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Research Article

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Determinants of Perinatal Mortality Among Deliveries Attended in Public Hospitals in Hadiya Zone, South Ethiopia

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Abstract

Background: *Perinatal mortality is the sum of stillbirth and early neonatal death. Perinatal mortality accounts for three-quarters of the deaths during the neonatal period. Ethiopia is one of the sub-Saharan countries with high perinatal mortality, which accounts for 4% of the world's perinatal mortality.*

Objective: *To assess the determinants of perinatal mortality among the public hospital deliveries in Hadiya Zone, South Ethiopia.*

Methods: *An unmatched case-control study was conducted in public hospitals in Hadiya Zone, south Ethiopia, from January 1 to March 30, 2023. cases were stillbirths or early neonatal deaths. Controls were those newborns that were alive until their 7th day of life. Five hundred eighty-two study subjects (194 cases and 388 controls) from delivery registration and the neonatology logbook were recruited for this study. Data were collected using KoboCollect software version 1.29.3 and exported to SPSS version 25 for analysis. Candidate variables with a p-value of less than 0.25 were selected for multivariable analysis by using bivariate analysis. An adjusted odds ratio (AOR) with a 95% confidence interval (CI) was calculated, and variables with a P-value of <0.05 were identified as potential determinants of perinatal mortality.*

Result: *A total of 582 (194 cases and 388 controls) were reviewed. This study identified that maternal age 21-35 years [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 hour duration of labour [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)] as factors that determine perinatal mortality.*

Conclusion: *maternal age, residence, birth interval, history of perinatal mortality, duration of labour, obstetric complication, birth weight, and not the use of a partograph were independent determinants of perinatal mortality. Furthermore, the use of a partograph is recommended for early detection of obstetric complications so that action can be taken during labour follow-up.*

Keywords: Perinatal Mortality, Stillbirth, Hadiya Zone.

Abbreviations and Acronyms:

AOR:	Adjusted Odd Ratio
ICU:	Intensive Care Unit
SPSS:	Statistical Software for Social Sciences
UNFAP:	United Nations Family Program
UNICEF:	United Nations International
WHO:	World Health Organization

1. Introduction

Perinatal mortality refers to the number of stillbirths and deaths in the first week of life (early neonatal mortality). WHO defines stillbirth as the birth of a baby with no signs of life at or after 28 weeks' gestation. Early neonatal death (ENND), defined as the death of a newborn between zero and seven days after birth, WHO used the International Classification of Diseases (ICD-10) to classify stillbirth and neonatal death, which has been recommended for use in all settings. Based on timing, stillbirths can be classified as antepartum stillbirths, intrapartum stillbirths, and stillbirths with unknown timing. Antepartum stillbirth is a stillbirth that happens before the onset of true labour, whereas intrapartum stillbirth is a stillbirth that happens after the onset of labour and before birth. Moreover, a neonatal death is also classified based on the timing after childbirth as early and late neonatal deaths, where the first is considered a component of perinatal mortality together with stillbirths [1,2].

There are numerous causes of stillbirth, the majority of which are related to congenital anomalies, maternal infections like malaria and syphilis, non-communicable diseases, nutrition and lifestyle, maternal age greater than 35 years, and prolonged pregnancy [3]. The common causes of perinatal mortality are related to immaturity, hypoxia, and low birth weight. Moreover, obstetric causes for perinatal deaths such as intrapartum asphyxia, hypertensive disorders, and spontaneous preterm labour are the most common among the obstetric causes that are more likely to cause early neonatal death than stillbirths [4].

Early neonatal death and stillbirth account for 3 million and 3.33 million deaths, respectively, across the world, where 98 percent occur in the developing world [5]. Due to its significant impact on social, economic, and psychological aspects of human beings, a joint emergency expert meeting on global indicators of sexual and reproductive health organised by WHO, UNICEF, and UNFPA in 2000 recommended the perinatal mortality rate (PNMR) as one of 17 chosen indicators. Therefore, it is an indicator for the health as well as the economic status of a given country globally [6].

Ethiopia is one of the sub-Saharan countries with the highest perinatal mortality, which accounts for 4% of the world's perinatal mortality [7]. In Ethiopia, perinatal mortality is one of the highest in Africa (46 per 1,000 pregnancies). It is mainly attributed to home delivery, which accounts for more than 75% of the perinatal deaths [8].

