AFRICAN JOURNAL OF HEALTH SCIENCES AND MEDICINE
AJHSM (2023)02:02
http://www.du.edu.et/duj

RESEARCH ARTICLE

Early Neonatal Death and Associated Factors Among Babies Born in North Shoa, Ethiopia

Aregahegn Wudneh[1*], Tesfaye Gugsa Alemu[2], Abbas Ahmed[1], Mesfin Abebe[1], and Mogos Beya Gudeta[3]

Received: 11 May 2023

Accepted: 5 December 2023

Published: 25 December 2023

DOI:10.20372/ajhsm.v02i02.05

Suggested Citation: Wudneh A., Gugsa T.A., Ahmed A., Abebe M., and Beya M.G., Early Neonatal Death and Associated Factors Among Babies Born in North Shoa, Ethiopia, 2022. Afri. J. Heal. Sci. Med; 2023, 02(02).

Abstract

Background: Early neonatal death refers to the death of a newborn within the first seven days of life or with a birth weight of at least one kilogram. It is a key indicator of the quality of prenatal, intrapartum, and newborn care, and remains a major contributor to under-five mortality. In Ethiopia, few studies have examined early neonatal deaths, and most existing research relies on secondary, institution-based data. This study aims to provide insights into early neonatal mortality within rural communities of Ethiopia.

Methods: A community-based cross-sectional study was carried out in rural areas of the North Shoa Zone between January 1 and March 30, 2020. Data were entered using EpiData (version 4.2) and analyzed with SPSS (version 23). Variables with a p-value < 0.25 in bivariable analysis were included in multivariable logistic regression to adjust for potential confounders. Both crude and adjusted odds ratios (AOR) with 95% confidence intervals (CI) were calculated to assess associations between dependent and independent variables. Statistical significance was set at $p \leq 0.05$.

Result: The magnitude of Early neonatal death was 9(9.4%) (95%, CI: 7%-11%). Maternal age less than 18 years, mothers unable to read and write, gestational age less than 37 weeks, unable to cry immediately after delivery, and the short inter-pregnancy interval was significantly associated with early neonatal death.

Conclusion: Generally, this study has high early neonatal death, which needs more attention. Maternal age less than 18 years, mothers unable to read and write, gestational age less than 37 weeks, unable to cry immediately after delivery, and the short inter-pregnancy interval was significantly associated with early neonatal death.

Keywords: Ethiopia, Neonatal death, Newborn, Oromia, Still birth

*Correspondence: are.wud16@gmail.com
[1]Department of Midwifery, Dilla University, Dilla, Ethiopia

Background

Early neonatal death is defined as the death of a newborn between zero and seven days after birth [1]. The early neonatal period is the most vulnerable time of life, with the highest mortality rate compared to any other time [2, 3]. Key contributing factors include mode of delivery, preterm birth (<37 weeks), low Apgar score, birth asphyxia, traumatic delivery, and inadequate maternal care during pregnancy, labor, and delivery. Early neonatal death serves as a key indicator of the quality of prenatal, intrapartum, and newborn care. It is influenced by multiple determinants that must be carefully assessed before drawing conclusions about care standards [10-12].

Numerous maternal and fetal variables, as well as institutional factors, have an impact on newborn mortality. Congenital malformations, male fetus, multiple parties, premature cesarean birth, hypoxia, and pregnancy-related hypertension are among more variables that might lead to a nearly fatal newborn outcome [4, 5].

Globally, every year an estimated 4 million babies die in the first four weeks of life (the neonatal period), with the highest risk of death being on the first day of life [6]. Early neonatal death represents 73% of all postnatal deaths worldwide. Despite a 50% reduction in childhood mortality, the reduction of ENND has significantly lagged behind other Millennium Developmental Goal achievements and is a growing contributor to overall mortality in children aged <5 years [1, 7].

Globally, in 2015, among 5.9 million child deaths, nearly 2 million deaths occurred in the first week of life (early neonatal period) [8] the highest rates are generally in sub-Saharan Africa [6, 9], where almost all (99%) neonatal deaths arise in low-income and middle-income countries [6]. The reduction rate of neonatal deaths between 1990 and 2015 in low and middle-income countries is 5.3% (from 5.1 million to 2.7 million), which is slower than that of post-neonatal and under-five mortality in which 47 % and 58 % child death worldwide, respectively [10].

In 2015, maternal complications in labour carried a high risk of neonatal death, and poverty is strongly associated with an increased risk [11] and it is significantly higher among low birth weight and preterm births. Nearly 1/3rd of death occurred on the 1st day or within 24 hours of life [12-14].

