ ጥሪ የተዘጋጀ:

ጤናይስጥልኝ! ስሜ ……..ይባላል:: እኔ በአዲስ አበባ ዩኒቨርስቲ የህብረተሰብ ጤና ትምህርት ክፍል የማስተርስ ዲግሪ መመረቂያ ጥናት አድራጊ/ተቆጣጣሪ ሰሆን ጥናቱ የሚያተኩረው ሞተው የሚወለዱና በተወለዱ በሰባት ቀን ውስጥ የሞቱ ህጻናት ጋር የሚቆራኙ ምክንያቶችን መለየት ሲሆን ጥናቱም የሚደረገው በመንግስት ሆስፒታሎች ውስጥ በተወለዱት ላይ ነው::ለዚህ ጥናት አዲስ አበባ ዩኒቨርስቲ አስፈላጊውን ፈቃድ ሰጥቷል:: እርስዎ የተመረጡት በዘፈቀደ በተደረገ ምርጫ ሲሆን ከርሰዎ ጋር የማረገው ቆይታ ከ 2̈ እሰከ 3 ደቂቃ ይወስዳል::

<u>የጥናቱ አላማ፡-</u> አዲስ አበባ ውስጥ በሚገኙ የተመረጡ የመንግስት ሆስፒታሎች ውስጥ ሞተው የተወለዱና በተወለዱ በሰባት ቀን ውስጥ የሞቱ ህጻናት ጋር የሚቆራኙ ምክንያቶችን መለየት ነው::

<u>ለተጠያቂው የ ሚሰ ጠው ጥቅ ም</u>፡ - ለ ተ ጠ ያ ቂ ው ቀ ጥ ተ ኛ ጥቅ ም ላ ይ ኖ ረ ው ይ ች ላ ል ፡ ፡ ነ ገ ር ግ ን ጥ ና ቱ ሞ ተ ው የ ሚ ወ ለ ዱ ና በ ተ ወ ለ ዱ በ ሰ ባ ት ቀ ን ው ስ ጥ የ ሞ ቱ ህ ጻ ና ት ጋ ር የ ሚ ቆ ራ ኙ ም ክ ን ያ ቶ ች ን ለ መ ለ የ ት ይ ረ ዳ ል ::

<u>ጥ ና ቱ ሊ ያ ስ ከ ት ለ ው የ ሚ ች ል ጉ ዳ ት</u>፡ - በ ጥ ና ቱ ላ ይ መ ሳ ተ ፍ ም ን ም አ ይ ነ ት ጉ ዳ ት አ ያ ስ ከ ት ል ም፡ ፡

<u>የ ተ ጠ ያ ቂ ው ሙ ብ ቶ ች :-</u> ለ ሚ ጠ የ ቀ ው ጥ ያ ቄ መ ል ስ የ መ ስ ጠ ት ም ይ ሁ ን ያ ለ መ ስ ጠ ት ሙ ብ ት አ ለ ዎ ት እ ን ዲ ሁ ም ያ ል ተ ረ ዱ ት ን ነ ገ ር መ ጠ የ ቅ ይ ች ላ ሉ ፡ ፡

<u>ምስ ጢራ ዊ ነ ት ፡</u> -ሁ ሉ ም መ ረ ጃ ም ስ ጢ ራ ዊ ነ ቱ የ ተ ጠ በ ቀ ሲ ሆ ን የ እ ር ሶ ን ስ ም ባ ለ መ ፃ ፍ ም ስ ጢ ራ ዊ ነ ቱ ን ለ መ ጠ በ ቅ በ ም ስ ጢ ር ቁ ጥ ር የ ም ን ጠ ቀ ም ይ ሆ ና ል ፡ ፡

II. ስ ምምነ ት

ከ ላ ይ እ ን ደ ተ ጠቀ ሰ ው በ ጥና ቱ መሳ ተ ፍ ምን ም አ ይነ ት ጉ ዳ ት አ ያ ስ ከ ት ል ም፡ ፡ ስ ምዎ ም በ ዚ ህ መጠይቅ ላ ይ አ ይጻ ፍ ም::

መረ ጃ ው ም ለ ማን ም ተ ላ ል ፎ አ ይሰ ጥ ም፡ :የ እ ር ስ ዎ እ ው ነ ተ ኛ መል ሶ ች ለ ሚደ ረ ገ ው ጥና ት በ ጣም ጠቃ ሚ ና ቸ ው፡ ፡

ስ ለ ዚ ህ በ ጥና ቱ ለ መሳ ተ ፍ ፈ ቃ ደ ኛ ነ ዎ ት?

