ADDIS ABABA UNIVERSITY

COLLEGE OF DEVELOPMENT STUDIES

CENTER FOR POPULATION STUDIES

ASSESSMENT OF DETERMINANTS OF PERINATAL MORTALITY AMONG PUBLIC HOSPITAL DELIVERIES IN ADDIS ABABA, ETHIOPIA: AN UNMATCHED CASE CONTROL STUDY

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DECLARATION

I, declare that the thesis has been composed by my own and that the work has not been submitted for any other degree or professional qualification. All sources of material used for the thesis development, have been acknowledged as complete references.

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ABBREVIATIONS

AAU	Addis Ababa University
ANC	Antenatal care
APH	Antepartum Haemorrhage
CS	Caesarean section
EDHS	Ethiopian Demographic and Health SurveyComplete blood count
ENND	Early Neonatal Death
HDP	Hypertensive Disease of Pregnancy
HIV	Human Immunodeficiency Virus
ICD	International Classification of Diseases
NGO	Non-Governmental Organization
PM	Perinatal Mortality
PMR	Perinatal Mortality Rate
PNC	Postnatal Care
PROM	Premature Rupture of Membrane
REC	Research Ethics Committee
SDG	Sustainable Development Goal
SVD	Spontaneous Vertex Delivery
TT	Tetanus Toxoid
VDRL	Venereal Disease Research Laboratory
WHO	World Health Organization

ABSTRACT

Background: According to accepted terms, the period known as the perinatal period begins at week 22 of pregnancy and lasts until day seven following delivery. However, different nations' legal systems have varying definitions of late fetal death (stillbirth). Late fetal death is seen as occurring at and after the 28th gestational week in the majority of poor nations, notably Ethiopia as well as in some affluent ones. Even though there has been a marked decline in fatality among babies of post-neonatal age in Ethiopia, the rate of infant deaths during the perinatal period continues to be substantial. This research has identified the determinant factors and causes of perinatal mortality in Addis Ababa, Ethiopia.

Objective: The aim of this study is to assess determinants of perinatal mortality among public hospital deliveries in Addis Ababa, Ethiopia.

Method: A hospital based unmatched case control study was carried out. In all, 318 samples (106 cases and 212 controls) were collected from Addis Abeba's three government hospitals. Cases were perinatal 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 1st March – 31st May. For data input and analysis, Epi-Info version 7.0 and SPSS version 23 were utilized. Logistic regression model was utilized to identify the variables that are determinants of perinatal death.

Results: Obstetric complication occurred in 42.5% of cases and 18.9% of controls. Obstetric complications (AOR 4.399; 95%CI (2.288 - 8.456)), very low birth weight (AOR 5.033; 95%CI (1.499 - 16.896)) and low birth weight (AOR 14.479; 95%CI (4.484- 46.749)) were the determinants of perinatal mortality that increase risk of perinatal death. Whereas, education (AOR 0.135; 95%CI (0.037 - 0.492)) and partograph use (AOR 0.374; 95%CI (0.176 - 0.797)) were found to be protective factors for perinatal mortality.

Conclusion & recommendation: The determinants of perinatal mortality in the study area were largely educational status, obstetric complications, low birth weight and partograph use. Some of them can be avoided by examining pregnant women early on and monitoring them after delivery.

Keywords: perinatal mortality, case-control, determinants, Addis Ababa.

1. INTRODUCTION

1.1 Background

For numerous families, the delight of having kids has been overshadowed by problems associated with pregnancy, maternal and neonatal mortality or stillbirth. The expansion of knowledge and technology throughout the ages has resulted in a tremendous increase in the scope and caliber of medical care services(Hug et al., 2021). Due to these developments, the frequency of pregnancy-related maternal and new-born health issues has gradually decreased(Hug et al., 2021). However, such problems and fatalities continue to occur in various regions of the globe at an unacceptably high rate(Sala & Luppi, 2020).

Observations over many years showed that it can often be challenging to discern between live-born babies who pass away soon after birth and stillborn new-borns(Busby & Mangano, 2017). Particularly those who emerged from women who experienced labor and delivery issues that might have caused premature deliveries, fetal distress, hypoxia, or neurologic dysfunction(Busby & Mangano, 2017). The World Health Organization created the term "perinatal mortality" to describe both late fetal and early neonatal deaths in order to address this issue(Busby & Mangano, 2017). According to accepted terms, the period known as the perinatal period begins at week 22 of pregnancy and lasts until day seven following delivery(International Statistical Classification of Diseases and Related Health Problems, 2016). However, different nations' legal systems have varying definitions of late fetal death (stillbirth)(Zeitlin et al., 2016). Late fetal death is seen as occurring at and after the 28th gestational week in the majority of poor nations, notably Ethiopia as well as in some affluent ones(Zeitlin et al., 2016). Therefore, the phrase "perinatal mortality" refers to the loss of a fetus or new-born that occurs within the perinatal period(Zeitlin et al., 2016).

Worldwide, new-born and child mortality has decreased as a result of public health initiatives including vaccination and treatment for infectious illnesses. However, the amount of improvement made in lowering perinatal fatalities has been small(Hug et al., 2021). Throughout the world, there are more than 7 million perinatal deaths annually, including 3.5 million stillbirths and 4 million neonatal deaths(Hug et al., 2021). In all countries by 2030, sustainable development program engagement and action to be implemented, which targets the reduction of the neonatal mortality rate and stillbirths to 12 or fewer per 1000 live births and under-5 mortality to 25 or fewer per 1000 live births(World Health Organization & United Nations Children’s Fund (UNICEF), 2017).

In low and middle income nations, these perinatal deaths account for around 99% of the total(Hug et al., 2021). Unfortunately, about half of these perinatal deaths typically take place at home, go unnoticed, are not reported, and are therefore unaccounted for(Berhan & Berhan, 2014). The WHO assessed Ethiopia's perinatal mortality rate (PMR) in 2006 to be 57/1000 live births, with a ratio of early neonatal deaths (ENNDs) to stillbirths of roughly 2:1(Neme et al., 2020). Neonatal mortality rate (NMR) and the PMR are regarded as important indices of a nation's health due to the serious issue and its connection to the standard of medical treatment offered throughout pregnancy, the peripartum period, and the first month of the new-borns' lives(Berhan & Berhan, 2014b). Furthermore, the third Sustainable Development Goal (SDG-3); to end preventable new-born and under-5 mortality by 2030, remains dependent on lowering stillbirths and early neonatal deaths. Ending avoidable child deaths was chosen as the primary goal of the SDG-3 because more than 75 percent of infant deaths occur within the first 28 days of life(Sala & Luppi, 2020).

The description of its connection to maternal mortality emphasizes the significance of perinatal fatalities reduction. In addition, due to the high correlation between maternal and perinatal mortality, nearly two-thirds of maternal mortality factors also contribute to perinatal mortality(Hug et al., 2021). According to estimates, premature birth (29%), neonatal infections (18%), and complications from asphyxia (22%) were the main causes of neonatal fatalities(Desalew et al., 2020). Asphyxia was the main contributor to neonatal deaths in Sub-Saharan Africa, and it was also a result of subpar obstetric care(Tekelab et al., 2019). The 2016 EDHS finding indicated perinatal mortality was 33 deaths per 1000 pregnancies with (42 versus 32) deaths per 1000 pregnancies in urban and rural respectively , there is also marked regional variations, highest in Somali (50) and lowest in Afar (26) deaths per 1000 pregnancy. In Addis Ababa, perinatal mortality rate was 28 deaths per 1000 pregnancies(Ethiopia Demographic and Health Survey, 2016).

When it comes to lowering under-five mortality, Ethiopia is one of the Sub-Saharan African nations on the fast track. With 33 deaths per 1000 births, Ethiopia is one of the nations with the highest perinatal mortality rates in the world, and the decrease of neonatal and perinatal mortality remains a significant issue(Girma et al., 2022). However, it was noted that post neonatal mortality had decreased significantly more than early neonatal mortality, which was mostly responsible for the huge fall in infant mortality (54% vs 24%)(Mekonnen et al., 2013). More than half (52.4%) of early neonatal deaths occurred within the first two days of birth(Tesfay et al., n.d.). The national new-born and child survival strategy document for

Ethiopia claims, Asphyxia-14%, preterm -11%, newborn infection -9%) and other neonatal causes account for more than one third of under-five mortality in Ethiopia, with the majority of cases occurring in the first week of life(World Health Organization & United Nations Children's Fund (UNICEF), 2017).

1.2 Statement of the Problem

Around the world, 2.6 million babies are stillborn and 2.7 million newborns die(World Health Organization, 2014). In 2012, 1,840,000 new-born fatalities were in ten nations particularly Ethiopia that accounted around 2/3rd of the global neonatal deaths(World Health Organization, 2014). Neonatal mortality rate in nations with low and middle-income countries, fell between 1990 and 2015 from 36 to 19 deaths per 1,000 live births(World Health Organization & United Nations Children's Fund (UNICEF), 2017). The new-born babies who died within the first 28 days of life declined from 5.1 million to 2.7 million with the reduction rate 5.3%(World Health Organization & United Nations Children's Fund (UNICEF), 2017). This early neonatal mortality reduction has been slower than that of post-neonatal and under-five mortality which are 47 % and 58 % worldwide respectively(Allanson et al., 2015). Among 5.9 million child deaths in 2015, nearly 2 million deaths occur in the first week of life(Allanson et al., 2015).

Perinatal deaths are significantly higher among low birth weight and preterm births. Around 72.9% of low birth weight and preterm live born those have been admitted to neonate intensive care unit were dead. Nearly 1/3rd of death occurred on the 1st day or within 24 hours of life. Whereas the finding conducted in high income countries indicated that death rate based on gestational age cut-off 28weeks of fetal and neonatal death was 1.7 to 4.9 and 1.3 to 4.0 per 1000 live birth, this much lower death occur in developed countries(Mohangoo et al., 2013). Similar to other sub-Saharan nations, Ethiopia has a high rate of perinatal death. (Jena et al., 2020). According to 2016 EDHS report perinatal mortality rate (PMR) is 33/1000 births. Similarly, in Addis Ababa, the perinatal mortality is 28 per 1000 birth. The reduction of death rate between 2000 and 2016 shows that from 166 to 67, 97 to 48 per 1,000 live births for Under-5 and infant mortality respectively. The significant changes were made to lessen child fatality, however the degree of drop in new-born death is sluggish. (49 to 29 death per1000 live births) due to high perinatal mortality(Ethiopia Demographic and Health Survey, 2016).

Other studies conducted in different parts of Ethiopia indicated that maternal illiteracy, being self-employed and multiple births have contributed to perinatal mortality rate of 23.4 and 27.5 per1000 live births from stillbirth and early neonatal deaths respectively(Girma et al., 2022). Obstructed labour (27%), mal-presentation (11%), hypertensive disorder of pregnancy and prematurity (7%) have contributed to neonatal mortality within first 28 days of life(Berhan & Berhan, 2014). It contributes nearly 28% of under-5 deaths and 75% deaths within 1st weeks(Berhan & Berhan, 2014). One of the main issues with under-five mortality is perinatal death(Getiye & Fantahun, 2017).

By 2030 in all countries, sustainable development program engagement and action to be implemented proposed reduction of the neonatal mortality rate and stillbirths to 12 or fewer per 1000 live birth. Most studies concentrate on the 1% of perinatal deaths that occur in rich countries, even though 99% of them occur in low- and middle-income countries. There is little data on perinatal fatalities in the majority of low and middle-income nations(Houweling et al., 2019); similar to Ethiopia, where early neonatal death and a rising trend in perinatal death are the main causes of the country's high neonatal and infant mortality rates(Mitiku, 2021).

As to my knowledge while searching different literatures, though many studies have been published in Ethiopia, few prenatal mortality studies have been conducted in our country, particularly Addis Ababa. Among those few researches, there was a study done on factors associated with perinatal mortality among public hospital deliveries in Addis Ababa in 2014. It was conducted in Tikur Anbessa, Gandhi memorial, Zewditu memorial and St. Paul hospitals which are geographically too close to each other(Getiye & Fantahun, 2017). When studying public hospitals in the same geographical areas, there would be risk of overlooking the diverse socio-demographic and geographic factors that could impact perinatal mortality, which resulted in lack of representativeness. Each area may have its own unique population density, income levels, cultural practices and healthcare infrastructure, which could all influence accessibility and quality of care. By focusing on just small areas, that study may not have captured the entire spectrum of factors that impacted perinatal mortality.