Despite the enormous efforts and interventions made so far, perinatal mortality remains one of the leading causes of under-5 mortality. Each year, three million perinatal deaths occur across the world due to the joint effects of stillbirth and early neonatal death. The low and middle-income countries suffer a heavy burden from perinatal mortality, where 97–99% of all perinatal mortality occurs worldwide, which is the highest number [9].

A systematic review and meta-analysis study conducted in Ethiopia on the determinants of perinatal mortality in Sub-Saharan African countries showed that observed and adjusted perinatal mortality rates were found to be 58.33 and 42.95, respectively. A problem is attributable to inappropriate maternal health care provision during the course of pregnancy, labour, delivery, and postpartum periods, particularly when complications happen and there is a lack of newborn care immediately after delivery and within the first 7 days of life.

There have been many initiatives focusing on or aimed at reducing the perinatal mortality rate globally. Reducing perinatal mortality, including neonatal mortality, infant mortality, and under-five mortality, is a global agenda as a component of the Sustainable Development Goals (SDG). SDG-3 targets ending preventable deaths of newborns. Ethiopia shared the SDG to achieve the target for reduction of neonatal mortality to below 12 per 1,000 live births by 2030. Reduction of neonatal, infant, and under-five mortalities cannot be realised without substantial reduction of perinatal mortality. This is because most neonatal deaths occur during the first week of life, which is part of perinatal mortality.

The Ministry of Health in Ethiopia has been working for years to make health services accessible for women through community and facility-based interventions to increase newborn and child survival. Despite these interventions, perinatal mortality remains one of the problems in Ethiopia. The factors associated with stillbirths and early neonatal deaths are inextricably linked, making it difficult to know whether a death is due to one or the other. It is critical to identify determinant factors and implement evidence-based preventive interventions in order to reduce perinatal mortality. However, to the best of the principal investigator's knowledge, no study has been conducted to assess the determinants of perinatal mortality in public health facilities in Hadiya Zone. Therefore, the findings of this study provide valuable information on factors contributing to perinatal mortality to health professionals, researchers, and other stakeholders working to improve child survival, specifically those working to reduce perinatal mortality. As a result, this research will be carried out in order to better understand the common and avoidable factor that determines perinatal mortality in the Hadiya Zone of Ethiopia

2. Methods and Materials

2.1 Study Area and Period

Unmatched case-control study design was employed at public hospitals in Hadiya Zone, south Ethiopia, from January 1 2023 to March 30 2023. The zone is located in the southeast of Ethiopia, 232 kilometers from Addis Ababa. The zone has twelve woreda and seven town administrations. There are 1 specialized and teaching hospital, 4 primary hospitals, and 61health centres in the zone. The zone has a total population of 1,987,365, and there were 68,763 expected births in the zone annually.

2.2 Source and Study Population

All deliveries (live births and stillbirths) that have been attended in public hospitals from January 1, 2021, to December 30, 2022, in Hadiya Zone were used as the source population. The study populations were still births, early neonatal deaths (deaths occurred

during the first seven days after delivery), live births, and neonates discharged who then proved alive after seven days by phone call to family or HEW in the Zone.

2.3 Inclusion Criteria

On the delivery service registration form and the neonatology logbook, cases and controls with a complete and accurate record of their medical history or birth status were included in the study. Additionally, this study included controls that were confirmed to be alive following discharge.

2.4 Exclusion criteria

The study eliminated cases and controls whose medical histories or delivery result status were not fully and accurately reported on the delivery service registration and the neonatology logbook. Additionally, anyone whose status could not be confirmed as live were excluded.

- **Cases:** stillbirths and early neonatal deaths registered.
- **Controls:** Newborns delivered alive and did not die before the age of seven days and then the phone call was given to family or HEWs of that district to prove that discharged neonate was alive up to the seven completed postnatal period.

2.5 Variables

Dependent Variable: Stillbirth and early neonatal death (Perinatal Mortality)

Independent variables: Maternal Socio demographic factors, maternal obstetrics history related factors, Maternal medical illness Factors, Newborn related factors and Health care related factors.