አ ይ ደ ለ ሁ ም (አ መሰ ግ ና ለ ሁ በ ል ና አ ቁ ም) 2) አ ዎ (ጥ ያ ቄ ው ን ቀ ጥ ል)

የ ጥ ና ት አ ድ ራ ጊ ው ስ ም፡ -የ ም ስ ራ ች ጌ ት ዬ

ስ ል ክ ፡ +251912022669

ኢ-ሜ ይ ል ፡ mesir19@gmail.com

የ ጠ ያ ቂ ው ስ ም._____ ፊ ር ማ _____

የ ተ ጠ የ ቀ በ ት ቀ ን (በ ኢ ት ዮ ጵ ያ አ ቆ ጣ ጠ ር) -------/----------/----------

የ ጥ ና ቱ ው ጤ ት

ተ ጠ ና ቋ ል

በ ከ ፊ ል የ ተ ጠ ና ቀ ቀ

በ ሱ ፐ ር ቫ ይ ዘ ር ተ ረ ጋ ግ ጧ ል

ስ ም ----------ፊ ር ማ----------ቀ ን

የ መለ ያ ጥያ ቄ (በ ጥና ት አ ድራጊ ና ተ ቆ ጣጣሪ የ ሚሞላ)

ጥያ ቄ ቁ ጥር	ጥያ ቄ	መል ስ
001	የ መጠይቅ መለ ያ ቁ ጥር	
002	የ ሆስ ፒ ታሉ ስ ም	
003	የ እ ና ትየ ውየ ህ ክ ምና ካ ር ድ ቁ ጥር	
004	የ ተ ወለ ደ ው/ች ው ህ ጻ ን ው ጤት ምን ነ በ ር ?	1. በ ህ ይ ወት የ ተ ወለ ደ /ደ ች 2. ሞ ቶ /ታ የ ተ ወለ ደ /ደ ች
005	በ ህ ይ ወት ያ ለ ከ ሆነ ; ከ ተ ወለ ደ /ች በ ሏ ላ የ ነ በ ረ ው ሁ ኔ ታ ምን ነ በ ር ?	1. ወ ደ ጨ ቅ ላ ህ ጻ ና ት ህ ክ ምና ክ ፍ ል ተ ላ ከ /ከ ች 2. በ ህ ይ ወት ወ ደ ቤ ት ሄ ደ /ች 3. ከ ተ ወለ ደ /ደ ች በ ሃ ላ ወ ዲ ያ ው ኑ የ ሞ ተ /ተ ች
006	ለ ጥያ ቄ ቁ ጥር 005 መል ስ ዎ ወ ደ ጨ ቅ ላ ህ ጻ ና ት ህ ክ ምና ክ ፍ ል ተ ላ ከ /ከ ች ከ ሆነ ; ው ጤቱ ምን ነ በ ር ?	1. በ ሰ ባ ት ቀ ን ው ስ ጥ አ ል ሞ ተ ም/ተ ች ም 2. በ ሰ ባ ት ቀ ን ው ስ ጥ ሞ ተ /ተ ች
007	ለ ጥያ ቄ ቁ ጥር 005 መል ስ ዎ በ ህ ይ ወት ወ ደ ቤ ት ሄ ደ /ች ከ ሆነ ;የ እ ና ትየ ው ን አ ድራ ሻ (ስ ል ክ ቁ ጥር) ፃ ፍ	_____
008	በ ህ ይ ወት ወ ደ ቤ ት ለ ሄ ዱ ት በ ስ ል ክ የ ሚ ጠ የ ቅ ጥያ ቄ በ_____ሆስ ፒ ታ ል በ ቀ ን _____ የ ወ ለ ዱ ት ህ ጻ ን የ 45 ቀ ን ክ ት ባ ት ን መ ው ሰ ዱ ን /ዳ ን እ ን ደ መ ሳ ሻ ነ ት በ መ ጠ ቀ ም በ 7 ቀ ን ው ስ ጥ አ ለ መ ሞ ቱ ን /ት ን ማ ረ ጋ ገ ጥ	1. በ ሰ ባ ት ቀ ን ው ስ ጥ አ ል ሞ ተ ም/ተ ች ም 2. በ ሰ ባ ት ቀ ን ው ስ ጥ ሞ ተ /ተ ች

DECLARATION

I the undersigned, declare that this thesis is my original work, has never been presented in this or any other university, and that all the resources and materials used for the thesis development, have been acknowledged as complete references.

Name: Yemisrach Getiye

Signature: _____

Date of submission: _____

This thesis work has been submitted for examination with my approval as University primary advisor.

Name: Professor Mesganaw Fantahun

Signature: _____

Date: _____