On the other hand, studying public hospitals in different dispersed areas allows for a more comprehensive understanding of the multifaceted factors that influence perinatal mortality. By examining a diverse range of hospitals, researchers can gain insights into the various challenges and disparities in access to specialized medical services, healthcare infrastructures

and socio-demographic factors. This approach provides a more nuanced understanding of the complex dynamics at play and inform targeted interventions and policy decisions aimed at improving healthcare delivery and access for all populations in Addis Ababa.

Studying public hospitals in different dispersed sub-cities in Addis Ababa can fill the knowledge gap on perinatal mortality by providing a more comprehensive understanding of the factors that influence it. One key aspect to consider is the disparities in access to specialized medical services and healthcare infrastructure across different sub-cities. For example, some areas may have better-equipped hospitals with trained staff and access to essential resources, while others may lack these critical components. Understanding these disparities could help identify areas that require targeted interventions and investment in healthcare infrastructure to improve perinatal outcomes.

Furthermore, socio-demographic factors such as maternal education, socioeconomic status, and access to prenatal care can significantly impact perinatal mortality rates. By studying public hospitals in different areas, we tried to explore how these factors vary across different areas and identify hospitals at higher risk of poor perinatal outcomes. This knowledge can inform targeted interventions and policy decisions aimed at addressing these disparities and improving healthcare access for vulnerable hospitals.

Additionally, the geographic distribution of public hospitals can also influence healthcare outcomes. Some areas may have a higher concentration of hospitals, leading to better access to care, while others mght have limited healthcare facilities, resulting in barriers to timely and adequate medical attention during pregnancy and childbirth. Understanding these geographic disparities can help policymakers allocate resources effectively and strategically to ensure equitable access to quality maternal and child healthcare services across all areas in Addis Ababa.

In conclusion, this study tried to fill those gaps and studying public hospitals in different dispersed sub-cities in Addis Ababa provided a more comprehensive understanding of the determinants of perinatal mortality. This approach has the potential to drive meaningful improvements in maternal and child health outcomes and it could contribute to overall public health advancements in the city. Therefore, this research was intended to close this gap by assessing determinants of perinatal mortality. It is anticipated that the findings of this study will increase the awareness of all concerned parties on the factors contributing to perinatal

mortality in hospitals across the nation and serve as a key resource for any potential intervention aimed at enhancing new-borns' survival and achieving national objectives.

1.3 Research Questions

What are the socio-demographic, new-born, health care, obstetric and medical factors that determine perinatal mortality in the study area?

1.4 Research Objectives

1.4.1 General objective

- To assess the determinants of perinatal mortality among public hospital deliveries in Addis Ababa, Ethiopia from1st March – 31st May.

1.4.2 Specific objectives

- To determine socio-demographic factors that determine perinatal mortality among public hospital deliveries in Addis Ababa, Ethiopia from1st March – 31st May.
- To identify new-born factors that determine perinatal mortality among public hospital deliveries in Addis Ababa, Ethiopia from1st March – 31st May.
- To investigate health care factors that determine perinatal mortality among public hospital deliveries in Addis Ababa, Ethiopia from1st March – 31st May.
- To identify obstetric and medical risk factors that determine perinatal mortality among public hospital deliveries in Addis Ababa, Ethiopia from1st March – 31st May.

1.5 Significance of the study

In all of the nation's regions, Ethiopia keeps on dealing with an intolerably high rate of perinatal fatalities(Ethiopia Demographic and Health Survey, 2016). Ethiopia is one of the nations in the globe with a high rate of prenatal death, according to the WHO's Country, Regional, and Global estimates of perinatal mortality(Dessu & Dawit, 2020). However, the majority of conducted research only analysed fatalities and were insufficient to identify the factors that contribute to prenatal mortality. The paucity of data on factors that contribute to perinatal death seems to be a major obstacle to efforts to lower new born mortality in Ethiopia. In order to project prospective interventions at both the local and national levels, it is crucial to understand the problem's current stage and identify its potential drivers. This will enable the problem's root to be removed. The EDHS is population-centered survey conducted across the whole country that provides valid data on perinatal death at this time. However, the

EDHS only provided information on the prevalence of perinatal death based on several socio-demographic parameters not including the determinants.

The sustainable development goal is set to cut neonatal and under-5 child mortality to at least as low as 12 and 25 per 1000 live births respectively once the next 7 years have passed. Over the past 8 years, the nation has made progress toward achieving this target, and throughout this time, there has been a reduction in child mortality. However, the huge decline in post neonatal child fatalities was largely responsible for the decrease in the burden of child death. In order to significantly reduce child mortality, it is thought that treatments that target the perinatal age group are useful. This is due to the early neonatal fatalities having a disproportionately large death toll in the new-born age group(Mengesha & Sahle, 2017).

The information needed to enhance the health condition of expectant mothers and their unborn children is provided in part by perinatal mortality as a health indicator. Identifying determinants of perinatal mortality is very important for decision makers in building and implement strategies to improve the care provided to the pregnant mothers and their new-borns. This institution-based case control research aims to close the information deficit about the key factors that influence perinatal mortality and their corresponding levels of effect.

1.6 Scope and Limitation of the study

This study is intended to assess determinants of perinatal mortality among public hospital deliveries of Addis Ababa city administration. Socio-demographic factors, new-born factors, health care factors, obstetric and medical risk factors were assessed and compared to perinatal mortality. The study covers only Addis Ababa city administration, considering three selected public hospitals of Addis Ababa where there is high availability of delivery service, neonatal intensive care unit and patient flow. Since this research is conducted at hospital level, it might have missed deeper exploration of cultural practices and beliefs surrounding pregnancy and childbirth in addition to socioeconomic factors such as income and access to healthcare which may influence perinatal mortality rates. As a result, the findings of this study doesn't necessarily represent all factors determining perinatal mortality. Therefore, it is suggested that other researchers to study at community level, so as to include more factors which are expected to have effect on perinatal mortality. Despite these limitations, the researcher has paid due attention to ensure the reliability and validity of the collected data.

2. LITERATURE REVIEW

2.1. Introduction

On a regular basis, it can be challenging to discern between live-born babies who pass away shortly after birth and stillborn babies(Busby & Mangano, 2017). Particularly, the difficulty increases if the labor becomes more complex because of premature delivery, fetal discomfort, hypoxia, or neurologic despair(Busby & Mangano, 2017). The areas of the world where delivery in hospitals is least common and most labors are attended by traditional birth attendants or family members without proper training in medicine would be most negatively impacted by the notification of new birth deaths(Busby & Mangano, 2017). Additionally, a number of epidemiological investigations also showed a greater death incidence in the late fetal and early neonatal periods compared to the other new-born age groups(Zeitlin et al., 2016). Additionally, the pattern of fatalities as well as factors that contribute to fatality in the late fetal and early new-born periods typically overlap(Sala & Luppi, 2020). Thus, between the years of 1940 and 1950s, these debates led to the development of the concepts of the perinatal period and perinatal death(Zeitlin et al., 2016).

In accordance with the WHO International statistical classification of diseases and related health problems, at 22 weeks (154 days of gestation) the perinatal phase begins when the expected gestational weight at delivery is 500gm and the 7^{th} day after delivery. Fetal length can be used to determine the gestational age of a baby when weight measurements are not available and the gestational age of the fetus is unknown. At 22 weeks, the crown-to-heel length is estimated to be 25 cm. Furthermore, according to the WHO, an alive delivery is the entire extraction of a fetus from its mother, No matter how long a pregnancy has been, following separation, breathes or exhibits any other signs of life, such as heartbeat, umbilical cord pulsation, or discernible voluntarily moving muscles, whether or not the placenta remains connected or the umbilical cord has been trimmed; such delivering is referred to as a "live birth"(International Statistical Classification of Diseases and Related Health Problems, 2016).

Regardless of the length of gestation, a stillbirth or fetal death is defined as a loss before the full removal or detachment from the mother of the child as a consequence of conception (Hug et al., 2021). The absence of breathing or any other signs of life, such as the heart beating, the pulse of the umbilical cord, or clear voluntary muscle activity, following such separation indicates the fetus is dead (Hug et al., 2021). So, perinatal mortality is the demise of a child

during the perinatal period, which is defined as the loss of a fetus after the 22nd week of pregnancy and the fatality of a new-born before the first postpartum week(International Statistical Classification of Diseases and Related Health Problems, 2016). Each country must adhere to these WHO established case definitions, as it provides a basis for comparing the health condition of individuals in various nations and guiding medical interventions(International Statistical Classification of Diseases and Related Health Problems, 2016). Nevertheless there are variations in how the perinatal period and perinatal death are defined in various nations(International Statistical Classification of Diseases and Related Health Problems, 2016). Due to changing trends in reproductive health, socioeconomic growth, and the standard of obstetric and neonatal health care facilities, the incidence of fetal mortality in general and late fetal death in particular has considerably decreased in the majority of industrialized countries(Mf, 2007). Therefore, 22 weeks of gestation is frequently considered the age of life in the majority of industrialized countries because there are fewer incidences of late fetal death and new-borns that are extremely young have a higher chance of surviving (Mf, 2007).

However, most underdeveloped countries, like Ethiopia, which has a high rate of stillbirths, have the authority to classify losses as late fetal mortality when they take place in utero beyond the 28th week of gestation(Mf, 2007). An excellent illustration of this is the nations of Africa and South East and South Central Asia(Mf, 2007). However, this does not imply that all advanced countries utilize 22 weeks of pregnancy as the standard threshold for defining late fetal mortality(Zeitlin et al., 2016). As an example, losses occurring after the 28th gestational week are regarded as late fetal deaths in Sweden, which has one of the lowest perinatal death rates worldwide(Zeitlin et al., 2016).

2.2 Theoretical Review

Although improvements in obstetrics and neonatology have significantly reduced perinatal fatality over the past few years, agreement on theoretical concerns is still difficult to come by(Joseph, 2019). The births-based approach (which expresses perinatal mortality rates for each pregnancy stage per 1,000 total births during any pregnancy week) and the extended fetuses-at-risk formulation (which expresses perinatal mortality rates per 1000 in danger babies at any trimester according to pregnancy age which is a survival assessment model from the fetal aspect are examples of current models of perinatal death (Joseph, 2019). Contrary to the fetuses at risk model, which indicates that perinatal fatality rates grow progressively with extended pregnancy, the births-based model demonstrates that perinatal

mortality rates fall rapidly throughout pregnancy with an uptick at later stages of pregnancy (Joseph, 2019).

There are numerous mysterious phenomena in Perinatology that have eluded simple explanation. The conundrum of overlapping perinatal mortality curves presents perhaps the most significant obstacle to perinatal theory (Joseph, 2019). Yerushalmy, who demonstrated that low birth weight infants of pregnant smokers had lower neonatal mortality (compared to low birth weight infants of non-smokers) and that this mortality difference reversed at higher birth weights, was the first to describe this phenomenon more than 50 years ago (Yerushalmy, 2014). In fact, regardless of how maturity is defined (birth-weight or gestational age), this mortality crossover is a general phenomenon observed across many contrasts (e.g., singletons versus twins, infants of women with versus without hypertension, different outcomes (e.g., stillbirth, neonatal death sudden infant death syndrome, and cerebral palsy), and etc. (Joseph & Kramer, 2018).

2.2.1 Biological basis for birth patterns and late gestation changes in perinatal mortality

Studies on both animals and humans have shown that as gestation progresses, the utero-placental unit's capacity to maintain the fetus gradually declines (Joseph, 2019). The average uterine blood flow volume per unit of estimated fetal weight in humans is thought to decrease over the course of the pregnancy, from 993 ml/min/kg at 24 weeks to 360 ml/min/kg at 34 weeks, and finally to 296 ml/min/kg at 38 weeks (Joseph, 2019). This gives the rationale for routinely inducing labor at post-term gestation in all pregnancies, and even earlier in high-risk pregnancies (VanderWeele et al., 2012). The gradual decrease in utero-placental blood flow from mid-gestation afterward is also more in line with the fetuses-at-risk pattern of gestational age-specific perinatal mortality (which indicates a rise in death rates prior to term gestation) than it is with the births-based pattern (which only shows an upturn in death rates at term or post-term gestation) (Joseph, 2019). Non-causal models frequently make extensive use of interaction and other product terms, which serve a crucial diagnostic or non-causal prognosis purpose. Terms in non-causal models do not require causal interpretation (unlike those in causal models), and their presence in those models is merely explained by their effectiveness asp redictors. Serologic tests, which are frequently employed to diagnose particular infections, are therefore evaluated exclusively on their diagnostic performance, disregarding causal interpretation, particularly the reverse causation between infection and immune response. The births-based model, in a similar way, offers non-causal prognosis, reassuring mothers of young children who smoked during pregnancy that their children have

a relatively better prognosis without any causal implications regarding the connection between maternal smoking and mortality (Joseph, 2019).