2.6 Sample Size Determination and Sampling Procedures

The required sample size was calculated by double population proportion formula for unmatched case control study using Epi-Info version 7.2.3.1. So that using P1 = proportion of cases exposed to low birth weight (LBW) was 0.3005, P2= proportion of control exposed low birth weight (LBW) was 0.426, odds ratio 1.7, 95% confidence interval and power of 80% which gave large sample size of 180 cases and 360 controls by using 2:1 control to case ratio. The total sample size became 582(Total Cases = 194 Total Control = 388). Final sample size was 582.

SN	Factors which determine PM	Percent of controls exposed	OR	Percent of cases with exposure	Case control Ratio 2:1	Sample size calculated		
						Kelsey	Fleiss	Fleiss with Continuity Correction
1	Low Birth weight <2500mg	30.05	1.7	42.2	Case	180	181	194
					Control	360	362	388
					Total	540	543	582
2	Obstetric Complication	27.87	2.2	45.9	Case	81	82	90
					Control	162	164	180
					Total	243	246	270
3	Duration of labor >8hrs	46.99	2.75	70.9	Case	51	50	56
					Control	102	99	111
4	Use of Partograph	11.5	3.31	30.1	Case	50	53	61
					Control	100	106	122
					Total	150	159	183

Table 1: A Sample Size Table Calculated Using Strongly Related Factors That Determine Perinatal Mortality

The Sample size was proportionally allocated to the study hospitals i.e. Duna, Gombora, soro, Shashogo, Amaka and Nigist ellen Mohamed Memorial Specialied Teaching Hospital(NEMMSTH) based on average delivery rate of three months prior to data collection. Then from January 1 2021 to December 30 2022(a two-year report) delivery report, using delivery and neonatology logbooks as source of data; cases were purposely selected and for each case, two controls delivered in the same day as of cases were considered as a control group.

3. Data Collection Procedures

Data were collected using the Kobo Collect toolbox. Kobo Toolbox is a free, open-source tool for mobile data collection, available to all. It allows collecting data in the field using mobile phones as well as with paper or computers. Trained midwives used a structured questionnaire with a digital form deployed on Kobo Toolbox to collect data from medical records. Data were collected from seven hospitals. One trained data collector was assigned to each hospital. The data collectors were supervised by a supervisor using GPS in Kobo. These hospitals were selected based on their availability of both delivery and neonatal intensive care unit service and their ability to serve as referral centres for primary health care units for all health facilities in the zone. The delivery service registration and neonatology logbooks from the delivery ward and ICU, respectively, were used as the primary sources of data. The data collection period was from January 1 to March 30, 2023.

4. Data Analysis and Procedures

The data were coded, checked, and entered into SPSS version 25 for analysis. Descriptive statistics were used to summarise data, and frequencies and percents were used to organise categorical variables, while the mean with standard deviation was used to describe a continuous variable. Selection of candidate variables for multivariate analysis was done using bivariate analysis, and those with p-values <0.25 were selected as potential candidates and included in a multivariable logistic regression model to identify independent factors associated with perinatal mortality using the backward likelihood ratio method. An adjusted odds ratio (AOR) with a 95% confidence interval (CI) was calculated to determine the strength and magnitude of the association, and variables with a P-value <0.05 were identified as potential determinants of perinatal mortality. The model assumptions and goodness of model fitness were checked by Hosmer Lemeshow's goodness fit (P-value = 0.921). To assess multicollinearity, the variance inflation factor (VIF) was used to identify the correlation between independent variables and determine the strength of the relationship. Finally, findings were summarised in texts, summary values, and tables.

5. Data Quality Management

Data collectors were recruited and trained for two days prior to conducting the data collection on the purpose of the study, details of the questionnaire, data collection procedures, filling out the questionnaire, and confidentiality. Seven degree-holding midwives were recruited as data collectors. They were expected to check the data entry the day after data collection for the completeness of the questionnaire. Before the actual data collection, the questionnaire was pretested on 5% of the population outside the study area in the same category to check the accuracy of the data. After the pretest, some missed variables were added to the questionnaire.

