perinatal

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Determinants of perinatal death among Deliveries Attended in hospitals of Addis Ababa University, Ethiopia: A case control study, 2023/24

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Abstract

Background: - The total of stillbirths and early neonatal deaths is known as perinatal mortality. It is the death of a baby that occurs before the first seven days of life and after 28 weeks of gestation. Three-quarters of the deaths that occur during the newborn period are related to perinatal mortality. With 4% of the global perinatal mortality rate, Ethiopia is among the sub-Saharan nations with the highest rates of perinatal death.

Objective: assessment of the determinants of perinatal death Among Deliveries Attended in hospitals of Addis Ababa University, Ethiopia

Methods: - A case control study was used as the research design, and it was carried out from February, 2024 up to May 2024 and all women having a gestational age of 28 weeks and more in the study area were the study population. There were two groups of these women: the case group and the control group. The women in the case groups are those who had ENNDs or stillbirths. The control groups are those women who had alive birth and discharged with alive baby. Sample size was calculated by using double population proportion formula and it was 288 with the case to group ratio of 1:2. Collected data was checked for completeness, consistency, clarity, and missed values and then entered to SPSS version 25 data management and further statistical analyzed was done. Statistical significances were assured at p-value < 0.05.

Result: - The determinants of perinatal death were come from rural area (AOR=2.2), illiterate (AOR=1.4), initiation of ANC at the third trimester of pregnancy (AOR=3.9), having MSAF during labour and delivery (AOR=5.9), having IUGR fetus AOR=2.9) and male fetus (AOR=2.3).

Conclusion and recommendation: - Reducing perinatal death among women with risk factors such as residing in rural areas, illiteracy, late ANC initiation, MSAF, IUGR, and male fetuses requires a comprehensive planning. So, enhance training for healthcare providers to recognize signs of fetal distress early and manage MSAF appropriately. Equip healthcare facilities with the necessary tools and protocols to handle MSAF, including skilled personnel for neonatal resuscitation.

Abbreviation and acronym

AAU	Addis Ababa University
AOR	Adjusted Odd Ratio
APH	Antepartum Hemorrhage
BMI	body mass index
CI	Confidence Interval
COR	Crude Odd Ratio
EDHS	Ethiopian Demographic and Health Survey
ENAP	Every Newborn Action Plan
GMH	Gandi Memorial Hospital
MCH	maternal and child health
TASH	Tikur Anbessa Specialized Hospital
WHO	World Health Organization
ZMH	Zewuditu Memorial Hospital
ENND	Early neonatal death

1. Introduction

1.1 Background

The number of stillbirths and fatalities within the first week of life (also known as early neonatal mortality) is referred to as perinatal mortality. The birth of a baby that shows no signs of life at or after 28 weeks of gestation is classified as a stillbirth by the WHO. The World Health Organization (WHO) classified stillbirth and neonatal death using the International Classification of Diseases (ICD-10), which has been advised for use in all settings. Early neonatal death (ENND) is defined as the death of an infant between zero and seven days following birth. Stillbirths can be divided into three categories based on when they occur: antepartum, intrapartum, and stillbirths with unclear time. Additionally, neonatal deaths are divided into early and late categories according to when they occur after delivery, with the former being categorized as a part of perinatal (1, 2).

Perinatal mortality rates are among the highest in the world in Sub-Saharan Africa (SSA) due to a combination of entrenched poverty and inadequate access to health services. According to one study, there were 34.7 preterm deaths for every 1000 births in the SSA (3). Among the SSA nations with the highest rate of perinatal mortality is Ethiopia. As per the 2016 Ethiopian Demographic Health Survey, there were 33 perinatal deaths for every 1000 births in Ethiopia. It was lowest in the Southern Nations, Nationalities, and People's Region (26 fatalities per 1000 pregnancies) and highest in Somalia (50 deaths per 1000 pregnancies). (4).

According to a systematic assessment of several studies, stillbirth rates vary greatly amongst nations, with Finland and Singapore having the lowest rates at two per 1000 births, and Pakistan and Nigeria having the highest rates at 47 and 42 per 1000 births, respectively. Ten countries—India, Pakistan, Nigeria, China, Bangladesh, Democratic Republic of the Congo, Indonesia, Afghanistan, United Republic of Tanzania, and Ethiopia—are thought to account for 1.8 million stillbirths annually. Roughly 1.2 million stillbirths (half of the stillbirths) occur when a woman is in labor, and these deaths are directly linked to inadequate medical attention during this crucial period. (5).

According to the 2010 global health estimate, there were around 2.6 million stillbirths by the close of 2010. Half of these stillbirths happened during labor and delivery. Additionally, in the first week of life, there were around 2.8 million neonatal deaths. In low- and middle-income nations, there were over half of these newborn deaths (6).In a single year, approximately 8,000,000 perinatal deaths are reported worldwide. Approximately 40–60% of all perinatal deaths occur in the first seven days of life, and nearly all of these deaths take place in underdeveloped nations. Developing nations have a perinatal mortality rate of 50 per 1,000 live births, while developed nations have a rate of 10 per 1,000 live births. (7).

Sub-Saharan Africa has a stillbirth rate that is almost ten times higher than that of affluent nations (6-7). The frequency of stillbirths in sub-Saharan Africa ranged from 28.9 to 154.6% per 1000 people, according to an observational multi-country study (8–10). As a result, stillbirth rates in a nation with a low to moderate income are unacceptably high. Previous studies have shown that antenatal care utilization, place of delivery, body mass index (BMI) and anemia, previous stillbirth, uterine rupture, abruption placentae, belonging to the poorest family, antepartum hemorrhage, maternal hypertensive disorder during pregnancy, and small weight-for-gestational age babies are associated with factors such as asphyxia, maternal infection, non-communicable disease, chronic illness, resident, inter-pregnancy interval, previous preterm birth, premature rupture of membranes, the induced onset of labor, prolonged labor (>12 hours), multiple pregnancies, mode of delivery, mother age, place of residence, education level, parity and antenatal care utilization predict stillbirth significantly. [(11-15).

Understanding the stillbirth rate is crucial for determining its causes and improving the standard of care provided to expectant mothers and new mothers. It also serves as a sensitive indicator of the health-care system. Initiatives from after 2015 demonstrate that stillbirths remain a sustainable development aim and are part of a global hidden agenda. A goal to eliminate avoidable stillbirths was adopted by 194 nations, including Ethiopia, during the 2014 World Health Assembly and incorporated in the Every Newborn Action Plan. The plan's objective was to lower the country's stillbirth rate to 12 or less per 1000 live births by 2030. (16).