Another theory for the paradox is called collider stratification bias, which states that perinatal mortality patterns that cross over any determinant contrast (such as twins vs. singletons) are due to stratification on a variable, such as gestational age, that is the common effect of both the determinant in question and an unmeasured or unidentified confounder (of the relationship between gestational age and perinatal death) (Whitcomb et al., 2009). Although this bias is a well-known phenomenon, the explanation may be undermined by the inability to pinpoint candidates who are likely to act as the unmeasured confounder in the paradox. Among the factors that have been proposed as unmeasured confounders are those that only pertain to particular contrasts (such as placental abruption in the relationship between preclampsia and cerebral palsy) or generic ones that are not sufficiently characterized (such as genotype or placental proteins) (Joseph, 2019). The gestational age-specific birth rate may be a better candidate for this confounding factor function as it influences both the stratification variable involved (i.e. gestational age) and also the outcome (perinatal death). The more straightforward argument that interaction and other terms in non-causal prognostic models do not require causal elucidation is likely more persuasive than the "mixed models" approach.

2.2.2 Perspectives in obstetrics and neonatology

Up until recently, the births-based perspective's observation of the exponential drop in perinatal death rates with increasing gestation prevented the development of an epidemiologic framework for supporting medically indicated early delivery (Joseph, 2019). Such an early delivery has an impact on the pattern of birth rates, which serves as the demographic counterpart to an early delivery that is medically indicated in obstetrics. The birth rate has likely changed over time in high-income countries' populations in recent decades, which is consistent with a temporal drop in perinatal mortality (Joseph, 2019). The births-based viewpoint in neonatology has resulted in possibly erroneous global comparisons of neonatal mortality among babies born at extremely preterm gestation (Shah PS, Lui K, Sjörs G, et al, 2016; Hossain S, Shah PS, Ye XY, et al, 2016).

The fetuses-at-risk and births-based models are suitable for addressing different epidemiologic issues; the longitudinal survival analysis perspective of the fetuses-at-risk model is preferable for addressing causal questions, while the cross-sectional births-based

model is excellent for setting prognosis at birth. This difference arises because the fetuses-at-risk formulation represents a survival analysis model and because critical biological phenomena including birth rates can only be represented in this framework. On the other hand, the births-based approach derives its strength as a prognostic model from its use of gestational age at birth and birth weight as powerful predictors of mortality and other outcomes of perinatal interest. Epidemiologic questions in medicine fall into causal and non-causal categories. The fetuses-at-risk and births-based models provide the framework for research in causal and non-causal perinatal domains respectively.

2.3 Empirical Literature Review

Numerous research carried all over the globe demonstrate an elevated rate of prenatal deaths. Each year, 2.8 million new-borns globally pass away in the initial seven days of life, out of 133 million new-borns born alive. Throughout the intra-partum period, 2.6 million stillbirths took place, accounting for about fifty percent of all perinatal deaths. Specifically, 98% of the fatalities happened in nations with low and moderate incomes(WHO, 2010). According to the research carried out using secondary data analysis in Portugal between 1988 and 2011, 9.5% of the total new-borns died during the perinatal period. In a comparable investigation carried out in South Africa, the perinatal death rate for infants delivered between 2013 and 2014 was 2.92%(Allanson et al., 2015, Fuster, 2016). 1.68% of neonates born in North East Iran experienced perinatal fatalities between 2011 and 2012, according to a descriptive cross-sectional study design(Ghorat et al., 2016). The rate of perinatal death among neonates born during the research period was 9.8% at Jimma University Teaching Specialized Hospital using a similar study design in 2012 and 2013(Ahmed, 2016). According to a case control study conducted in Southern Ethiopia between 2008 and 2010, the perinatal death rate was 33.3%(Getachew and Yifru, 2012). According to a research investigation conducted at Wolliata Sodo University and General Hospital between 2014 and 2015, 17.3% of neonates born in the study area died at that time(Mihiretu et al., 2017).

Age of the mother is still associated with an increased risk of perinatal death, according to studies conducted in hospitals and communities. For instance, perinatal death was found to be significant in mothers with the age of 35 years or more in comparison to those between 18 and 35 years old in a prospective community-based cluster census and case control still birth and early neonatal death research carried out in the West Bank and Gaza Strip(Kalter et al., 2008). An additional investigation carried out in a Nepalese hospital revealed that women over the age of 35 had a higher rate of antepartum stillbirth than those under that age. In

comparison with a better income level, lower socioeconomic status was found to be a contributing factor for perinatal death in the case control research that was carried out in India for a year(Viswanath et al., 2015). An investigation carried out in Rwanda revealed that perinatal death rates have risen in women over 34 than in those between the ages of 20 and 34(Musafili et al., 2015). According to a research done in the North Shewa zone of Oromia, Ethiopia, women over the age of 35 were more likely to lose their babies during the perinatal period than those under 35 (Roro et al., 2018).

According to a research on immigrants done in Sweden evaluating the impact of inadequate prenatal care on perinatal results, mothers who get inadequate ANC are 6.2 times more likely to have negative results than mothers who receive adequate treatment(Belihu et al., 2016). in contrast to women who received the best treatment, those who received subpar intrapartum and early postnatal care exhibited 13 and 18 fold greater risk, respectively(Belihu et al., 2016). The Lancet Child Survival Series also vigorously contends that maternal medical services throughout gestation, delivery, and initial neonatal treatment, as well as pediatric medical initiatives, are two healthcare programs where treatments meant to lower newborn fatalities belong(Hug et al., 2021).

According to a community-based longitudinal research in Eastern Uganda, women who delivered at their homes were three times more likely to experience perinatal mortality than those who delivered in medical centers(for the PROMISE- EBF Study Group et al., 2015), highlighting the danger of inadequate postpartum care brought on by home birth and its detrimental effects on the pregnancy(for the PROMISE- EBF Study Group et al., 2015). In the majority of research, family wealth, the mother's literacy and age were among the socio-demographic characteristics that typically had a connection with prenatal results(Chuwa et al., 2017). women under the age of 20 have a two-fold greater chance of experiencing negative perinatal results than those between the ages of 20 and 30 (for the PROMISE- EBF Study Group et al., 2015). Comparing women with secondary and higher education to mothers without education, it was found that the probability of losing baby was increased by 2.67 times(Chuwa et al., 2017).

In a Zimbabwean research, women with no formal schooling or only an elementary school education had a five-fold higher chance of losing their babies to perinatal mortality(Dhege et al., 2014, pp. 2002–2201). Families that were more prosperous or made more money stood a greater probability of preventing perinatal mortality in their infants(Wiegerinck et al., 2015).

Using women from middle-class homes as a benchmark, those with higher socioeconomic position are at a decreased chance of losing their fetus to perinatal mortality (Wiegerinck et al., 2015). Infants born into the most impoverished households had a 3 fold higher mortality rate than those born into the wealthiest ones.

There was no statistically significant link between prior abortion and perinatal death, according to research conducted in northern rural Tanzania(Mboya et al., 2020). Additionally, it is recognized that multiple deliveries considerably increase the likelihood of perinatal death in compared to solitary births (Bellizzi et al., 2018). Multiple investigations found a high correlation between perinatal death and issues related to pregnancy. In a case-control investigation done in Zimbabwe, pregnant women with problems had a 7.04 percent probability of delivery to a baby who would die at delivery or very soon after(Getiye & Fantahun, 2017). The likelihood of staying alive for babies was also influenced by their weight at delivery, with infants weighing less than 2500 g having a high risk of not making it through the perinatal period (Ukke & Diriba, 2019).

With regards to the key factors that determine prenatal mortality and their individual levels of impact, the present research aims to close the information deficit that currently exists. It will help in preventing occurrence of perinatal deaths by identifying potential determinants of maternal, fetal/new-born and health care factors. The result of the study will provide information for health care providers to improve quality of antenatal, delivery and postnatal care after identifying determinants of perinatal mortality. It will also help to the community to receive quality care at health institutions that will reduce perinatal deaths. Finally the result may provide information as input for large scale facility and community based quantitative and qualitative studies in the capital and as a reference for other researchers interested in perinatal mortality and other studies.

2.4 Conceptual Frame-work

This Conceptual framework tries to show the process of attaining the association of dependent and independent variables of perinatal mortality among deliveries. The data on perinatal mortality can guide someone in understanding the determinants as well as its current status. Based on the theoretical and empirical literature discussed in the aforementioned paragraphs, perinatal mortality is influenced by a multitude of determinants. Most of them are easily preventable and few are unpreventable due to the nature of the factors. To align the conceptual framework with the research objectives, perinatal mortality is the dependent variable and the mentioned socio-demographic factors, new-born factors, health care factors, obstetric and medical risk factors are independent variables which majorly affect perinatal mortality directly or indirectly. The conceptual framework for this study showed in the following figure:

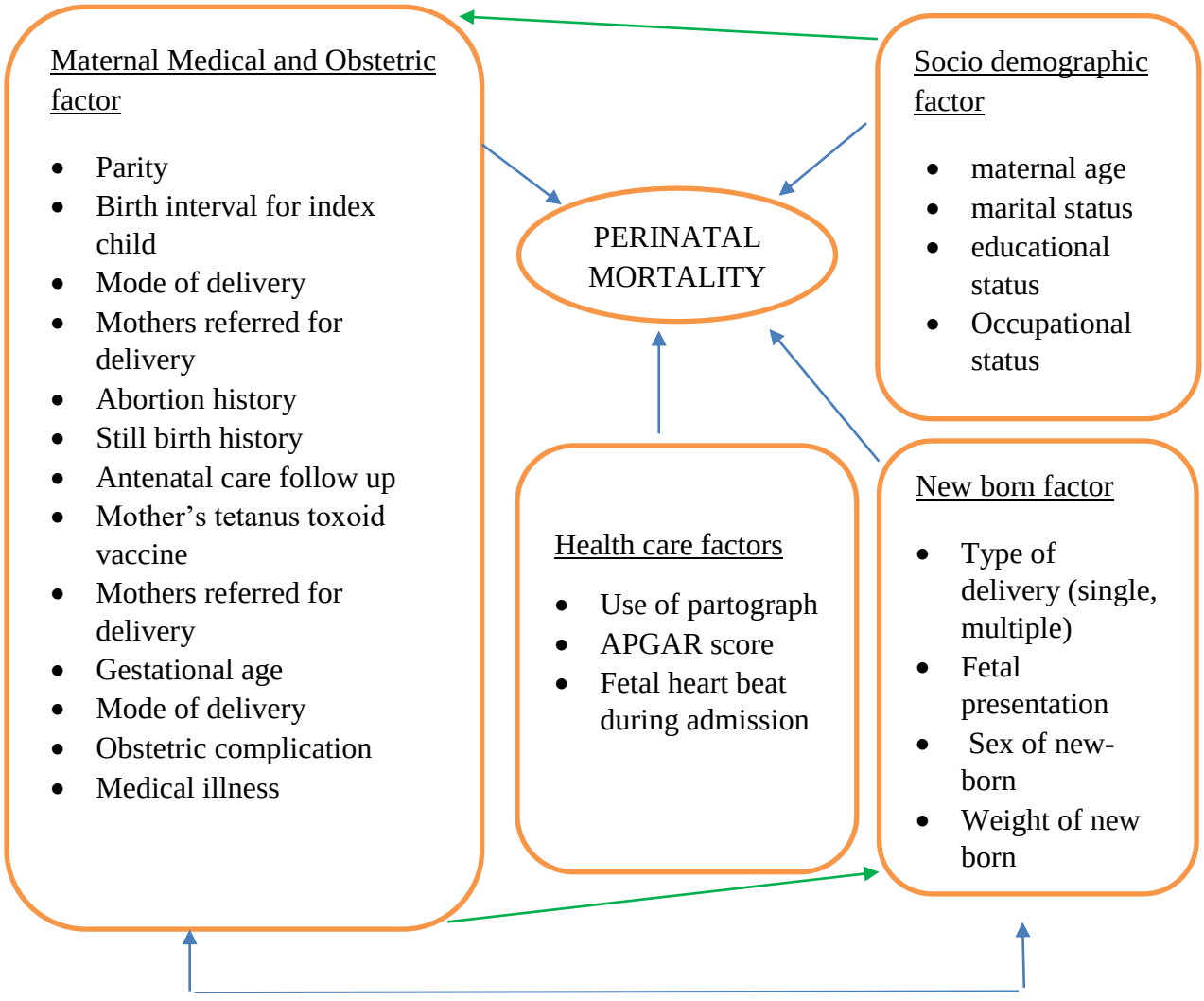

Figure 1: Conceptual frame work developed after reviewing different literatures.