6. Results

6.1 Socio Demographic Characteristics

A total of 582 (194 cases and 388 controls) maternal charts were reviewed, with a completion rate of 100%. The mean (SD) ages of the mothers were 27.88.9 and 34.86.1 for cases and controls, respectively. From the total mothers, 37.6% of cases and 41% of controls were between the ages of 21 and 35. Only two and one of the mothers in the cases and controls were single, respectively. One hundred forty (72.2%) cases and 191 (49.5%) control mothers were from rural areas. The majority (83.0%) of cases and 328 (56.4%) controls were housewives, whereas self-employed individuals accounted for 6.7% of cases and 33.8% of controls, respectively. Regarding educational status, about 53.1% (103) of the cases had primary education, whereas 247 (63.7%) of the controls had secondary education.

6.2 Obstetrics Characteristics of the Mothers

One hundred twenty-one (62.4%) and 296 (76.3%) of cases and controls had history of previous delivery. Just less than half (48.8%) of the cases gave birth within two years or less after previous delivery while 248 (83.8%) of the controls gave birth after two years of previous delivery. About 547 (94%) of the respondents had at least one ANC visit and about 70.6% of the cases and 91.8% of the controls took more than two TT vaccination. The majority (76.1%) of the mothers were delivered by spontaneous vaginal delivery. Eighty-six (44.3%) of cases had prolonged labor whereas only 17.5% of the controls had prolonged labor. Regarding abortion, 48 (8.2%) of the mothers had previous history of abortion. From the total respondents, 13.9% of the cases had history of perinatal death likewise about 8.8% of the controls had history of perinatal death. About 2.6% (15) of the mother's health deteriorated and 5 (2.6%) of the mothers died after delivery. Seventy-two (37.1%) mothers of the cases and 58 (14.9%) mothers of the controls had at least one type of obstetric complication. From all obstetric complications, Antepartum hemorrhage and preeclampsia accounts for 33.3% and 12.1% of cases complications and 48.3% and 5.2% of controls complications respectively.

6.3 Medical Illness Related Factors

Five hundred sixty-four (96.9%) mothers were screened for HIV with all (100%) being non-reactive. A total of five hundred twenty-six mothers were screened for VDRL, 3 (1.5%) cases and 5 (1.3%) controls were reactive for venereal disease research laboratory (VDRL) test, 48 (8.2%) participants were "unknown". One (1.5%) cases and two (0.5%) controls were positive for hepatitis B surface antigen testing, 37 (6.4%) were "unknown" and the rest were negative. The proportion of anemia was 26.8% of cases and 11.3% of controls. About 21 (10.8%) mothers of the cases and 11 (2.8%) of the controls had history of chronic illness.

Variable	Case (N=194)		Control (N=388)		Total	
	No	(%)	No	(%)	No	(%)
HIV test result						
Reactive	0	0	0	0	0	0
Non-reactive	187	96.4	377	97.2	564	96.9
Unknown	7	3.6	11	2.8	18	3.1
VDRL						
Reactive	3	1.5	5	1.3	8	1.4
Non-reactive	166	85.6	388	100	526	90.4
Unknown	25	12.9	23	5.9	48	8.2
Hepatitis B						

Reactive	1	.5	2	0.5	3	0.5
Non-reactive	172	88.7	370	95.4	542	93.1
Unknown	21	10.8	16	4.1	37	6.4
Hemoglobin						
< 11mg/dl	52	26.8	44	11.3	96	16.5
≥ 11mg/dl	142	73.2	344	88.7	486	83.5
History of chronic illness						
Yes	21	10.8	11	2.8	32	5.5
No	173	89.2	377	97.2	550	94.5

Table 2: Medical Illness Related Factors of Mothers With Perinatal Deaths (Cases) and Controls Among Public Hospitals Deliveries in Hadiya Zone, South Ethiopia, 2023

Newborn Related Factors

Among the total of 194 cases, 51 (26.3%) were early neonatal deaths, while 143 (73.7%) were stillbirths. Regarding presentation of the child during delivery, 176 (90.7%) of cases and 359 (92.5%) of controls were vertex presentations. More than half (59.8%) of the cases and 274 (70.6%) of the control newborns were female. Eighty-eight (45.4%) of cases and 38 (9.8%) of control newborns had low birth weight. Of the newborns, 504 (86.6%) were delivered at term. Considering preterm deliveries, 33.5% of cases and about 1% of controls were preterm deliveries. Four (0.7%) of the newborns were twins. Congenital anomalies were recorded in 4.6% of the cases and 0.8% of the controls. Of the total, eighty-four (14.4%) of the newborns have at least one health problem. Prematurity, sepsis, and asphyxia accounted for 23.7%, 22.2%, and 14.9% of cases, respectively, and 4.1%, 2.3%, and 3.6% in controls.