Finding stillbirth predictors would, in one way or another, help achieve the global goal of reducing stillbirths. Ethiopia is one of the nations with the highest global stillbirth rates (17–18). The

Ethiopian Demographic and Health Survey (EDHS) reports from 2016 and 2019 show that, respectively, the stillbirth ratio was 11 and 12 per 1000 live births. (19-20).

To the best of our knowledge, no research has been done in Addis Ababa to pinpoint the risk factors for antepartum stillbirth, which would allow for the development of management and preventive measures to lower these avoidable fatalities. In order to determine the precise risk factors linked to antepartum stillbirth in this context, we carried out this case control study at a tertiary hospital in Addis Abeba.

1.2 Statement of the problem

In industrialized countries, the estimated perinatal loss rate was from 4.2 to 6.8 per 1000 births, but in underdeveloped countries, it ranged from 20 to 32 per 1000 births (21). The WHO survey also revealed that, among 29 countries, the rates of stillbirth and early neonatal mortality were 17.7 and 8.4 million, respectively (22). Additionally, the causes of stillbirth vary between industrialized and poor nations. In the industrialized world, the rate of stillbirth during childbirth is 1 in 1000, but in the underdeveloped world, it is 1 in 100 births. (23).

In many contexts, stillbirths are undervalued despite bearing a heavy burden. By 2030, every Newborn Action Plan (ENAP) has established a target of 12 stillbirths per 1000 births or fewer (24–25). Ethiopia was rated seventh out of the ten countries that accounted for 66% of all stillbirths worldwide.4 Data from the Ethiopian Demographic Health Survey (EDHS) showed that stillbirth rates in Ethiopia ranged from 25.5 to 85 per 1000 live births, with considerable regional variations. (26-27).

Many studies conducted in various nations have revealed that the most commonly mentioned factors that influence the outcome of a stillbirth are maternal age greater than 35, multiple pregnancies, parity higher than four, educational status, lack of antenatal care follow-up, chronic comorbidities, preeclampsia or APH, intrauterine growth restriction, major congenital anomaly of the infant, and poor maternal nutritional status (28–29).

Understanding the determinants or risk factors for stillbirth is crucial to achieving the goal. Therefore, determining the factors that contribute to stillbirths is essential as they may be key in producing data that are needed to close knowledge gaps. Thus, using information from obstetrics

and internal medicine, the goal of this study is to determine the factors that contribute to stillbirth in Addis Abeba university teaching hospitals.

1.3 Significance of the study

Several studies done at different parts of the world revealed that the reduction of perinatal mortality goal was not achieved. So, in order to reduce the perinatal mortality, the major point of action was detecting the determinant factor of still birth. Therefore, this study will assess the determinant factor of still birth in Addis Ababa University teaching hospitals.

It also has much benefit for the physicians and other health workers who are working in maternal and child health (MCH) unit, labor and delivery by identifying the risk factors for future risk reduction by working on the prevention of risk factors.

The finding of the study can inform designing effective health education and health promotion policy, programs and practice targeting risk groups. It will help supporting stakeholders as input to improve perinatal mortality based on this study.

Findings from this study will provide crucial information on local scenarios to obstetricians, which can aid them in making appropriate decisions. In addition, the findings of this study can also serve as a basic framework and baseline information for other studies with a similar interest in the future.

2. Literature review

Study done in Abuja, Nigeria on perinatal mortality revealed that prepartum hemorrhage [AHR = 2.8 (95% CI 1.2 - 6.7)], un-booked status [AHR = 1.8 (95% CI 1.4 - 2.2)], and prior perinatal mortality [AHR = 2.3 (95% CI 1.7 - 3.1)]. The risk of perinatal death was linked to maternal age ≥ 35 years [AHR= 1.4 (95% CI 1.0 - 1.8)]. (30).

Study done in Hadiya Zone, South Ethiopia on determinant of perinatal mortality analysis turned up a total of 582 cases (194 cases and 388 controls). The results of this study showed that the following factors influence perinatal mortality: maternal age between 21 and 35 years old [AOR=0.38; 95% CI (0.17, 0.84)], rural residence [AOR=2.88: 95% CI (1.29, 6.46)], birth interval less than two years [AOR=5.34: 95% CI (2.59, 10.99)], history of perinatal mortality [AOR=3.2: 95% CI (1.38, 7.43)], less than eight hours of labor duration [AOR=0.19: 95% CI (0.09, 0.40)], obstetric complication [AOR=7.92: 95% CI (3.81, 16.46)], low birth weight [AOR=7.75:95% CI (3.27, 18.39)], and use of partograph [AOR=0.14: 95% CI (0.07, 0.30)]. (31).

Study done in Gamo zone on determinants of Perinatal mortality revealed that in the multivariable logistic regression model, the following factors were found to be statistically significant: grand multiparity (AOR: 7.40; 95% CI: 2.77, 20.26); one antenatal visit (AOR: 4.40; 95% CI: 1.64, 11.91); spontaneous vaginal delivery (AOR: 0.36; 95% CI: 0.16, 0.82); preterm (AOR: 6.78; 95% CI: 2.41, 19.09); birth weight <2,500 grams (AOR: 3.10; 95% CI: 1.48, 6.46); maternal ever hemoglobin level <10 gm/dl (AOR: 4.04; 95% CI:1.91, 8.57); and pre-partum onset of pregnancy-induced hypertension (AOR: 4.01; 95% CI: 2.01, 6.08). (32).

Study done in Northern India on determinants of still birth uncovered that preterm delivery and pregnancy-induced hypertension were associated with a ten-fold increased risk of stillbirth, with adjusted odds ratios of 12.54 (95% CI 3.95-39.00; p <0.001) and 12.75 (95% CI 2.95-55.00; p <0.001), respectively. Additionally, a substantially greater and independent risk of stillbirth was

linked to older mothers (OR 1.90, 95% CI 1.10-3.27; p <0.02). The odds of a stillborn baby were higher in males (OR 4.02, 95% CI 1.38-11.69). (30).