3. METHODS

3.1 Study area

Ethiopia's capital, Addis Ababa, has a total size of 527 km^2 and is situated in the country's central region. It serves as one of the Ethiopian cities that is run by the city council. Numerous local and international organizations, like the African Union, have their headquarters in the city. The majority of individuals work as government employees, merchants or daily labourers. 11 Sub-Cities and 121 Woredas make up Addis Ababa's units of administration.

The estimated population of Addis Abeba for 2020/2021 was projected to be 3,770,554 as per the most recent census with women making up 51.5% of that total. 87,854 of the females in the age category of reproduction (33% of the total population) are anticipated to get pregnant in 2020–2021(CSA, 2007). The Addis Ababa City Administration Health Bureau is in charge of heading the health sector generally in terms of city management. The municipality maintains a three-tiered health system. The health system building blocks adhere to a plan of illness prevention and health improvement. In Addis Ababa, there are over one thousand medical institutions, consisting 12 government hospitals, 33 private hospitals, 102 health centers and a number of higher or medium clinics.

This research was carried out in labor and neonatology wards of 3 government hospitals of Addis Ababa; Abebech Gobena Mothers' and Children's Medical Center, Gandhi memorial hospital and St. Peter's specialized hospital. At the municipal and federal levels, each of these institutions functions as a referral and educational centers.

3.2 Research Approach

Quantitative data-collection methods were employed to conduct the study. A well-structured questionnaire was used.

3.3 Study design and period

An institution based unmatched case control study design using secondary data as a source of information was performed from1st March - 31st May.

3.4 Population

3.4.1 Source population

All deliveries (live births, stillbirths and early neonatal deaths) attended in the study hospital in the study period were the source population.

3.4.2 Study population

Cases: Perinatal deaths that fulfill the inclusion criteria during the study period were included as study group.

Controls: Live births that left the hospital alive and weren't dead before they were seven days old and fulfilled the inclusion criteria during the study period were included as study group.

3.4.3 Study unit

The unit of the study were mothers who encountered stillbirth, early neonatal death or live birth during the study period.

3.5 Eligibility criteria

3.5.1 Inclusion criteria

- Third trimester pregnant women who were on ANC follow-up in the study hospital during the study period.
- All early neonates with maternal address from Addis Ababa, delivered in the study hospital and survived their seventh day during the study period were included in this study.
- All early neonates with maternal address from Addis Ababa, delivered in the study hospital and died before seven completed days during the study period were included in this study.

3.5.2 Exclusion criteria

- Study units whose medical registration number was not stated in the delivery summary or missing cards.
- Study units whose phone numbers (for babies who were discharged) were wrong or not listed on the medical records.
- When the woman was referred for birth from elsewhere than Addis Abeba.

3.6 Sample size determination

The sample size of the study was determined using two population proportion formula by using EPI Info software version 7. Among variables (Mother's age, Maternal history of having perinatal deaths, Preterm delivery, Multiple births, obstetric complication (HDP), Male babies), that are independent predictors of perinatal mortality extracted from the research done in North Showa zone (Roro et al., 2018), West Gojam (Yirgu et al., 2016) and Hawassa Referral Hospital (Bayou et al., 2012), **Obstetric complication (hypertensive disease of pregnancy)** was discovered to provide the maximum sample size with odds ratio of 3.2 and obstetric complication (HDP) among the controls was 6.4%, taking 95% level of confidence, 80% power and 2:1 ratio of controls to cases, 302 people were included in the overall sample size. (101 cases and 201 controls). By taking a 5% non-response rate, the final sample size for this study is 318 (106 cases and 212 controls).

Table 1: Sample size determination for a study on determinants of perinatal mortality among public hospital deliveries in Addis Ababa, Ethiopia

No.	Variable	power	Ratio (Controls to cases)	% of controls exposed	AOR	Calculated sample size			Reference
						Case	Control	total	
1	Mother's aged 35 years and above	80%	2:1	5.5%	7.588(1.913-30.102) *	31	61	92	(Roro et al., 2018)
2	Mothers whopreviously experienced Perinatal deaths	80%	2:1	6.8%	9.55 (4.67, 19.54) *	21	41	62	(Yirgu et al., 2016)
3	Preterm delivery	80%	2:1	4.8%	8.583(2.275-32.386)*	29	58	87	(Roro et al., 2018)
4	Multiple births	80%	2:1	7.5%	3.599(1.200-10.798)*	71	142	213	(Roro et al., 2018)

5	**Obstetric complication (HDP)**	**80%**	**2:1**	**6.4%**	**3.2 (1.33-7.53)****	**101**	**201**	**302**	**(Bayou et al., 2012)**
6	Male babies	80%	2:1	49.3 %	5.478(2.502-11.997)*	26	51	77	(Roro et al., 2018)

3.7 Sampling procedures

Three Government hospitals in Addis Ababa were selected on the basis of patient flow, delivery service and new-born ICU accessibility during the study period. Prior to data collection, sample size was proportionally distributed across the facilities using the three-month average delivery rate as a basis. Then from the delivery report, perinatal deaths from1st March – 31st May, 2023 were randomly recruited as cases. For every case, two babies born and left the hospital alive were selected to function as the control group. Data were gathered using a structured questionnaire from neonatal and maternal medical records. Admission history, labour follow up sheet, delivery summary and antenatal care (ANC) follow up sheet were employed. Then from mothers' medical records, phone numbers were taken and to demonstrate that the neonates who had been discharged and had survived for at least seven full days, a phone call was made. Out of the 212 controls; seven mothers with alive neonates who were randomly selected and then made sure that the phone number was not registered in their medical record, or with wrong phone number or came from elsewhere than Addis Ababa, the following alive neonate served as a control group. Based on the information grabbed from each study hospitals of respective delivery rate attended during the study period which is 800, 762 and 343 for Abebech gobena mothers' and children's medical center, Gandhi memorial hospital and St. Peter's specialized hospital respectively; Of the total delivery of 1905, 800(42%), 762(40%) and 343(18%) for Abebech gobena mothers' and children's medical center, Gandhi memorial hospital and St. Peter's specialized hospital, respectively, were allocated proportionally to each hospital.

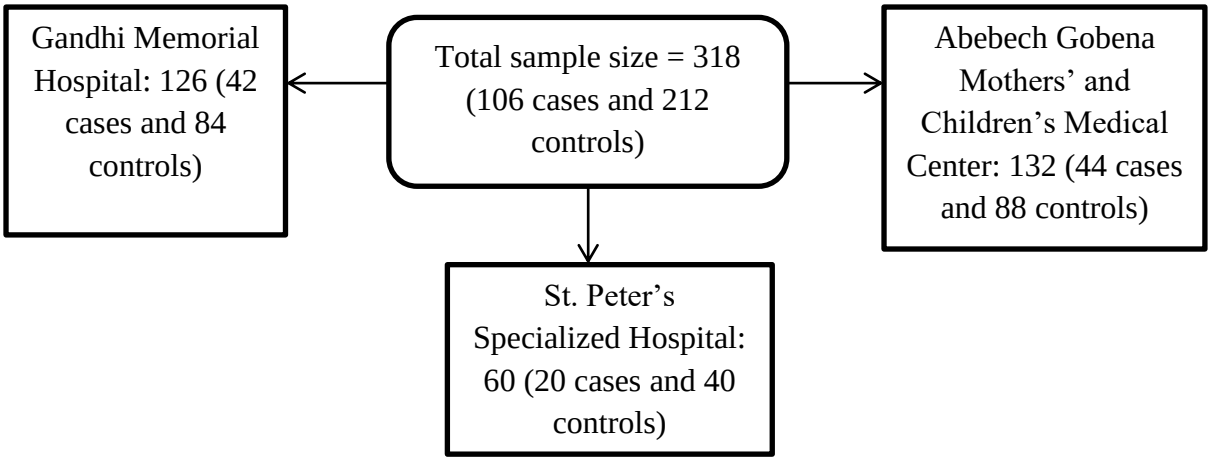

Figure 2: Schematic presentation of sampling procedure

3.8 Data collection instruments and procedures

An English record reviewing tool was created after evaluating pertinent literature. Information was gathered utilizing a standardized questionnaire from neonatal and maternal cards. The registration books were used to pick the cases and controls, among the total delivery of 1905, 800(42%), 762(40%) and 343(18%) for Abebech gobena mothers' and children's medical center, Gandhi memorial hospital and St. Peter's specialized hospital were respectively allocated proportionally to each hospital; After which the cards of the selected cases and controls were located in the archive using the card numbers from the registration book. Maternal cards were used to collect data on stillbirths and early neonates had their own cards evaluated. To find out how new-borns were doing after being released from the hospital, a call was placed to the mother's number. To gather data for the research variables, admission history, labor follow-up sheet, delivery summary, and ANC follow-up sheet were employed. The variables include: socio-demographic, new-born factors, health care factors, medical and obstetric variables. In about 5% of the research participants at Zewditu Memorial Hospital, the questionnaire was pre-tested using perinatal fatalities from February 2022, which contributed to refinement of the questionnaire and a better understanding of local context and potential challenges that ultimately improved the quality, reliability and validity of the research finding.

3.9 Study Variables

3.9.1 Dependent variable

Perinatal mortality(still birth and early neonatal death)

3.9.2 Independent variables

Socio-demographic variables: Age of the mother, marital status, occupational, educational level

Maternal variables: number of previous live birth, last delivery, mode of delivery, abortion history, early neonatal death history, still birth history, antenatal care follow up, mother's tetanus toxoid vaccine, referral, pregnancy weeks

Medical variables: Maternal complication, chronic illness, HIV, haemoglobin level, VDRL, hepatitis B

Health care related variables: Partograph use, APGAR score, fetal heart beat during admission

Neonate variables: delivery type, fetal presentation, new-born sex, weight of new-born

3.10 Operational definition and Measurement

Early neonatal mortality: deaths among live births before the first 7 days of life.

Still birth: Fetus of at least 1,000 gram of birth-weight or corresponding to approximate 28 weeks of gestation or more, with no signs of life before delivery(pre-partum stillbirth or at delivery (intra-partum stillbirth).

Perinatal mortality: number of stillbirths and deaths in the first week of life per 1000 total births

Term: pregnancy which lasts between 37-42 weeks

Post-term: pregnancy which lasts more than 42 weeks

Pre-term: delivery before 37 weeks of pregnancy

Abortion: pregnancy termination prior to20 weeks' gestation or a fetus born weighing less than 500 grams.

ANC: the care given to an expectant mother from the time of conception until the beginning of labor

Low birth weight: weight at birth between 1500 and 2500gm

Very low birth weight: weight at birth less than 1500gram

Prematurity: is defined as a birth that takes place before 37 weeks of gestational age

VDRL test: a screening test for syphilis

Congenital anomaly: conditions of prenatal origin that is present at birth, potentially impacting an infant's health, development and/or survival

3.11 Data processing and analysis

Software version 23 of SPSS was utilized for analysis, while Epi-info version 7 was used to code, input, and clean the data. Frequency distribution was applied to define the features of the study participants. Bivariate logistic regression analysis was employed to assess the degree of the link between the predictor and outcome variables and to choose potential

variables for multiple logistic regression analysis. Those Variables that had a bivariate p-value of less than 0.25 were incorporated into a multivariate logistic regression analysis (Zhang, 2016). Using the Hosmer-Lemshow test of significance (p-value was >0.05), the model's fitness was evaluated. The strength of the association was measured using an odds ratio with a 95% confidence interval, and variables with a p-value of less than 0.05 were deemed statistically significant. Prior to analysis, data were examined for completeness and consistency. Tables and figures were used to describe the study finding and predictor variables. The obtained data was analysed using SPSS version 23.

3.12 Ethical considerations

Ethical approval was obtained from Addis Ababa University, College of Development studies, Center for Population studies research and ethical review committee (REC). After the REC gave its approval, the Addis Ababa City Health Bureau (AACHB) and St. Peter's specialised hospital were notified of the study's aims via a letter of support from the AAU College of Development Studies and after that, the chosen hospitals where the study was done were given formal consent by the AACHB. Given that the study is based on medical cards with the exception of one question that received a phone call as a response, it wasn't necessary to have informed consent for the medical record review. However, over the phone, each chosen respondent was asked to affirm their desire by providing informed verbal permission. The privacy of respondents and the confidentiality of data were upheld. The questionnaire did not contain the respondents' names.

3.13 Dissemination of the result

The finding of this study will be presented and submitted to Addis Ababa University, College of Development studies, Center for population studies and to Addis Ababa city health bureau. The findings will be presented in relevant workshops, seminars, scientific conferences and to the responsible bodies. Moreover, the finding of this study will be published in national or international reputable journals.