Health Care Service Related Factors

Partograph was used for 446 (76.6%) of the total study participants. The proportion of mothers who delivered without partograph follow-up was 86 (44.3%) in cases and 50 (12.9%) in controls. Seven (3.6%) of cases and 339 (87.4%) of control mothers delivered using the childbirth checklist. More than half (55.5%) and 254 (43.6%) of the deliveries were attended by midwives alone and jointly in teams, respectively. About 85.6% of the NICU attendants were trained nurses.

Variable	Case (N=194)		Control (N=388)		Total	
	No	(%)	No	(%)	No	(%)
Partograph						
Yes	108	55.7	338	87.1	446	76.6
No	86	44.3	50	12.9	136	23.4
Child birth check list/SBCC						
Yes	7	3.6	339	87.4	346	59.5
No	187	96.4	49	12.6	236	40.5
Referral paper						
Yes	19	9.8	359	92.5	378	64.9
No	175	90.2	29	7.5	204	35.1
Delivery attendant						
Nurse	1	0.5	0	0	1	0.2
Midwife	90	46.4	233	60.1	323	55.5
IESO	4	2.1	0	0	4	0.7
Jointly in team	99	51.0	155	39.9	254	43.6

Table 4: Health Care Service for Mothers With Perinatal Deaths (Cases) and Controls in Public Hospital Deliveries in Hadiya Zone, South Ethiopia, 2023

Factors Associated with Perinatal Mortality

In the bivariable logistic regression analysis, maternal age, residence, education status, occupation, parity, birth interval, TT status, duration of labour, obstetric complication, haemoglobin level, history of chronic disease, newborn sex, birth weight, gestational age, congenital anomaly, and partograph use were significantly associated with perinatal mortality.

After adjusting for potential confounding variables in multivariable logistic regression, maternal age, residence, birth interval, perinatal death history, duration of labour, obstetric complication, birth weight, and partograph use were found to be independent determinants of perinatal death. The odds of perinatal mortality were 62% lower among newborns whose mothers were aged 21-35 as compared to newborns whose mothers were aged 36 years [AOR = 0.38, 95% CI: (0.17, 0.84)]. There were 2.9 times higher odds of perinatal mortality among newborns whose mothers were from rural residence as compared to newborns whose mothers were from urban residence [AOR = 2.88, 95% CI: 1.29, 6.46]. The odds of perinatal mortality were 5.3 times higher among newborns whose mothers had less than or equal to a two-year birth interval compared to those whose previous birth interval was more than two years [AOR = 5.34; 95% CI: (2.59, 10.99)]. Newborns whose mothers had previous perinatal death histories had 3.2 times higher odds of perinatal mortality compared to those newborns whose mothers had no previous perinatal death history [AOR = 2.05, 95% CI: (1.19, 3.52)].

The odds of perinatal mortality were 81% lower among newborns whose mothers had no prolonged labour (8 hours) as compared to newborns whose mothers had prolonged labour (8 hours) [AOR = 0.19, 95% CI: (0.09, 0.40)]. The odds of perinatal mortality were 7.9 times higher among newborns whose mothers had an obstetric complication compared to newborns whose mothers had no obstetric complication [AOR = 7.92, 95% CI: 3.81, 16.46)]. . Newborns who had low birth weight (2500 g) had 7.7 times higher odds of perinatal mortality compared to those who had 2500 g birth weight [AOR = 7.75, 95% CI: 3.27, 18.39)]. The odds of perinatal mortality were 86% lower among newborns whose mothers' labour was followed using a partograph than among newborns whose mothers' labour was not followed by a partograph [AOR = 0.14; 95% CI: 0.07, 0.30].