Study done about determinants of still birth in Kano, Nigeria revealed that mothers who had access to clean water in an urban location had a lower probability of giving stillbirth (OR: 7.78 95% CI: 1.73–34.91 p = 0.007) compared to mothers who lived in a semi-rural environment, where the odds were seven times greater. There was a significant difference in the likelihood of a stillbirth (OR: 10.20 95% CI: 3.65–28.55 p < 0.001) between mothers with and without formal schooling. Mothers in rural shacks had a greater probability of having a stillbirth than urban home mothers (OR: 8.84 9% CI: 3.14–24.87 p < 0.001). Comparing the risks of stillbirth between residing in an urban region without a disease and living in a rural area with a disease (OR: 24.76 95% CI: 6.54–93.73 p < 0.001), there was a significant correlation. (31).

A case control study done in north Ghana on determinants of stillbirths revealed that compared to women between the ages of 25 and 34, moms aged <=24 had a higher risk of stillbirth (AOR = 3.0, 95% CI 1.08 – 8.39). At the multivariate level, the correlations vanished (AOR = 1.4, 95% CI 0.67 – 3.01; AOR = 2.5, 0.27 – 23.85, similarly). Compared to mothers who gave delivery within 12 hours of labor, mothers who labored for more than 12 hours were at a higher risk of stillbirth (AOR = 3.5, 95% CI 1.94, 6.61). The time between births did not significantly predict stillbirths (AOR = 2.0, 95% CI 0.79 – 5.19). Particularly in late pregnancy, low diastolic blood pressure of less than 80 mmHg was substantially linked to stillbirth (AOR = 2.2, 95% CI 1.04 – 4.54) (32).

A study done in Nepal on determinants of still birth revealed that maternal age (AOR = 1.0, 95% CI 1.0–1.1), maternal education level (AOR 2.4, 95% CI 1.7–3.2), increasing parity (AOR = 1.2, 95% CI 1.0–1.3), prior stillbirth (AOR =2.6, 95% CI 1.6–4.4), lack of prenatal care attendance (AOR = 4.2, 95% CI 3.2–5.4), being the poorest family (AOR =1.3, 95% CI 1.0–1.8), antepartum hemorrhage (AOR =3.7, 95% CI 2.4–5.7), maternal hypertensive disorder during pregnancy (AOR = 2.1, 95% CI 1.5–3.1), and small-for-gestational age babies (AOR = 1.5, 95% CI 1.2–2.0) (33).

A study done in Bale Zone Hospitals on determinants of still birth revealed that mothers who had a brief interval before giving birth had three times the likelihood of experiencing a stillbirth (AOR: 2.991; 95%CI: 1.351–6.621) compared to their peers. When compared to moms who began their prenatal visits in their first trimester, stillbirths were 2.7 times more common (AOR: 2.739; 95%CI: 1.048–7.158) in mothers who began their visits later in the third trimester. Mothers who were

referred from another healthcare facility had a three-fold increased risk of experiencing stillbirth (AOR: 3.215; 95%CI: 1.430–7.229) compared to those who were not referred. Additionally, moms who had labored for more than 24 hours had a three times higher chance of experiencing stillbirth (AOR: 3.169; 95%CI: 1.241–8.091) than their counterparts. Women whose amniotic fluid had meconium staining had 2.6 times higher odds of stillbirth (AOR: 2.670; 95%CI: 1.082–6.592) than women whose fluid had not been stained. Additionally, it was discovered that mothers who gave birth to newborns weighing less than 2500 g had a three times higher chance of stillbirth (AOR: 3.155; 95%CI: 1.235–8.07) than mothers who gave birth to neonates ranging between 2500 and 4000 g. Together with the previously mentioned results, C-section delivery was also linked to a lower risk of stillbirth. Mothers who had given birth via cesarean section had a 70% lower chance of experiencing stillbirth (AOR: 0.323; 95%CI: 0.120–0.871) than mothers who had given birth vaginally. (34).

Study done in North Shoa Zone, Oromia region, on determinants of still birth revealed that the risk of stillbirth was 3.79 times higher for mothers who underwent induced labor compared to those who experienced spontaneous beginning labor (AOR ¼ 3.79, 95%CI ¼ 1.53,9.38). A mother's chance of experiencing a stillbirth was 3.59 times higher than that of her peers whose labor lasted more than 18 hours (AOR ¼ 3.59, 95%CI ¼ 1.53, 8.33). Compared to their peers, mothers who presented mal during delivery had a 3.45-fold increased risk of stillbirth (AOR ¼ 3.45, 95%CI ¼ 1.99, 9.8). Compared to mothers without preeclampsia or eclampsia, those with preeclampsia/eclampsia had a 4.5-fold increased risk of stillbirth (AOR ¼ 4.58, 95%CI ¼ 1.45, 14.48). Compared to normal pregnancies, fetuses with birth defects have a 3.05 times higher chance of having a stillbirth (AOR ¼ 3.05, 95% CI 1.31, 7.1). (35).

Study done in Mizan-Tepi Teaching Hospital revealed that the independent factors influencing stillbirth were: history of obstetric complications [AOR=2.8, 95% CI: 1.38 - 5.80], hemoglobin level < 11.5 mg/dl [AOR=2.6, 95% CI: 1.28 - 5.56], referral status [AOR=2.3, 95% CI: 1.06 - 5.00], partograph use [AOR=4.0, 95% CI: 1.88 - 8.47], antenatal care follow up [AOR=3.1, 95% CI: 1.51 - 6.40], and previous history of stillbirth (AOR=4.4, 95% CI: 1.36 - 14.4). (36).

A study done in southern Ethiopia on predictors of still birth revealed that stillbirth was significantly more common in women who had multiple pregnancies [AOR = 2.98, 95%CI: 1.39–6.36], preterm births [AOR = 2.83, 95%CI: 1.58–508], cesarean deliveries [AOR = 3.19, 95%CI:

1.87–5.44], no ANC visit [AOR = 4.17, 95%CI: 2.38–7.33], and hypertension during pregnancy [AOR = 3.43, 95%CI: 1.93–6.06]. (37).

Study done in Hiwot Fana specialized hospital on determinants of still birth revealed that Determiners of stillbirth included a history of adverse birth outcomes (adjusted odds ratio=9.55; 95% CI (4.37, 20.85), p=0.003), multiple pregnancies (adjusted odds ratio=7.04; 95% CI (2.12, 23.40), p=0.000), and spontaneous vaginal delivery (adjusted odds ratio=0.17; 95% CI=(0.05, 0.51), p=0.002). (38).