4. RESULT AND DISCUSSION

4.1 Socio-demographic factors

Maternal cards from 318 women (106 cases and 212 controls) were examined. The mean age of mothers of case and control groups was 28.32±5.032 standard deviation (SD) and 28.61±5.230 standard deviation (SD) years respectively. Majority of mothers (92.5% of control) and 93.4% of case group were married. With regard to maternal occupational status, a little more than half of the mothers (53.4% of cases and 54.2% of controls) were house wives. Educated mothers accounted for 79.2% and 76.9% in cases and controls respectively (Table 2).

Table 2: Socio-demographic factors of mothers with and without perinatal mortality among public hospital deliveries in Addis Ababa, Ethiopia, 2023.

Variable	Category	Perinatal outcome	
		Case (n (%))	Control (n (%))
Marital status	Married	99(93.4%)	196(92.5%)
	Single	1(3.8%)	8(0.9%)
	Widowed	1(0.9%)	3(1.4%)
	Divorced	5(4.7%)	5(2.4%)
Occupational status	House wife	63(53.4%)	115(54.2%)
	Private employee	17(16.0%)	43(20.3%)
	Government employee	8(7.5%)	23(10.8%)
	Daily labourer	2(1.9%)	5(2.4%)
	Merchant	7(6.6%)	13(6.1%)
	Student	2(1.9%)	3(1.4%)

The maternal age group from 25 - 29 was the most common age group in both the case and controls (Fig 3).

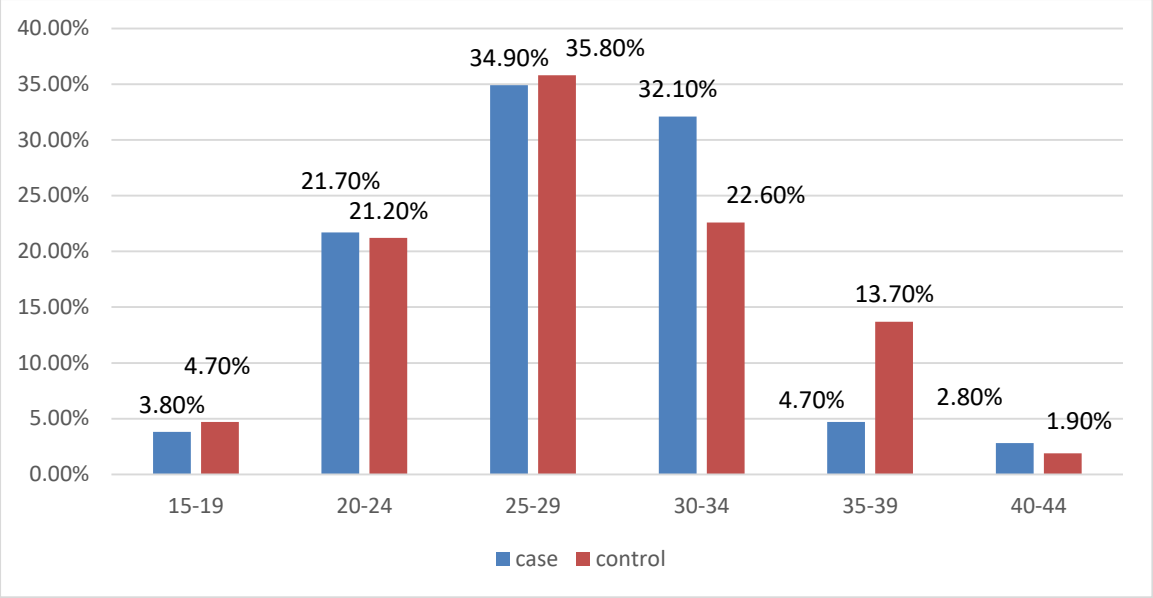

Figure 3: Maternal age with and without perinatal mortality among public hospital deliveries in Addis Ababa, Ethiopia, 2023.

Mothers who are educated accounted for 79.2% of the cases and 76.9% of the controls (Fig 4).

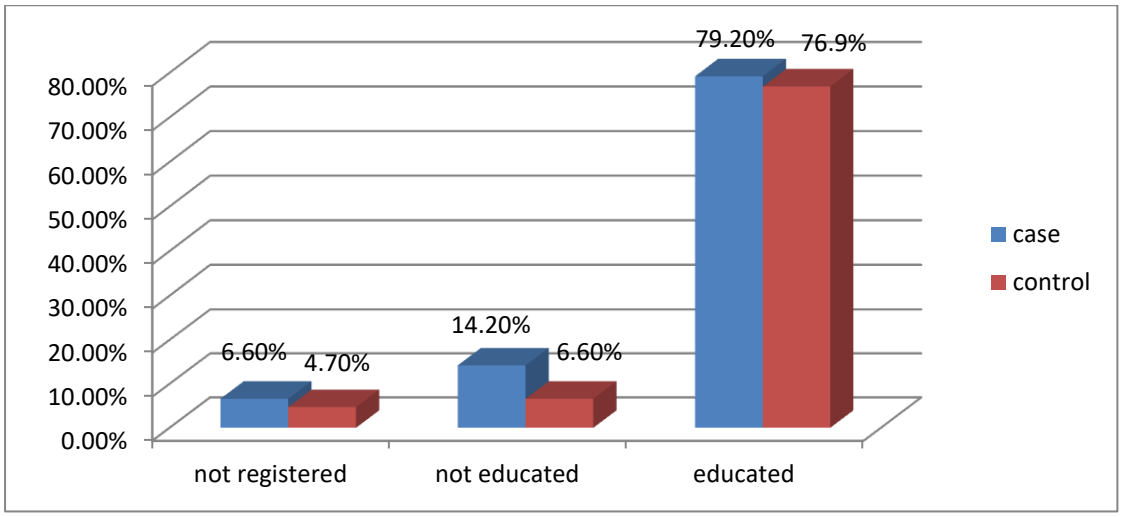

Figure 4: **Maternal educational status with and without perinatal mortality among public hospital deliveries in Addis Ababa, Ethiopia, 2023.**

4.2 Obstetrics factors

Among mothers who had previously given birth, 84.3% of controls and 78.5% of cases gave birth more than two years following their previous delivery. 79.2% of the women received referrals from other medical institutions; the remainder underwent follow-up care at the appropriate hospitals. 65.1% of mothers delivered normally by SVD and 22.0% by caesarean section. 5.3% of women had aborted previously. Of these, 64.7 % had induced abortions,

29.4% had spontaneou and 5.9% had both types of abortion. From the total respondents, 5.7% of cases and 2.4% and 1.9% of controls had stillbirth and early neonatal death history respectively (Table 3).

Table 3:- Obstetrics factors of mothers with and without perinatal mortality among public hospital deliveries in Addis Ababa, Ethiopia, 2023.

Variables	Category	Perinatal Outcome	
		Case	Control
Birth interval	<2 years	17(21.5%)	27(15.7%)
	≥2 years	62(78.5%)	145(84.3%)
ANC follow-up	Yes	102(96.2%)	206(97.2%)
	No	2(1.9%)	6(2.8%)
TT vaccination n	Yes	100(94.3%)	201(94.8%)
	No	2(1.9%)	2(0.9%)
	Not registered	4(3.8%)	9(4.2%)
Referral status	Referred	81(76.4%)	171(80.7%)
	Not referred	25(23.6%)	41(19.3%)
Mode of delivery	SVD	67(63.2%)	140(66.0%)
	Forceps delivery	7(6.6%)	9(4.2%)
	Vacuum delivery	7(6.6%)	11(5.2%)
	Caesarean section	22(20.8%)	48(22.6%)
	Assisted breach delivery	-	2(0.9%)
	Other	3(2.8%)	2(0.9%)
History of abortion	Yes	10(9.4%)	7(3.3%)
	No	96(90.6%)	205(96.7%)
Type of abortion	Spontaneous	2(20.0%)	3(42.9%)
	Induced	7(70.0%)	4(57.1%)
	Both types	1(10.0%)	-
Previous history of stillbirth	Yes	6(5.7%)	5(2.4%)
	No	100(94.3%)	207(97.6%)

Previous history of ENND	Yes	6(5.7%)	4(1.9%)
	No	100(94.3%)	208(98.1%)

Seventy-nine percent of women had term births. The proportion of preterm delivery was 16.0% in cases and 13.4% in controls (Fig 5).

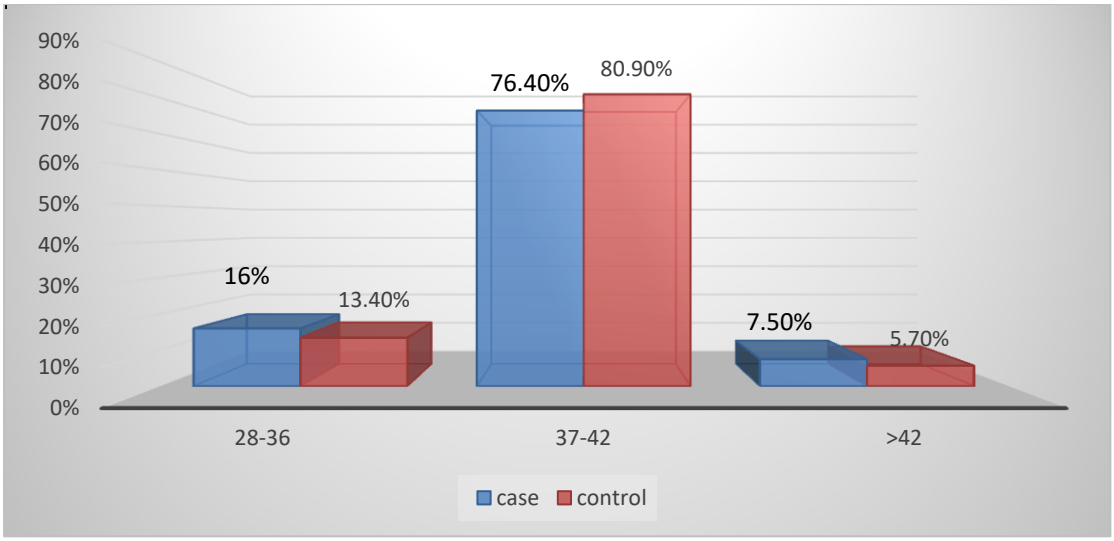

Figure 5: Gestational age of women with and without perinatal mortality among public hospital deliveries in Addis Ababa, Ethiopia, 2023.

Of the total respondents in the study, 40(18.9%) and 27(25.5%) of control and case mothers delivered at the first time (prim-gravida) respectively (Fig 6).

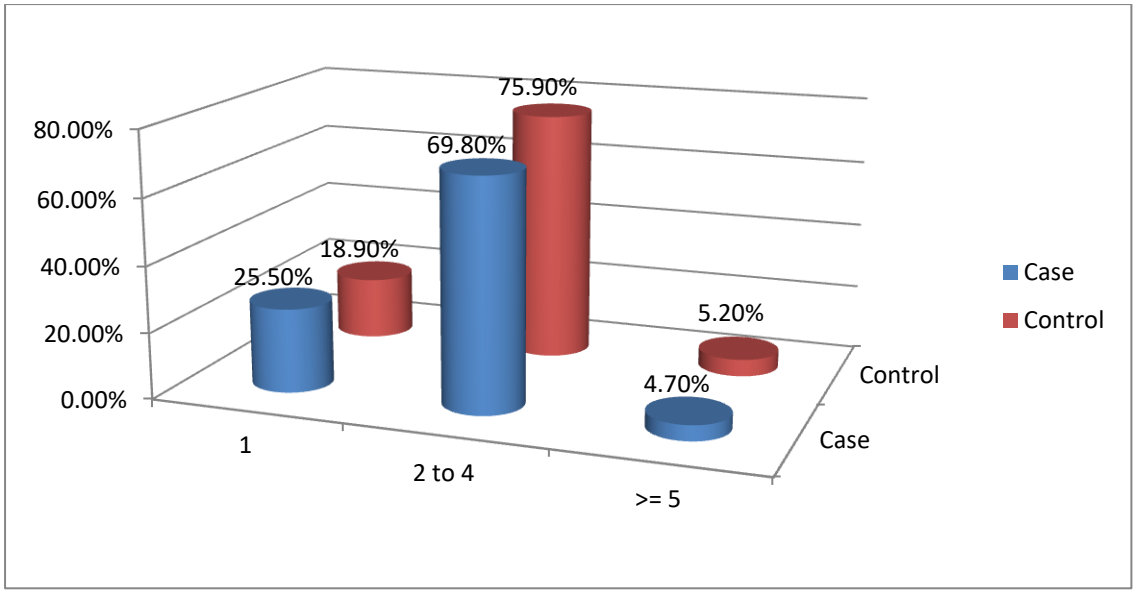

Figure 6: Number of previous live birth of women with and without perinatal mortality among public hospital deliveries in Addis Ababa, Ethiopia, 2023.