Variables	Perinatal outcome		
	Case (%)	Control (%)	AOR(95% CI)
Maternal age			
≤ 20 years	51(26.3)	29(7.5)	1.03(0.29-3.56)
21-35 years	73(37.6)	159(41.0)	0.38(0.17-0.84)*
≥ 36 years	70(36.1)	200(51.5)	1
Residence			
Rural	140(72.2)	191(49.2)	2.88(1.29-6.46)*
Urban	54(27.8)	197(50.8)	1
Educational status			
No formal education	9(2.3)	16(8.2)	2.41(0.53-11.02)
Primary education	68(17.5)	103(53.1)	2.50(0.98-6.34)
Secondary education	247(63.7)	50(25.8)	0.46(0.18-1.14)
Higher education	64(16.5)	25(12.9)	1
Birth interval			
≤ 2 years	59(48.8)	48(16.2)	5.34(2.59-10.99)**
> 2 years	62(51.2)	248(83.8)	1
TT status			
≤ 2 times	57(29.4)	30(7.7)	2.59(0.86-7.87)
> 2 times	137(70.6)	358(92.3)	1
Abortion history			
Yes	16(8.2)	32(8.2)	2.12(0.80-5.59)
No	178(91.8)	356(91.8)	1
Perinatal death history			
Yes	27(13.9)	34(8.8)	3.20(1.38-7.43)**
No	167(86.1)	354(91.2)	1

Duration of labor			
< 8 hours	108(55.7)	320(82.5)	0.19(0.09-0.40)**
≥ 8 hours	86(44.3)	68(17.5)	1
Obstetric complication			
Yes	62(32.0)	58(14.9)	7.92(3.81-16.46)**
No	132(68.0)	330(85.1)	1
Hemoglobin level			
< 11mg/dl	52(26.8)	44(11.3)	1.82(0.80-4.15)
≥ 11mg/dl	142(73.2)	344(88.7)	1
Newborn sex			
Male	78(40.2)	114(29.4)	1.13(0.58-2.20)
Female	116(59.8)	274(70.6)	1
Birth weight			
<2500 g	88(45.4)	38(9.8)	7.75(3.27-18.39)**
≥2500 g	106(54.6)	350(90.2)	1
Partograph use			
Yes	108(55.7)	338(87.1)	0.14(0.07-0.30)**
No	86(44.3)	50(12.9)	1

Note: *p-value <0.05, **p-value <0.01

Table 5: The Association between Different Factors and Perinatal Mortality among Public Hospital Deliveries in Hadiya Zone, South Ethiopia, 2023

7. Discussion

Perinatal mortality in this study was influenced by the mother's age, place of residence, birth interval, history of prior perinatal deaths, and length of labour, obstetric complications, birth weight, and usage of partographs. When comparing neonates with moms aged 21 to 35 to newborns with mothers aged 35, the odds of perinatal mortality were 62% lower in the former group. Studies were performed in the UK, Uganda, Tigray and Southern Ethiopia all revealed similar results. This could be because of the mother's physical capacity to carry the kid despite her advanced maternal age, which could lead to poor perinatal outcomes from utero-placental insufficiency brought on by ageing blood vessels in the uterus. Moreover, as maternal age advances, she is more likely to give birth to a newborn with different complications, including an inability to adapt to extrauterine life and increased susceptibility to infections [11, 19].

Residence was also found to be a determinant factor for perinatal mortality. There were three times higher odds of perinatal mortality among newborns whose mothers were from rural residences as compared to newborns whose mothers were from urban residences. This finding is supported by studies conducted in Nigeria (20) and Tigray, northern Ethiopia (11). The possible explanation for this might be that urban resident mothers had better wealth, education, sanitation services, and media access for health service utilization.

The current study also found a significant association between the birth interval and perinatal mortality. The odds of perinatal mortality were five times higher among newborns whose mothers had less than or equal to a two-year birth interval compared to those whose previous birth interval was more than two years. This finding is consistent with studies conducted in Addis Ababa, Illu Abbaa Born Oromia, Northwest Ethiopia, and meta-analyses done in Ethiopia (23). This may be due to the fact that a short birth interval increases the risk of obstetric complications that can affect the perinatal outcome. Moreover, long birth spacing enables the maternal body to replenish nutrient stores, accumulate energy, and even decrease economic stress, all of which can lower the risk compared to short birth spacing [14-23].