3. Objective

3.1 General objective

To identify the determinants of perinatal death among deliveries attended in the three teaching hospitals of Addis Ababa University

3.2 Specific objective

- To assess the socio-demographic characteristics effect on perinatal deaths in Addis Ababa university hospital
- To determine the effect of reproductive characteristics and maternal medical complications on perinatal deaths in Addis Ababa university hospitals
- To determine the labour characteristics with perinatal deaths in Addis Ababa university hospital

4. Methodology

4.1 Study area

The study was done in the three teaching hospitals of Addis Ababa University. Namely Tikur Anbessa Specialized hospital the Addis Ababa University Hospital (33catchments areas), Zewditu Memorial hospital (16 catchments areas) and Gandhi memorial hospital (21catchment areas) the latter two are regional Hospitals under Addis Ababa Health Bureau affiliated to Addis Ababa University. These hospitals are capable in providing comprehensive care to pregnant women, labor and delivery services including critical maternal and neonatal care.

4.2 study design and period

A case-control study research design was used, and it was carried out between February and May of 2024.

4.2 Population and Study Sample

The study population was women who gave birth in the study area after 28 weeks of gestation. These mothers were divided into two groups: the control group and the case group. Women with perinatal deaths make up the case groups. Women in the control groups are those who had live birth and discharged with alive baby on the first 7 days of neonatal life in the specified time frame.

4.3 Inclusion criteria

For the case group

1. Women having a gestational ≥28weeks
2. Confirmed perinatal death

For the control group

1. Women having a gestational age of ≥28 weeks during delivery
2. Who gave alive birth and discharged or kept at the hospital with alive baby in the first 7 days of neonatal life.

4.4 Exclusion criteria

1. Unable to participate in the study,

2. Seriously illness

3. Mother of died in the data collection

4.5 Sample size determination

In order to determine the sample size, Epi-info version 7.2.0.1 was used. When calculating the sample size, the following assumptions were taken into account: a 95% confidence level, a 2:1 control to case ratio, 80% power, a 64.7% exposure percentage of controls drawn from a study done in the North Shoa Zone, Oromia area (35) and an odds ratio of 2.35. Preeclampsia was the chosen exposure. After that, 288 was determined to be the sample size (96 cases and 192 controls).

Sample Size for Unmatched Case-Control Study

For:					
	Two-sided confidence level(1-alpha)			95	
	Power (% chance of detecting)			80	
	Ratio of Controls to Cases			2	
	Hypothetical proportion of controls with exposure			64.7	
	Hypothetical proportion of cases with exposure:			81.16	
	Least extreme Odds Ratio to be detected:			2.35	
		Kelsey	**Fleiss**	**Fleiss with CC**	
Sample Size - Cases		91	87	96	
Sample Size - Controls		182	174	192	
Total sample size:		273	261	288	

4.6 Study Variables

4.6.1 Dependent Variable

- Still birth

4.6.2 Independent Variables

- ✓ Sociodemographic characteristics
- ✓ Age
- ✓ Residence
- ✓ Marital status.
- ✓ Education

- ✓ income
- ➢ Obstetric characteristics
- ➢ Health related characteristics
- ➢ Maternal medical condition
- ➢ Iron folate utilization
- ➢ Labour duration
- ➢ Liqueur status
- ➢ Obstetric complications
- ✓ PIH
- ✓ APH
- ✓ GDM

4.7 Sources of Data

The data collected from the three-teaching Hospital of Addis Ababa University a women who gave birth after 28 weeks of gestation of both case and control. The data collected directly from the patient face to face or through phone call and her chart using standardized questionnaire after consent was taken.

4.8 Sampling technique and procedure

Cases were chosen using a sequential sampling strategy. and two mothers who deliver just prior and after each case were recruited as controls among eligible mothers.

4.9 Data Quality Control Measures

Before beginning the actual data collection process, supervisors and data collectors received training on data correctness and completeness, and any necessary modifications were made after consulting with both parties. To make sure the questions were clear, logically ordered, and had no skip patterns, the questionnaire was pre-tested on 5% of the study participants. Data collectors and supervisors reviewed the completed surveys each day before a responder left the premises. By assisting the supervisor and data collectors, the primary investigator managed the data gathering process. Close supervision, open communication, and prompt decision-making were all used during the data collection phase.

4.10 Collection of Data

The lead investigator conducting the research and a data collector completed the data collection and obtained patient permission. The information was gathered from the obstetric department

wards of Addis Ababa University's three teaching hospitals. Consent for face-to-face or phone interview and for reviewing her clinical records was taken from the study participant. The sociodemographic and clinical variables collected using a semi-structured questionnaire face-to-face interviews while the participants are comfortable after delivery for mothers whose outcome is stillbirth and for the control group participants. Data was collected by data collector at the neonatal intensive care unit after neonatal death is confirmed and the mother is ready for the interview. Those mother in the control group discharged before the interview called and asked for their consent for the interview those who are willing the data collector proceeded with the interview; those who declined or the phone was not working mothers who delivered immediately before or after them interviewed after consent. Maternal chart also reviewed for gestational age, maternal complications, and management.

For those mothers who lost their newborns, they were interviewed, and consent taken empathetically and when they were comfortable (if needed by the principal researcher). Those participants found to be depressed or emotionally disturbed, the interview (including consent ascertainment) was not undertaken, and were linked to the hospital psychiatry service available in each hospital after discussing it with the attending physician(s).

Three BCS midwives and three nurses having at least one previous similar data collection experience under the primary investigator's supervision who are not parts of the managing team collected the data. The data collectors were trained for 1 day about the contents of the questionnaire, the consent process, and how to collect the data properly.

Along with the questionnaire, a separate document was created to obtain the participants' agreement. The study participants are read, informed, and given the opportunity to give their oral consent by the research assistant (data collector).

In order to guarantee the accuracy and coherence of the data gathered, the principal investigator checked and evaluated each completed questionnaire. The questionnaires were filled out daily after being reviewed by the principal investigator.