4.3 Medical and maternal factors

95.0% and 96.5% of women had negative results for HIV and VDRL test respectively. 94.0% of mothers were non-reactive for hepatitis B, while 6.0% were reactive. Hemoglobin was done for 95.3% of mothers during ANC follow up or before delivery. Proportion of anemia was 15.2% in cases and 8.0% in controls. The proportion of mothers who have chronic illnesses and obstetric complications were, 10.4% and 42.5 in cases and 3.8% and 18.9% in controls respectively (Table 4).

Table 4:- Medical and Maternal factors with and without perinatal mortality among public hospital deliveries in Addis Ababa, Ethiopia, 2023.

Variables	Category	Perinatal Outcome	
		Case	Control
HIV	Reactive	7(6.6%)	9(4.2%)
	Non-reactive	99(93.4%)	203(95.8%)
VDRL	Reactive	3(2.8%)	8(3.8%)
	Non-reactive	103(97.2%)	204(96.2%)
Hepatitis B	Positive	5(4.7%)	14(6.6%)
	Negative	101(95.3%)	198(93.4%)
Hgb done	Yes	99(93.4%)	204(96.2%)

	No	7(6.6%)	8(3.8%)
Hgb level	<6	6(5.7%)	3(1.4%)
	6-8	4(3.8%)	3(1.4%)
	8-10	6(5.7%)	11(5.2%)
	≥11	83(78.3%)	189(89.2%)
Chronic illness	Yes	11(10.4%)	8(3.8%)
	No	95(89.6%)	204(96.2%)

42.5% of the case and 18.9% of the control mothers had history of obstetric complication (Fig 7).

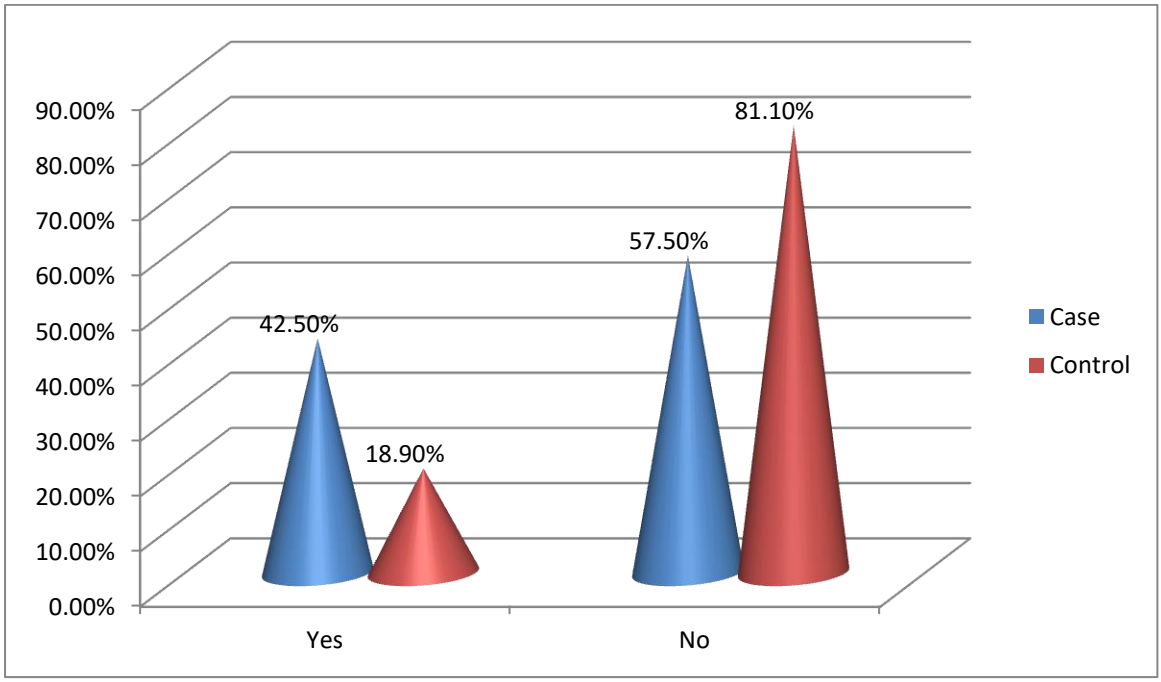

Figure 7: Obstetric complication of women with and without perinatal mortality among public hospital deliveries in Addis Ababa, Ethiopia, 2023.

From all obstetric complications, premature rupture of membrane and Ante partum hemorrhage accounts for 31.1% and 15.6% of cases and 25.0% and 20.0% of controls respectively (Table 5).

Table 5: Maternal complications with and without perinatal mortality among public hospital deliveries in Addis Ababa, Ethiopia, 2023.

Obstetric complications	Perinatal Outcome	
	Case	Control
Preeclampsia	7(15.6%)	5(12.5%)
Eclampsia	6(13.3%)	2(5.0%)
Ante partum hemorrhage	7(15.6%)	8(20.0%)
Obstructed labor	3(6.7%)	3(7.5%)
Preterm labor	4(8.9%)	3(7.5%)
Premature rupture of membrane	14(31.1%)	10(25.0%)
Others	4(8.9%)	9(22.5%)

Others*- post-partum haemorrhage, uterine rupture, Gestational diabetes mellitus

4.4 New-born factors

Cephalic presentations were seen in 97 cases and 196 controls. Ninety four percent of mothers gave birth to a single new-born and six percent gave birth to multiple new-borns. More than half of new-borns (56.3%) were females. Congenital anomaly occurred on 23.6% of the case and 0.5% among the controls (Table 6).

Table 6: New-born characteristics among public hospital deliveries in Addis Ababa, Ethiopia, 2023.

Variables	Category	Perinatal Outcome	
		Case	Control
Fetal Presentation	Cephalic	97(91.5%)	196(92.5%)
	Breach	6(5.7%)	14(6.6%)
	Transverse	3(2.8%)	2(0.9%)
Type of delivery	Single	101(95.3%)	198(93.4%)
	Multiple	5(4.7%)	14(6.6%)
Sex	Male	41(38.7%)	98(46.2%)
	Female	65(61.3%)	114(53.8%)
	≥2500gm	52(49.1%)	164(77.4%)
Congenital	Yes	25(23.6%)	1(0.5%)

anomaly	No	81(76.4%)	211(99.5%)

The mean birth weight of newborns was 2031.13±798. 256gm in cases and 2851.65±556.912gm in control. Very low and low birth weight new-borns were more prevalent in cases with 17.0% and 34.0% respectively (Fig 8).

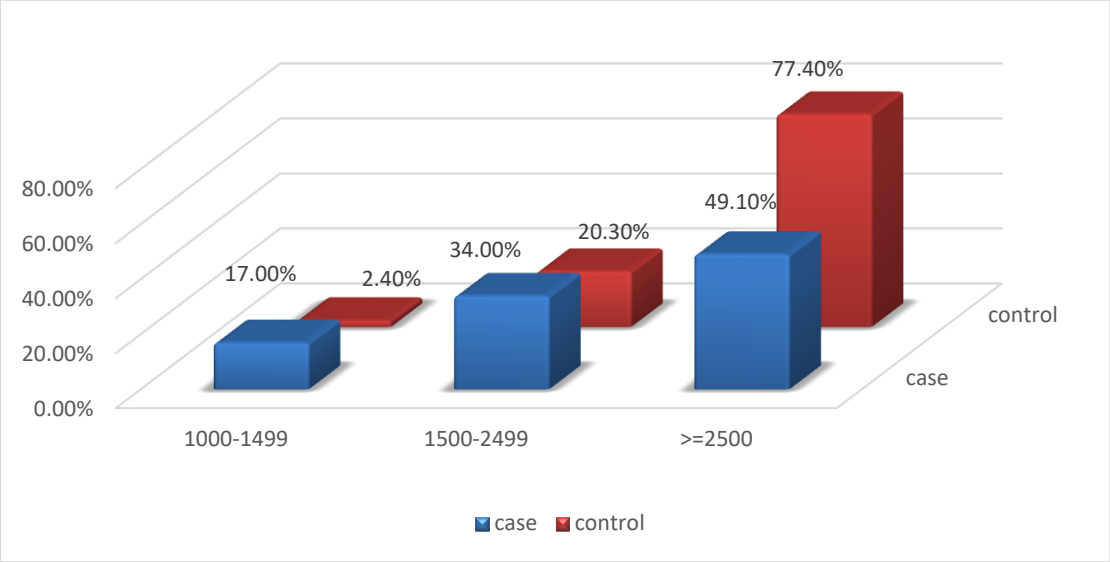

Figure 8: Weight of new barns with and without perinatal mortality among public hospital deliveries in Addis Ababa, Ethiopia, 2023.

4.5 Health care related factors

In case groups, 25.5% of mothers gave birth without partograph follow-up, compared to 9.0% of mothers in controls. Due to various obstetric issues that prevented the mother from going into labor, 8.2% of their partographs were not indicated (Table 7).

Table 7:- Partograph use for mothers with and without perinatal among public hospital deliveries in Addis Ababa, Ethiopia, 2023.

Variables	**Category**	**Perinatal Outcome**	
		Case	Control
Partograph Use	Yes	70(66.0%)	176(83.0%)
	No	27(25.5%)	19(9.0%)
	Not indicated	9(8.5%)	17(8.0%)

15 (26.8%) of the Fifty six stillbirths had a positive fetal heartbeat when they were admitted to the hospital but were ultimately classified as stillbirths during giving birth and the remaining 41(73.2%) were admitted with IUFD (Fig 9).

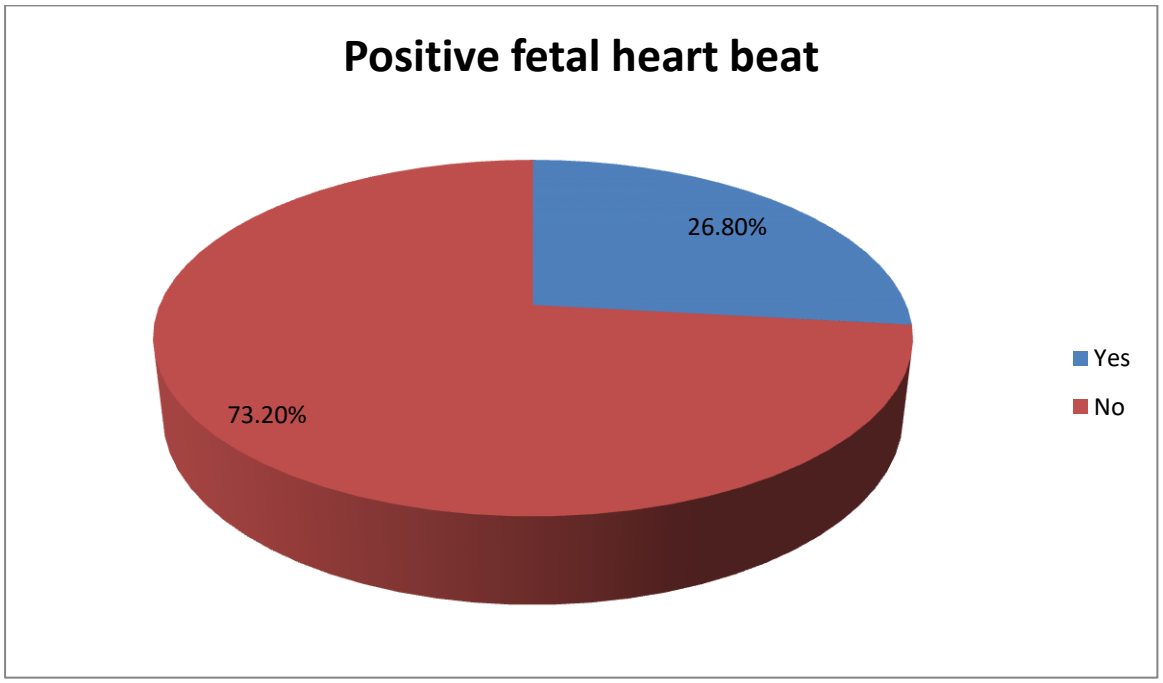

Figure 9: Fetal heartbeat at admission of still births among public hospital deliveries in Addis Ababa, Ethiopia, 2023.

Of early neonatal deaths, majority of the new-borns in the first and fifth minute APGAR score of 0-3 accounted for 52% and 62% respectively, followed by APGAR score of 4-6 which were 38.0% and 22% of neonates and Apgar score of 7-10 was 10% in fir and 16.0% in the first and fifth minute respectively (Table 7).