The history of perinatal mortality was significantly associated with perinatal mortality. Newborns whose mothers had a history of perinatal mortality had three times higher odds of perinatal mortality compared to those newborns whose mothers had no history of perinatal mortality. This finding is supported by studies conducted in different parts of Ethiopia: Addis Ababa, North Showa, Jimma, and a meta-analysis done in Ethiopia. This might be due to the fact that women who have experienced repeated stillbirth or early neonatal mortality may have anatomic or physiologic problems related to the reproductive system that may lead to complications and lead to perinatal mortality. Additionally, when a family loses a newborn soon after birth, there is a need to replace the lost baby in a short birth interval, which may also lead to an increased risk of perinatal death.

Regarding duration of labour, the odds of perinatal mortality were 81% lower among newborns whose mothers had no prolonged labour (8 hours) as compared to newborns whose mothers had

prolonged labour (8 hours). This finding is supported by the findings of studies conducted in Kenya, Jimma, and Southern Ethiopia. The possible explanation for this might be that prolonged labour increases the risk of birth asphyxia, birth trauma, umbilical cord prolapse, and maternal complications, which results in increased perinatal mortality and morbidity.

Obstetric complications were among the factors identified as associated with perinatal mortality. The odds of perinatal mortality were eight times higher among newborns whose mothers had an obstetric complication compared to those with no obstetric complications. This was also consistent with studies conducted in the Democratic Republic of the Congo, Zimbabwe, Arba Minch, Jimma and south Ethiopia, and a meta-analysis done in Ethiopia. This could be because maternal complications like preeclampsia, bleeding, obstructed or prolonged labour, and others affect foetal blood nutrition and health, which can also have a negative consequence on the survival of the foetus and newborn.

Furthermore, the study revealed that the birth weight of a newborn was a strong determinant of perinatal mortality. Perinatal mortality was eight times higher among newborns with low birth weight (2500 g) compared to newborns with normal birth weight (2500 g). Similar findings were reported by studies conducted in Kenya, Addis Ababa, Tigray, southern Ethiopia, and a meta-analysis done in Ethiopia. The possible reason might be that low birth weight newborns are usually preterm babies, which makes them susceptible to hypothermia, infection, and other health problems, which in turn makes them vulnerable to perinatal death as compared to babies of normal weight [16-25].

The odds of perinatal mortality were 86% lower among newborns whose mothers' labour was followed using a partograph as compared to their counterparts. Similar findings were reported by studies conducted in Uganda, Addis Ababa, Illu Abbaa Boor Oromia, Arba Minch, and Southern Ethiopia. This might be due to the fact that the use of partograph during labour and delivery helps alert the attending health care worker to early detect any abnormalities during the course of labour. Consequently, it can prevent perinatal mortality and morbidity with early diagnosis and management of labour complications.

8. Conclusion

The study identified a history of perinatal death, advanced maternal age, rural residency, and a birth interval of less than two years. It also found a positive correlation between perinatal death and obstetric difficulties and low birth weight. Contrarily, longer labours and the use of partograph were either protective or adversely linked with perinatal death [26-30].

Limitation of the Study

This study's primary flaw is the use of secondary data as its information source. It was challenging to collect all the essential factors because this data was acquired for another reason, and some of the medical records did not contain certain information. Therefore, it is impossible to prevent the confounding impact of unmeasured variables. Furthermore, information was gathered from hospital service records, therefore baby fatalities that occurred after discharge would not have been captured due to the dependability of HEWs and families' phone call responses.

Author's Contributions

I daily supervised the data collection, coded the data, carried out the analysis and wrote the first draft of the article. Other authors contributed the study design and analysis, comments throughout the entire process. Finally, they approved the final version of the manuscript prior to submission.

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Conflict of Interests

The authors declared that they have no challenging interests.

Ethics Approval and Consent to Participate

A written permission letter was written from the Hadiya Zone Health Department and sent to the Woreda Health Offices. During data collection, each respondent was informed about the purpose, scope, and expected outcome of the research, and appropriate informed verbal consent was taken from the respondents. Anyone who is unwilling to participate has the full right to withdraw from the study.

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Data and materials availability

The datasets generated and analyzed in this study available from the corresponding author on reasonable request.

Consent for publication

Not applicable.

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