4.11 Data Processing and Analysis

The collected data was input into EPI-info version 4.6.0.0 after being verified for accuracy, consistency, completeness, and missing variables. For additional statistical analysis, the coded and cleaned data was then exported to SPSS (Statistical Package for Social Science) version 25 data management. Frequency counts are used to evaluate how complete each variable is. Multivariable logistic regression was used to evaluate the factors that contribute to stillbirth. Every test was two-sided, and a p-value of less than 0.05 was considered statistically significant. Crude and adjusted odds ratios, as well as 95% CIs, were calculated from these models for each case and control individually.

4.12 Operational Definitions

Case: was defined as newborn 28 and above weeks of gestation in the health institutions either as a stillbirth or born alive but died within seven days after delivery. Gestational age as written by the attending physician.

Control: was defined as live births at 28 weeks of gestation in health institutions of the study area and survived the first 7 days after delivery.

Urban: was defined as in Addis Ababa or other big cities.

Rural: was defined as small cities outside Addis Ababa

4.13 Ethical Considerations

Before beginning the study, I presented the idea to my advisors for their input and approval. I then asked the community service ethical review committee and the obstetrics and gynecology research committee for ethical approval. Addis Ababa University provided a formal letter of authorization, and GMH, ZMH, and TASH received an official letter of collaboration from the aforementioned institution. Participants in the study were informed of the significance of the research. Each questionnaire's cover page included a one-page consent letter attached for this purpose. Following an explanation of the study's goals, benefits, and hazards to study participants, oral informed permission was obtained. Participants were not asked for their private information or confidentiality; participation was entirely voluntary. The respondent's choice to decline participation or to leave the interview was honored. The data gathered from research participants is kept private and utilized exclusively for patient management and research.

4.14 Dissemination plan and use of findings

The study's findings will be presented to the obstetrics and gynecology department at TASH. The final report will be sent to GMH & ZMH, TASH, and the Addis Ababa City Health Bureau. Additionally, the results of the study will be published and disseminated through various scientific publications and journals.

5. Result

5.1 Socio-demographic characteristics of the study participants

In this study 288 study participants were involved making a response rate of 100% with 96 case and 192 control. The majority of participants in this study22 were between the ages of 25 and 29. and 89.2% were urban in residency. Almost all were married and 33.7% of them were primary in education levels. Thirty-two percent of the husband were secondary education level and 55.6% of the participants were house wife. Fifty-one percent of the participants had the first birth and 59% of participants had <4 family size and half of the participants had <5000 ETB household monthly income. The chi-square test indicates that residency, maternal and paternal education level, occupation and household income were statistically significant. The characteristics of perinatal death vs socio-demographic characteristics were as shown in the table1. Below.

Table 1. The socio-demographic characteristics of the study participants among Deliveries Attended in hospitals of Addis Ababa University, Ethiopia, 2024.

Variable	Case (%)	Control (%)	total	X2- test, p-value
Age in years				4.93 (P=0.295)
<20	5(50.2)	17(8.9)	22(7.6)	
20-24	21(21.9)	54(28.1)	75(26)	
25-29	40(41.7)	72(37.5)	112(38.9)	
30-34	12(12.5)	27(14.2)	39(13.5)	
≥35	18(18.8)	22(11.5)	40(13.9)	
Residency				7.23(p=0.007)
Urban	79(82.3)	178(92.7)	257(89.2)	
Rural	17(17.7)	14(7.30	31(10.8)	
Marital status				1.58(p=0.454)
Married	90(93.8)	182(94.8)	272(94.4)	
Single	6(6.3)	8(4.2)	14(4.9)	

Divorced	0()	2(1)	2(0.7)	
Maternal education level				30.0(p=0.000)
no formal education	37(38.5)	22(11.5)	59(20.5)	
Primary	23(24)	74(38.5)	97(33.7)	
Secondary	16(16.7)	52(27.1)	68(23.6)	
college and above	20(20.8)	44(22.9)	64(22.2)	
Husband education level				18.56(p=0.000)
No formal education	18(20)	22(12.1)	40(14.7)	
Primary	17(18.9)	52(28.6)	69(25.4)	
Secondary	20(22.2)	72(39.6)	92(31.9)	
College and above	35(38.9)	36(19.80	71(26.1)	
Occupation				27.26(p=0.000)
Housewife	48(50)	112(58.3)	160(55.6)	
Government employee	25(26)	16(8.3)	41(14.2)	
Private employee	17(17.7)	40(20.8)	57(19.8)	
Merchant	2(2.1)	18(9.4)	20(6.9)	
Daily labour	1(1)	6(3.1)	7(2.4)	
Other	3(3.1)	0	3(1)	
Age at first birth				6.38(p=0.094)
<20	9(9.4)	37(19.3)	46(16)	
20-24	46(47.9)	95(49.5)	141(49)	
25-29	36(37.5)	52(27.1)	88(30.6)	
30-34	5(5.2)	8(4.2)	13(4.5)	
Family size				1.21(p=0.271)
<4	61(63.5)	109(56.8)	170(59)	
≥4	35(36.5)	83(43.2)	118(41)	
Birth order				0.372(p=0.830)

First	47(49)	100(52.1)	147(51)	
Second	26(27.1)	46(24)	72(25)	
third and above	23(24)	46(24)	69(24)	
Household monthly income				7.1(p=0.030)
<5000	22(22.9)	28(14.6)	50(17.4)	
5000-10000	50(52.1)	88(45.8)	138(47.9)	
>10000	24(25)	76(39.6)	100(34.7)	

5.2 Maternal health related characteristics of the study participants

Only 12.5% of the study participants has known hypertensive disorder before pregnancy and 3.1% of the participants had DM disorder. Almost-12 percent of the study participants had anemia in this pregnancy. The properties perinatal death in each variable were as shown in the table 2 below.