Table 7: APGAR score of perinatal death among public hospital deliveries in Addis Ababa, Ethiopia, 2023

Variables	Category	Early neonatal death
APGAR score first minute	0-3	26(52.0%)
	4-6	19(38.0%)
	7-10	5(10.0%)
APGAR score fifth minute	0-3	31(62.0%)
	4-6	11(22.0%)
	7-10	8(16.0%)

4.6 The determinants of perinatal death

Binary logistic regression was done to see the association of perinatal mortality with different factors. According to bivariate analysis; educational status, history of abortion, history of chronic illness during pregnancy, history of obstetric complications, new-born's weight and partograph use showed significant association.

History of abortion and history of chronic illness during pregnancy were not significant factors associated with perinatal mortality. However; educational status, history of obstetric complications, new-born's weight and partograph use were significantly associated with perinatal death. The odds of perinatal death was 4.29 times higher among mothers who had obstetric complications than those without complications (AOR 4.399; 95%CI (2.288 - 8.456)). The odds of perinatal death were higher among very low birth weight and low birth weight new-borns than normal weighing new-borns (AOR 5.033; 95%CI (1.499 – 16.896)) and (AOR 14.479; 95%CI (4.484- 46.749)) respectively. The odds of experiencing perinatal mortality was 87% less likely among mothers who were educated compared to those who had no education (AOR 0.135; 95%CI (0.037-0.492). Partograph use was also found to be protective factor for perinatal mortality The odds of perinatal mortality was 64% less likely among mothers whose labour was followed using partograph compared with mothers whose labour is not followed by partograph (AOR 0.374; 95%CI (0.176 – 0.797) (Table 8).

Table 8: The determinants of perinatal mortality among public hospital deliveries in Addis Ababa, Ethiopia, 2023.

Variable	Category	Perinatal outcome		Crude odd ratio(95%CI)	Adjusted odd ratio(95%CI)
		Case	Control		
Educational status	Not educated	18(17.0%)	9(4.2%)	1	1
	Educated	78(73.64%)	187(88.2%)	0.187(0.063-0.555)*	0.135(0.037-0.492)*
	Not registered	10(9.4%)	16(7.5%)	0.388(0.165-0.911)	0.165(0.058-0.468)*
History of abortion	No	96(90.6%)	205(96.7%)	1	1
	Yes	10(9.4%)	7(3.3%)	3.051(1.127-8.258)*	2.305(0.724-7.344)

Chronic illness	No	95(89.6%)	204(96.2%)	1	1
	Yes	11(10.4%)	8(3.8%)	2.953(1.150-7.579)*	1.712(0.536-5.472)
Obstetric complications	No	61(57.5%)	172(81.1%)	1	1
	Yes	45(42.5%)	40(18.9%)	3.051(1.127-8.258)*	4.399(2.288-8.456)*
Weight of the new-born	≥2500gm	52(49.1%)	164(71.4%)	1	1
	1000-1499gm	18(17.0%)	5(2.4%)	4.300(1.453-12.729)*	5.033(1.499-16.896)*
	1500-2499gm	36(34.0%)	43(20.3%)	11.354(4.018-32.082)*	14.479(4.484-46.749)*
Partograph use	No	27(25.5%)	19(9.0%)	1	1
	Yes	70(66.0%)	176(83.0%)	0.280(0.146-0.536)*	0.374(0.176-0.797)*
	Not Indicated	9(8.5%)	17(8.0%)	0.751(0.320-1.756)	0.969(0.340-2.763)

*- p-value < 0.05.

4.7 Discussion

This hospital-based study tried to identify the determinants of perinatal mortality related to socio-demographic, new-born, health care, obstetric and medical risk factors. The identified socioeconomic contributing factor for perinatal mortality was educational status. From medical, new-born and health care factors; history of obstetric complications, new-born's weight and partograph use were significantly associated with perinatal mortality. The odds of experiencing perinatal mortality was 87% less likely among mothers who were educated compared to those who had no education (AOR 0.135; 95%CI (0.037-0.492). This study was in line with studies conducted in Dabat, Amhara region (Andargie et al., 2013) , Addis Ababa (Getiye & Fantahun, 2017) and Kigali, Rwanda (Musafili et al., 2015). This might be due to literacy improve economic status, access to health care and improves birth spacing.

Mothers who were hospitalized with an obstetric complication had 4.399 times more odds of perinatal death than those with no documented complications. This finding closely resembles that of a study conducted in Zimbabwe, which found that mothers with obstetric complications were more likely to have perinatal death (AOR: 8.99) (Tachiweyika et al., 2011). A similar research conducted at Hawassa Referral Hospital reveals that 82.1% of mothers who experienced obstetric complications had a greater probability of losing a child (Yefru & Asres, 2014). This high rate of perinatal mortality in rural areas may be due to inadequate maternal healthcare usage which is likely because of significant delay in seeking medical attention, as well as inaccessibility or inadequate capacity of medical facilities (Yefru & Asres, 2014).

In keeping with the Zimbabwe study, which found that birth weights lower than 2500 grams were 9.46 times more likely to result in PND, very low birth weight and low birth weight both had 5.033 and 14.479 times greater chances of perinatal mortality respectively(Rose et al., 2014). According to a Tanzanian research, new-borns who are born weighing less than 2500g face two times the dangers than those who are born at a normal weight. (Lawn et al., 2010). Additionally, this outcome is in line with research from Vietnam that showed low birth weight babies have a 9.5 times increased chance of developing ENND. (Getachew & Yifru, 2012; Marete., 2014).

It also agrees with the study done in three Tanzania's locality of Dar Es Salam and study in wolliata sodo university and referral hospital (Mihiretu et al., 2017; Mpembeni et al., 2014). This explains that babies born with low birth weight have lack of fat deposition that makes

them vulnerable to hypothermia that may lead to death. It also might be due to no practice of kangaroo mother care in all hospitals in similar way. In addition, the findings of these studies were agreed with the current study. The cause may be because low birth weight babies are more susceptible to issues such as respiratory distress syndrome, weakened immunity, cardiovascular diseases, and infections. However, a research done in Jimma Specialized Hospital in Ethiopia found no link between low birth weights and perinatal mortality. (Aragaw, 2016). The variation in the dietary status of the mothers who delivered and the obstetric care provided to the new-borns may have been the cause of the research's results disagreeing with those of the current study.

Use of partographs during postpartum monitoring was discovered to be a protective factor ag ainst perinatal death. Compared to women whose labor was not monitored using a partograph, mothers whose labor was tracked using a partograph had a 62.6% lower risk of perinatal death (AOR 0.374, 95%CI; 0.176-0.797). The risks of experiencing perinatal death were found to be 65% lower among births at public hospitals in Addis Abeba in an unmatched case control study as compared to mothers who did not get Partograph labor monitoring (Getiye, 2017). Another case-control research done in Northern Tigray showed that mothers whose labor was partograph monitored had a 90% lower risk of neonatal death than those whose labor was not partograph monitored (Goba, 2018). This study is also supplemented with an investigation on perinatal mortality in peri-urban hospital in Kampala, Uganda (Nakibuuka, 2012). Since partograph is a labor follow-up chart that the WHO recommends using, the findings may have been supported by the fact that utilizing it can aid in the early diagnosis of fetal and mother problems and when used properly, it can aid medical personnel in spotting any anomalies that may arise during the birth process. As a result, it could avoid perinatal death, which can be handled with an early detection. In addition, it provides information about the caliber of prenatal care.

When they were admitted to the hospital, the majority (73.2%) of the stillbirths identified in this study had a negative fetal heart rate. This is backed by community-based perinatal mortality studies and systematic reviews conducted from sixteen hospitals (Yefru, 2014). Despite the high number of stillbirths prior to reaching the hospital, 26.8% of them occurred during the postpartum period and may have been averted with the right postpartum treatment.

To save the lives of new-borns who were delivered alive but had a low Apgar score of <7, proper and timely immediate new-born care is mandatory. This study showed that large

numbers of new-borns first and fifth minute Apgar score were within range of 0–3; 52.0% and 62.0% respectively. This demonstrates that new-born care and resuscitation are insufficiently effective in saving the lives of new-borns. This is in line with the study indicated in Wolliata Soddo teaching and referral hospital Apgar score (Mihiretu et al., 2017). This in fact near-certain death at a very low Apgar score is due to the inability of the new-borns to respond effectively to external aggression or the health care providers' may not have been effectively using resuscitation materials, lack of equipped neonatal intensive care unit in this study area which may enhance perinatal death (Mihiretu et al., 2017).

Strength

Considering its drawbacks, this research thoroughly examined all significant maternal and fet al variables that may be linked to perinatal death. The type of study design utilized is powerful in observing correlations between predictors and the dependant variables, and it is more effective to examine several factors for perinatal death. The data collection engages health care providers and telephone in order to gathers the babies' information after returning back to home up to 7 completed days.

Limitations

This study's primary drawback is that it relied on secondary data to provide its information. This study didn't show the occurrence of home delivery and community death. Since this research is conducted at hospital level, it might have missed deeper exploration of cultural practices and beliefs surrounding pregnancy and childbirth in addition to socioeconomic factors such as income and access to healthcare which may influence perinatal mortality rates. As a result, the findings of this study doesn't necessarily represent all factors determining perinatal mortality which suggests other researchers to study at community level sinorder to include more factors which are expected to have effect on it. It is not possible to avoid the confounding impact of unmeasured variables. Due to the referral of more complex cases to hospitals, the study that was conducted in hospitals may have an overrepresentation of the factors that contribute to perinatal death. Large confidence interval was observed because of small response in some variables.

5. CONCLUSION AND RECOMMENDATION

5.1. Conclusion

The determinants of perinatal mortality in the study area were mainly due to Educational level, obstetric complications, low birth weight and usage of partographs. The study has revealed that having obstetric complication and low birth weight were identified to be factors that increase the risk of perinatal mortality. While education and partograph use decreases the risk of perinatal death that were associated in this study, they are preventable causes of perinatal deaths and needs further encouragement in partograph use in labour follow up. Some of the determinants from the list above can be avoided by examining pregnant women early on and monitoring them after delivery to spot any anomalies and treat them accordingly. The other factor is poor quality of intra-partum care, which is demonstrated by the failure to use partograph which is one of the most significant determinants of perinatal mortality. For the majority of early newborn fatalities, the five minute APGAR score is often lower than the first minute APGAR score. Improving infant and neonatal resuscitation can help with this.

5.2. Recommendation

Some suggestions have been made at various levels in relation to the study's objectives and results.

Ministry of Health level

- ✓ Implement standardized protocols for perinatal care in public hospitals, including regular monitoring of fetal heart rate, timely interventions for high-risk pregnancies, and proper management of complications during delivery.
- ✓ Collaborate with relevant stakeholders, such as professional medical associations, academic institutions, and non-governmental organizations, to develop and implement evidence-based guidelines and best practices for perinatal care in public hospitals.

Addis Ababa City Health Bureau (AACHB)

- ✓ Ensure availability of essential medical supplies and equipment, such as ultrasound machines, fetal monitors, and emergency obstetric care kits, to improve the quality of perinatal care.

- ✓ Strengthen training and capacity-building programs for healthcare providers on perinatal care, including obstetricians, midwives, and nurses, to improve their skills and knowledge in managing high-risk pregnancies and complications during delivery.

Facility level

- ✓ Health care providers should improve obstetrics care, appropriate intrauterine monitoring and timely delivery of the babies and give appropriate new-born care.
- ✓ They should also give special attention for early recognition of abnormalities and manage accordingly while doing ANC and labour follow up.
- ✓ Hospitals should fulfil equipped neonatal care unit and have trained neonatal nursing.

Researchers

- ✓ The future researchers need to include community based investigations which could be useful to figure out other perinatal mortality determinants.

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APPENDICES

Annex I Consent Format

A call related information sheet: Greeting: Good morning/afternoon! Hello. My name is _____. In order to fulfill the requirements for a Master of Science in Population Studies at Addis Ababa University, I am the study's primary investigator. The study's objective is to determine the factors that contribute to perinatal death among Addis Abeba's hospital births. The Addis Abeba University has granted authorization for the conduct of this research. You have now been chosen at random for this research. Regarding the facts stated before, there is no danger associated with being part of this study. Any information that you provide will not be disclosed with anyone else, and your name won't appear on this form. Your sincere reply to the interviews will be crucial to the research's goals. At the same time, I want to thank you for participating willingly after carefully comprehending the information that was provided to you.

Do you agree to take part in this investigation?

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

Name of the lead researcher: Micky Birhanu

Cell phone No –0926411178

E-mail: mickybirhanu6@gmail.com.