Table 2. Maternal health related characteristics of the study participants

Variable	Case (%)	Control (%)	Total (%)	X2- test, p-value
Have you known hypertensive disorder in pregnancy				5.14(p=0.023)
Yes	18(18.8)	18(9.4)	36(12.5)	
No	78(81.2)	174(90.6)	252(87.5)	
Have DM disorder				0.52(p=0.472)
Yes	2(2.1)	7(3.6)	9(3.1)	
No	94(97.9)	185(96.4)	279(36.9)	
Anemia in this pregnancy				0.154(p=0.695)
Yes	12(12.5)	21(10.9)	33(11.5)	
No	84(87.5)	171(89.1)	255(88.5)	

5.3 Obstetric characteristics of the study participants

Almost all participants (92.7% case and 99% control) had antenatal care and 72.4% (46.1% of case and 72.4% of control) had four and above antenatal care visit. Majority of the participants (84.3% case and 85.3% control) ANC care were in the health centers. Fifty-three percent of the participants were primiparous and 2.4% of the participants had a history of still birth. Twenty-eight percent of the participants had a preceding pregnancy interval of less than two years. Six percent and 14.9% of the participants had AP and hypertensive disorder of pregnancy respectively. Twenty-two percent and fourteen percent of the participants had PROM and anemic respectively. Almost ninety-two and ninety four percent of the participants had took iron folic acid supplement and tetanus toxoid vaccine respectively. The chi-square test of the variable showed that attend ANC, number of Attend ANC, time of the first ANC, use contraceptive in the current pregnancy, history of still birth, preceding birth order, Hgb level, Iron supplement and tetanus vaccine were a significant factor for perinatal death.

Table 3. Obstetric related characteristics of the study participant

Variable	Case (%)	Control (%)	Total (%)	X2- test, p-value
Attend ANC				
No	7(7.3)	2(1)	9(3.1)	8.26(p=0.004)
yes	89(92.7)	190(99)	279(96.9)	
Number of ANC				61.88(p=0.000)
One	8(9)	0	8(2.9)	
Two	18(20.2)	3(1.6)	21(7.5)	
Three	22(24.7)	26(13.7)	48(17.2)	
Four and above	41(46.1)	161(84.7)	202(72.4)	
Time of first ANC				21.35(p=0.000)
1ST TM	38(42.7)	86(45.3)	124(44.4)	
2ND TM	33(37.1)	97(51.1)	130(46.6)	
3RD TM	18(20.2)	7(3.7)	25(9)	
Place of antenatal care visit				0.71(p=0.870)

current hospital	9(10.1)	21(11.1)	30(10.8)	
private clinics	4(4.5)	5(2.6)	9(3.2)	
HC	75(84.3)	162(85.3)	237(84.9)	
other government hospital	1(1.10	2(1.1)	3(1.1)	
Modern contraceptive used prior to the current pregnancy				23.7(p=0.000)
Yes	27(28.7)	114(59.4)	141(49)	
no	67(71.3)	78(40.6)	147(51)	
Gravidity				0.079(p=0.961)
one	39(40.6)	77(40.1)	116(40.3)	
two to five	54(56.3)	110(57.3)	164(56.9)	
six and above	3(3.1)	5(2.6)	8(2.8)	
parity				3.72(p=0.155)
PP	49(51)	103(53.6)	152(52.8)	
MP	36(37.5)	79(41.1)	115(39.9)	
GMP	11(11.5)	10(5.2)	21(7.3)	
History of still birth				14.35(p=0.000)
Yes	7(7.3)	0	7(2.4)	
no	89(92.3)	192(100)	281(97.6)	
Previous history of neonatal mortality				2.12(p=0.146)
Yes	8(8.3)	8(4.2)	16(5.6)	
no	88(91.7)	184(95.8)	272(94.4)	
Preceding birth order (=138)				7.30(p=0.007)
<24Months	21(42)	18(20.5)	39(28.3)	
≥24Months	29(58)	70(79.5)	99(71.7)	
APH				0.27(p=0.606)
YES	7(7.3)	11(5.7)	18(6.3)	
NO	89(92.7)	181(94.3)	270(93.8)	

Hypertensive disorder of pregnancy				1.65(p=0.198)
Yes	18(18.8)	25(13)	43(14.9)	
no	78(81.3)	167(87)	245(85.1)	
Premature rupture of membrane				1.21(p=0.270)
Yes	25(26)	39(20.3)	64(22.2)	
no	71(74)	153(79.7)	224(77.8)	
CBC (Hemoglobin level)				21.57(p=0.000)
<11 g/dl	26(27.7)	14(7.4)	40(14.1)	
≥11 G/dl	68(72.3)	174(92.1)	242(85.9)	
Took iron folic acid supplementation				24.8(p=0.000)
Yes	77(80.2)	187(97.4)	264(91.7)	
no	19(19.8)	5(2.6)	24(8.3)	
Tetanus toxoid plus vaccine				22.36(p=0.000)
Yes	82(85.4)	190(99)	272(94.4)	
no	14(14.6)	2(1)	16)(5.6)	

5.4 Labour and delivery related characteristics of the study participants

Almost ninety-two percent of the study participants were referred from other health facility and 73.8% of the labour were established spontaneously. Thirty-five percent of the delivery were at a gestational age of 39-40^{+6} weeks of gestation. Ninety-one percent of the study participants were admitted in the first stage of labour and 92.7% of the delivery were singleton. 18.8% and 20.8% percent of the participants had MSAF and IUGR pregnancy respectively. Only one percent of the participants had a cord accident and 25.3% of the participants had a labour duration of ≥12hrs and 58.7% of the participants were delivered by SVD. The occurrence of perinatal death in each variable were as shown in table 4 below. The chi-square test showed that GA at delivery, stage of labour at admission, types of birth, MSAF, IUGR and obstructed labour were significant factor for perinatal death.

Table 4. Labour and delivery related characteristics of the study participants

Variable	Case (%)	Control (%)		
Mode of admission				0.21(p=0.651)
Non-referral	9(9.4)	15(7.8)	24(8.3)	
Referral	87(90.6)	177(92.2)	264(91.7)	
Onset of labour				2.61(p=0.106)
Spontaneous	72(80)	134(70.9)	206(73.8)	
Induced	18(20)	55(29.1)	73(26.2)	
GA at delivery in weeks				105.5(p=0.000)
$28\text{-}33^{+6}$	40(41.7)	0	40(13.9)	
$34\text{-}36^{+6}$	12(12.5)	12(6.3)	24(14.6)	
$37\text{-}38^{+6}$	9(9.4)	33(17.2)	42(14.6)	
$39\text{-}40^{+6}$	18(18.8)	83(43.2)	101(35.1)	
$41\text{-}41^{+6}$	16(16.7)	44(22.9)	60(20.8)	
>=42	1(1)	20(10.4)	21(7.3)	
Stage of labour on admission				40.79(p=0.000)
1st stage	68(75.6	180(98.9)	248(91.2)	
2nd stage	22(24.4	2(1.1)	24(8.8)	
Types of birth				20.69(p=0.000)
singleton	79(82.3)	187(97.4)	266(92.4)	
Multiple	17(17.7)	5(2.6)	22(7.6)	
Fetal presentation at birth				0.371(p=0.542)
vertex	85(89.5)	176(91.7)	261(90.9)	
malpresentation	10(10.5)	16(8.3)	26(9.1)	
Meconium-stained amniotic fluid				8.30(p=0.004)

Yes	27(28.1)	27(14.1)	54(18.8)	
no	69(71.9)	165(85.9)	234(81.3)	
IUGR				30.69(p=0.000)
Yes	38(39.6)	22(11.5)	60(20.8)	
no	58(60.4)	170(88.5)	228(79.2)	
Obstructed labour				40.3(p=0.045)
yes	2(2.1)	0	2(0.7)	
No	94(97.9)	192(100)	286(99.3)	
Cord accident				1.52(p=0.218)
Yes	2(2.1)	1(0.5)	3(1)	
no	94(97.9)	191(99.5)	285(99)	
Duration of labour				21.65(p=0.000)
No labour	13(13.5)	14(7.3)	27(16)	
<12hrs	45(46.9)	143(74.3)	188(58.7)	
≥12hrs	38(39.6)	35(18.2)	73(25.3)	
Mode of delivery				0.19(p=0.912)
Vaginal	58(60.4)	111(57.8)	169(58.7)	
CS	36(37.5)	77(40.1)	113(39.2)	
AVD	2(2.1)	4(2.1)	6(2.1)	

5.5 Birth outcome related characteristics of the study period

From those of the total cases (n=96), 27% of them were still birth and 73% of them were early onset of perinatal death. Fifty-four percent of the study participants were male and 69.4% were a birth weight of 2500-3999 gram. Sex and birth weight were a significant factor.

Table 5. Birth outcome related characteristics of the study period

Variable	Case (%)	Control (%)	Total (%)	p-value
Birth outcome				

Still birth			26(9)	
Alive			262(91)	
Sex of the fetus				20.39(p=0.000)
Female	26(27.1)	106(55.2)	132(45.8)	
male	70(72.9)	86(44.8)	156(54.2)	
Weight				118.1(p=**0.000**)
<1000	5(5.2)	0	5(1.7)	
1000-1499	33(34.4)	0	33(11.5)	
1500-2499	22(22.9)	12(6.3)	34(11.8)	
2500-3999	33(34.4)	167(87)	200(69.4)	
≥4000	3(3.1)	13(6.8)	16(5.6)	
Neonatal status				
Alive			192(66.7)	
Perinatal death			96(33.3	

5.6 The determinant factors of perinatal mortality

The finding of bivariate logistic regression revealed that residency, maternal education, household monthly income, time of first ANC, preceding birth order, taking folic acid supplementation, MSAF, IUGR and sex of the fetus were an association perinatal death.

The multivariate logistic regression revealed that study participants who will come from rural area were 2.2 folds increase its perinatal death compared to those of from urban (AOR=2.2, 95%CI=1.11, 2.81) and study participant who were illiterate were 1.4 folds increase its perinatal death compared to those of education level of collage and above (AOR=1.4, 95%CI=1.07, 1.87).

Study participant whose initiation of ANC at the third trimester of pregnancy were 3.9 folds increase its perinatal death compared those of initiated in the first trimester of pregnancy (AOR=3.9, 95%CI=2.79, 19.03) and study participant having MSAF during labour and delivery had 5.9 folds increase its perinatal death compared to its opposite compartment (AOR=5.9, 95%CI= 1.02, 34.86).

Study participant having IUGR fetus had 2.9 folds increase its perinatal death compared to those of its opposite compartment (AOR=2.9, 95%CI=1.89, 9.83) and study participants having male fetus had 2.3 folds increase its perinatal death compared to those of female (AOR=2.3, 95%CI=1.45, 8.26)

Table 6. The bivariate and multivariate logistic regression of association between perinatal death and independent variable among women who gave birth in the three teaching hospitals of Addis Ababa university.

variable	cases	control	p-value	COR with 95%CI	P-value	AOR with 95%
Residency						
Urban	79(82.3)	178(92.7)	1		1	
rural	17(17.7)	14(7.30	0.009	2.7(1.29, 5.82)	0.049	**2.2(1.11, 2.81)**
Maternal education level						
no formal education	37(38.5)	22(11.5)	0.001	3.7(1.75, 7.81)	0.021	**1.4(1.07, 1.85)**
primary	23(24)	74(38.5)	0.291	0.68(0.34, 1.39)	0.209	0.39(0.09, 1.68)
secondary	16(16.7)	52(27.1)	0.321	0.68(0.31, 1.46)	0.268	0.43(0.09, 1.91)
college and above	20(20.8)	44(22.9)	1		1	
Household monthly income						
<5000	22(22.9)	28(14.6)	0.013	2.5(1.21, 5.13)	0.064	5.5(0.91, 33.20)
5000-10000	50(52.1)	88(45.8)	0.045	1.8(1.01, 3.19)	0.322	1.9(0.55, 6.25)
>10000	24(25)	76(39.6)	1		1	
Time of first ANC						
1ST TM	38(42.7)	86(45.3)	1		1	
2ND TM	33(37.1)	97(51.1)	0.351	0.77(0.45, 1.33)	0.151	0.43(0.14, 1.36)
3RD TM	18(20.2)	7(3.7)	0.000	5.8(2.24, 15.09)	0.046	**3.9(2.79, 19.04)**
Previous history of neonatal mortality						

Yes	8(8.3)	8(4.2)	0.153	2.1(0.76, 5.75)	0.286	2.1(0.53, 8.76)
No	88(91.7)	184(95.8)	1		1	
Preceding birth order in months (=138)						
<24	21(42)	18(20.5)	0.008	2.8(.31, 6.05)	0.278	1.8(0.63, 4.89)
≥24	29(58)	70(79.5)	1		1	
Hypertensive disorder of pregnancy						
Yes	18(18.8)	25(13)	0.201	1.5(0.79, 2.99)	0.989	1.1(0.29, 3.49)
No	78(81.3)	167(87)	1		1	
Took iron folic acid supplementation						
Yes	77(80.2)	187(97.4)	1		1	
No	19(19.8)	5(2.6)	0.000	9.2(3.33, 25.59)	0.077	0.15(0.02, 1.23)
Meconium-stained amniotic fluid						
Yes	27(28.1)	27(14.1)	0.005	2.4(1.31, 4.37)	0.048	**5.9(1.02, 34.86)**
No	69(71.9)	165(85.9)	1		1	
IUGR						
Yes	38(39.6)	22(11.5)	0.000	5.1(2.77, 9.26)	0.045	**2.9(1.89, 9.83)**
No	58(60.4)	170(88.5)	1		1	
Sex of the fetus						
Female	26(27.1)	106(55.2)	1		1	
male	70(72.9)	86(44.8)	0.000	3.3(1.95, 5.65)	0.002	**2.3(1.45, 8.26)**