Name of data collector_____ signature_____

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

Instruction: Please carefully respond to each of the following questions as applicable, (Circle the number of coding categories for number categories, and enter the necessary information in the area provided for blank categories.

A. Identification (undertaken and completed by the lead investigator)

Number	Questions	Answer	Skip
001	Questionnaire ID Number		
002	Hospital's name	1.Gahndi memorial hospital 2 Abebech Gobena Mothers' and Children's Medical Center 3 St. Peter's Specialized Hospital	
003	Card no. of the mother	_____	
004	Outcome of the neonate	1.Alive 2.dead	If the answer is 2, skip to 101
005	What happened following birth, if the baby was still alive?	1.Refered to NICU 2.Discharged alive 3. died right away following delivery	-If the answer is 2, skip to 007 -if the answer is 3, skip to 101
006	If your answer to question no. 005 is referred to NICU, what was the outcome of the new-born?	1. alive for up to seven days 2. died before the first seven days were up	
007	If your answer to question no. 005 is discharged alive, write phone number of the mother	_____	
008	Conduct a phone call and confirm whether the neonate is alive for up to seven days	1. alive for up to seven days 2. died before the first seven days were up	

B. Socio-demographic characteristics

Number	Questions	Answer	Skip
101	Mother's age		
102	Marital status	1.Married 2.Single	

		3.Widowed 4.Divorced	
103	Occupation	1.Housewife 2.Private worker 3.Civil servant 4.Daily worker 5.Merchant 6. Student 7.Others (specify)_____	
104	Educational status:	1.Illiterate 2.Literate (write in completed grades)_____ 3. not registered	

C. Maternal Variables

Number	Questions	Answer	Skip
201	Number of times the mother gave alive birth	_____	If it is 1,skip to 203
202	Birth Interval	1. Greater than two years 2. Less than or equal to two years 3.Not recorded	
203	Did she have egular ANC 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 woman receive a referral for birth from another medical facility or did she have follow up at this hospita?	1. Referred 2. Not referred	

206	Pregnancy length (in weeks)	_____	
207	Delivery method	1.SVD 2.forceps delivery 3.vacuum delivery 4.C/S 5.other, specify_____	
208	Did she have abortion history?	1.Yes 2.No	If, skip to 212
209	If the answer is yes, how many?	_____	
210	What was the type of abortion	1.spontaneous abortion 2. induced abortion 3.both types	
211	Did she have history of still birth	1.Yes 2.No	
212	Did she have History of neonatal death before first seven days were up	1.Yes 2.No	

D. Maternal Medical factors

Number	Questions	Answer	Skip
301	Mother's HIV result	1.Positive 2.Negative 3. Not registered	
302	What was VDRL test result of the mother?	1.Positive 2.Negative 3.Not registered	
303	Hep-B test result of the mother?	1.Reactive 2.Non-reactive 3.Unknown	
304	Was haemoglobin tested during antenatal care?	1. No 2. Yes	
305	What was the number	_____	

306	History of chronic illnesses of the mother	1. No 2. Yes	If 1, skip to 308
307	If your answer is yes, What was the disease/s?	1.DM 2.CKD 3.CHF 4 Hypertension 5.Other, specify_____	
308	History of Pregnancy related complication?	1.Yes 2.No	If 2, skip to 401
309	If 1, what was the pregnancy related complication/s?	1. Preeclampsia 2.Eclampsia 3.APH 4.OL 6. Pretermaturity 7. PROM 8 .Others(specify)_____	

E. Neonate variables

Number	Questions	Answer	Skip
401	Fetal Presentation	1. cephalic 2. breech 3. transverse 4. other, specify____	
402	Delivery type	1. One 2. Two or more	
403	Sex of the baby	1. male 2. female	
404	Birth weight	_____	
405	Any congenital defec during delivery?	1.yes 2.no	

F. Health care related variables

Number	Questions	Answer	Skip
501	Was partograph used?	1. Yes 2. No 3. Not indicated	
502	For still birth, was the fetal heart beat positive during admission?	1. Yes 2. No	
503	For babies died before the first seven days were up, what was 1st and 5th minute the APGAR score?	1. 1st minute_____ 2. 5t0h minute_____	

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 በሕዝብ ብዛት ጥናት የሳይንስ የማስተርሰ ዲግሪ መመረቂያ ጥናት አድራጊ 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 ነው::

ስለዚህ በጥናቱ ለመሳተፍ ፈቃደኛ ነዎት?

1) አይደለሁም (አመሰግናለሁ በልና አቁም) 2) አዎ (ጥያቄውን ቀጥል)

የጥናት አድራጊው ስ ም:- _____

ስልክ:- +251926411178

ኢ-ሜይል፡- mickybirhanu6@gmail.com

የጠያቂው ስም:- _____

ፊርማ:- _____

የተጠየቀበት ቀን (በኢትዮጵያ አቆጣጠር):- -------/----------/----------

A. የመለያ ጥያቄ (በጥናት አድራጊና ተቆጣጣሪ የሚሞላ)

ጥ. ቁ	ጥያቄ	መልስ
001	የመጠይቅ መለያ ቁጥር	
002	የሆስፒታሉ ስም	_____
003	የእናትየው የህክምና ካርድ ቁጥር	
004	የተወለደው/ችው ህጻን ውጤት ምን ነበር?	1. በህይወ ት የተወለደ/ደች 2. ሞቶ/ታ የተወለደ/ደች
005	በህይወት ያለ ከሆነ; ከተወለደ/ች በሗላ የነበረው ሁኔታ ምን ነበር ?	1. ወደ ጨቅላ ህጻናት ህክምና ክፍል ተላከ/ች 2. በህይወት ወደ ቤት ሄደ/ች 3. ከተወለደ /ች በሗላ ወዲ ውኑ የሞተ/ች
006	ለጥያቄ ቁጥር 005 መልስዎ ወደ ጨቅላ ህጻናት ህክምና ክፍል ተላከ/ች ከሆነ; ውጤቱ ምን ነበር ?	1. በሰባት ቀን ውስጥ አልሞተም/ችም 2. በሰባት ቀን ውስጥ ሞተ/ች
007	ለጥያቄ ቁጥር 005 መልስዎ በህይ ወት ወደ ቤት ሄደ /ች ከሆነ ; የእናትየውን አድራሻ (ስልክ ቁጥር) ፃፍ	_____
008	በህይወት ወደ ቤት ለሄዱት በስልክ የሚጠየቅ ጥያቄ በ _____ሆስፒታ ል በቀን _____ የወለዱት ህጻን የ45 ቀን ክትባትን መውሰዱን/ዷን እንደ መነሻነት በመጠቀም በ7 ቀን ውስጥ አለመሞቱን /±ን ማረጋገጥ	1. በሰባት ቀን ውስጥ አልሞተም/ተችም 2. በሰባት ቀን ውስጥ ሞተ/ች

B. የማህበራዊ እና ስነ ሕዝብ አወቃቀር

ጥ. ቁ	ጥያቄዎች	መልስ	ዝለል
101	የእናትየው ዕድሜ (አመት)	_____	
102	የጋብቻ ሁኔታ	1. ያገባ 2. ነጠላ 3. ባል የሞተባት 4.የተፋታ 5. አልተመዘገበም	
103	የሙያ ደረጃ	_____	
104	የትምህርት ደረጃ፡	1. ያልተማረ 2.የተማረ (በተጠናቀቁ ክፍሎች ይፃፉ)_____ 3. አልተመዘገበም	

C. ከእናትነት ጋር የተያያዘ መረጃ

ጥ. ቁ	ጥያቄዎች	መልስ	ዝለል
201	የአሁኑ ስንተኛ አርግዝና ነዉ	_____	1 ከሆነ ወደ 203 ይዝለሉ
202	የመጨረሻ ልጇ መቼ ነበር?	1. የአሁኑ አቅርቦት በ 2 ዓመታት (24 ወራት) ውስጥ 2. ከ 2 ዓመት በፊት ወይም እኩል (24 ወራት)	

		3. አልተመዘገበም	
203	እናትየው መደበኛ የቅድመ ወሊድ ክትትል ነበራት?	1. አዎ 2.አይ 3. አልተመዘገበም	
204	እናትየው የቲታነስ ክትባት ወስዳለች?	1. አዎ 2. አይ 3. አልተመዘገበም	
205	እናትየው በዚህ ሆስፒታል ክትትል ኖሯት ወይንስ ከሌላ የጤና ተቋም እንድትወልድ ተልኪል?	1. ተልኪል 2. አልተላከም።	
206	የእርግዝና ጊዜ (በሳምንት)	_____	
207	ልጅ መውለድ ዘዴ ምን ነበር?	ይግለጹ_____	
208	ከዚህ በፊት አርግዘሽ 7 ወር ሳይሞላዉ የፅንስ መጨንገፍ ታሪክ	1. አዎ 2.አይ	ካልሆነ፣ ወደ 211 ይዝለሉ
209	አዎ ከሆነ ስንት ነው?	_____	
210	ፅንስ ማስወረድ ምን ዓይነት ነበር?	1. ድንገተኛ ፅንስ ማስወረድ 2. ፅንስ ማስወረድ 3.ሁለቱም ዓይነቶች 4.ያልታወቀ	
211	ከዚህ በፊት አርግዘሽ ሞቶ/ታ የተወለደ/ደች ልጅ ታሪክ	1. አዎ 2.አይ	
212	የአራስ ሞት ታሪክ ከ 7 ቀናት በፊት	1. አዎ	

		2.አይ	

D. የሕክምና ምክንያቶች

ጥ. ቁ	ጥያቄዎች	መልስ	ዝለል
301	የእናትየው የኤችአይቪ ሁኔታ ምን ይመስላል?	1.አዎንታዊ 2.አሉታዊ 3.አልተመዘገበም	
302	የእናትየው የአባላዘር ምርመራ ውጤት ምን ነበር?	1.አዎንታዊ 2.አሉታዊ 3.አልተመዘገበም	
303	የእናትየው የሄፐታይተስ ቢ ውጤት ምን ነበር?	1.አዎንታዊ 2.አሉታዊ 3.አልተመዘገበም	
304	ሄሞግሎቢን ምርመራ የተደረገው ቅድመ ወሊድ ክትትል ጊዜ ነው?	1. አይ 2. አዎ	
305	የሂሞግሎቢን መጠን ምን ያህል ነበር?	_____	
306	እናትየው ሥር የሰደደ በሽታ አለባት?	1. አይ 2. አዎ	አይደለም ከሆነ ወደ ጥ ቁጥር 308 ይዝለሉ
307	አዎ ከሆነ ለመጠየቅ በሽታው ምን	1.የስኳር በሽታ	

	ነበር? (በርካታ መልሶች ይቻላል)	2. ሥር የሰደደ የኩላሊት በሽታ 3. የልብ ሕመም 4. ሥር የሰደደ የደም ግፊት 5. ሌላ፣ ይግለጹ_____	
308	እናትየው ምንም አይነት የወሊድ ችግር አላት?	1. አይ 2. አዎ	ካልሆነ ወደ 401 ዝለል
309	አዎ ከሆነ ውስብስብነቱ ምን ነበር? (በርካታ መልሶች ይቻላል)	ይግለጹ _____	

E. አዲስ የተወለዱ ልጅ ምክንያቶች

ጥ. ቁ	ጥያቄዎች	መልስ	ዝለል
401	የፅንሱ አቀራረብ ምን ነበር	1. ሴፋሊክ 2. ብሬች 3. ተሻጋሪ 4. ሌላ፣ ይግለጹ____	
402	የፅንሱ አይነት ምን ነበር?	1. ነጠላ 2. ብዙ	
403	አዲስ የተወለደ ልጅ ጾታ ምን ነበር	1. ወንድ 2. ሴት	
404	አዲስ የተወለደ ልጅ ክብደት ምን ያህል ነበር (በግራም)	_____	

405	በወሊድ ወቅት የተገኘ የትውልድ ችግር የለም ወይ?	1.አዎ 2.አይደለም	

F. የጤና እንክብካቤ ምክንያቶች

ጥ. ቁ	ጥያቄዎች	መልስ	ዝለል
501	የ’Partograph’ አጠቃቀም	1. አዎ 2. አይ 3. አልተጠቀሰም	
502	ገና ሲወለድ የፅንሱ ልብ በመግቢያው ወቅት አዎንታዊ ነበር?	1. አዎ 2. አይ	
503	ለአራስ ሕፃናት ሞት ከ 7 ቀናት በፊት ፣ በ 1 ኛ እና 5 ኛ ደቂቃ ላይ የአፕጋር ውጤት ምን ነበር?	1. የአፕጋር ውጤት በ1ኛ ደቂቃ_____ 2. የአፕጋር ነጥብ በ5ኛ ደቂቃ_____	