6. Discussion

Perinatal death, which encompasses stillbirth and early neonatal death, is influenced by a complex interplay of various determinants. Accordingly the finding of the current study revealed that study participants who will come from rural area were 2.2 folds increase its perinatal death compared to those of from urban (AOR=2.2, 95%CI=1.11, 2.81). This finding was in line with the study done in Hadiya Zone, South Ethiopia (31). This was may be due to in rural areas long distances to healthcare facilities and poor transportation infrastructure can delay access to care. There is often a shortage of skilled healthcare providers, including obstetricians, midwives, and nurses, in rural areas. This can result in inadequate prenatal and perinatal care. Leaving a rural area might interrupt regular prenatal visits, which are essential for monitoring the health of the mother and fetus, identifying potential complications early, and managing any health issues promptly.

Study participant who was illiterate were 1.4 folds increase its perinatal death compared to those of education level of collage and above (AOR=1.4, 95%CI=1.07, 1.87). This finding was congruent with the study done in Kano, Nigeria, Nepal (32, 33). This may be due to illiterate women may have limited knowledge about the importance of prenatal care, proper nutrition, and the recognition of pregnancy complications. This lack of information can prevent them from seeking timely and appropriate medical care. Illiterate women might delay or avoid prenatal care altogether, missing out on essential screenings and interventions that can prevent or manage complications. Without the ability to read and understand health information, women may be less likely to seek professional healthcare services and might rely more on traditional practices, which may not always be safe or effective.

Study participant whose initiation of ANC at the third trimester of pregnancy were 3.9 folds increase its perinatal death compared those of initiated in the first trimester of pregnancy (AOR=3.9, 95%CI=2.79, 19.03). The finding was supported by the study done in Bale Zone Hospitals (34). This may be due to early ANC allows for the identification of potential complications, such as gestational diabetes, preeclampsia, and infections, which can be managed or treated to reduce risks. Delaying ANC means missing these early screenings and interventions. Delaying ANC can lead to poor control of these conditions, increasing risks for both the mother and the fetus.

Study participant having MSAF during labour and delivery had 5.9 folds increase its perinatal death compared to its opposite compartment (AOR=5.9, 95%CI= 1.02, 34.86). This finding was congruent with the study done in Bale Zone Hospitals (34). This was may be due to MAS can lead to hypoxia (lack of oxygen), which can result in significant damage to the baby's brain and other organs. Severe cases of hypoxia can be fatal if not managed promptly and effectively.

Study participant having IUGR fetus had 2.9 folds increase its perinatal death compared to those of its opposite compartment (AOR=2.9, 95%CI=1.89, 9.83). The finding was similar with the study done in North Shoa Zone, Oromia region (35). This was may be due to IUGR often results from placental insufficiency, where the placenta cannot deliver sufficient oxygen and nutrients to the fetus. This can lead to chronic fetal hypoxia (lack of oxygen), increasing the risk of stillbirth or perinatal asphyxia.

Study participants having male fetus had 2.3 folds increase its perinatal death compared to those of female (AOR=2.3, 95%CI=1.45, 8.26). This finding was in line with the study done in Northern India (30). This was may be due to male infants are more prone to respiratory distress syndrome due to slower lung maturation. They have less surfactant, a substance that helps keep the air sacs in the lungs open, leading to greater difficulty in breathing after birth. Male infants tend to have a less mature immune system at birth, making them more susceptible to infections, which can lead to severe complications and increase the risk of perinatal death.

7. Conclusion

The determinants of perinatal death were come from rural area (AOR=2.2, 95%CI=1.11, 2.81), illiterate (AOR=1.4, 95%CI=1.07, 1.87), initiation of ANC at the third trimester of pregnancy (AOR=3.9, 95%CI=2.79, 19.03), having MSAF during labour and delivery (AOR=5.9, 95%CI= 1.02, 34.86), having IUGR fetus AOR=2.9, 95%CI=1.89, 9.83) and male fetus (AOR=2.3, 95%CI=1.45, 8.26).

8. Recommendation

Reducing perinatal death among women with risk factors such as residing in rural areas, illiteracy, late ANC initiation, MSAF, IUGR, and male fetuses requires a comprehensive, multi-faceted approach.

For those leave rural area: -mobile health units to reach remote areas, ensuring regular access to prenatal care. Utilize telemedicine to provide remote consultations, follow-ups, and specialized care for pregnant women.

For those illiteracy: -Implement community-based health education programs that use visual aids, storytelling, and demonstrations to educate women about prenatal care, childbirth, and newborn care. Ensure that all health communication materials are easy to understand, using pictures and simple language to convey important messages.

To avoid late ANC initiation: - Conduct campaigns to raise awareness about the importance of early and regular ANC visits.

Meconium-Stained Amniotic Fluid (MSAF): - Enhance training for healthcare providers to recognize signs of fetal distress early and manage MSAF appropriately. Equip healthcare facilities with the necessary tools and protocols to handle MSAF, including skilled personnel for neonatal resuscitation. Conducting further studies to check reasons for meconium passage in utero can help to plan management suggestions in the future.

Intrauterine Growth Restriction: - Ensure regular and comprehensive antenatal follow up for early detection of small for gestational age uterus and early referral. Provide nutritional

supplements and education to pregnant women to support optimal fetal growth. Develop individualized care plans for pregnancies complicated by IUGR, including timely delivery planning and postnatal care. Doing further research to identify causes of intrauterine growth retardation is suggested.

For those having Male Fetus: - Implement more rigorous monitoring protocols for male fetuses, especially in pregnancies already identified as high-risk. Provide personalized prenatal care that addresses the specific risks associated with male fetuses, including targeted education and support.

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