A significant change has been made to reduce child mortality, but the rate of decline in neonatal mortality is slower (49 to 29 death per1000 live births) due to high neonatal mortality [15]. In 2015 neonatal mortality rate was 28 per 1000 live births (87,410), and early neonatal death contributes more than 3/4th of total neonatal death [16]. The change in neonatal death is still stagnant and needs attention in rural and urban communities.

Despite the existing research regarding perinatal death neonatal deaths, there is limited understanding of the factors associated with early neonatal death in north Shoa, Oromia region. Little attention has been given to examining specific factors that impact early neonatal death.

Early neonatal death contributes to more than 3/4th of total neonatal death [14]. The change in neonatal death is still stagnant and needs attention in rural and urban communities.

This study may provide information about early neonatal death in rural communities of Ethiopia, which contributes to sustainable development program engagement, action, and partnership by all countries to reduce neonatal mortality by 12 or fewer by 2030 using primary data than secondary data about the problem.

Methods and Materials

The Study Area. Period and Design

A community-based cross-sectional study was conducted in North Shoa Zone from January one to March 30, 2020, which is bordered on the South by Oromia special zone surrounding Addis Ababa, on the southwest by West Shewa on the north Amhara region and southeast by East Shewa.

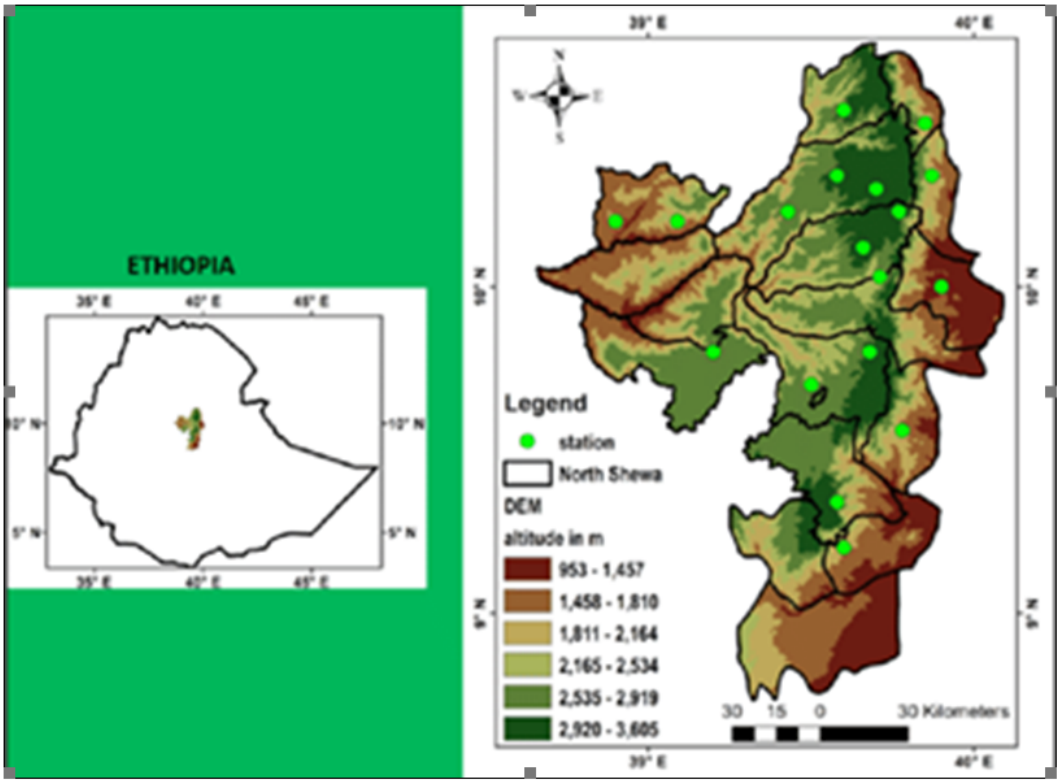


Figure 1 Map of the study area

The total population in the Zone is 1431305, 717552 male and female, respectively [17, 18]. The Zone has 14 woredas, which have three hospitals that currently give service (one general and two primaries) and 52 health centers.

According to 2017 zonal health statistics data, around 18350 women give birth annually in hospitals, health centers, and health posts [18]. The zone is found under the Oromia regional state and divided into 18 districts. Among these, five districts' mothers residing in the Kebeles were included in this study.

Population

Source population

All mothers who gave live birth within North Shoa, Oromia, Ethiopia, were the source population of this study.

Study population

All mothers who gave live birth within the last month before the data collection period were the population of this study.

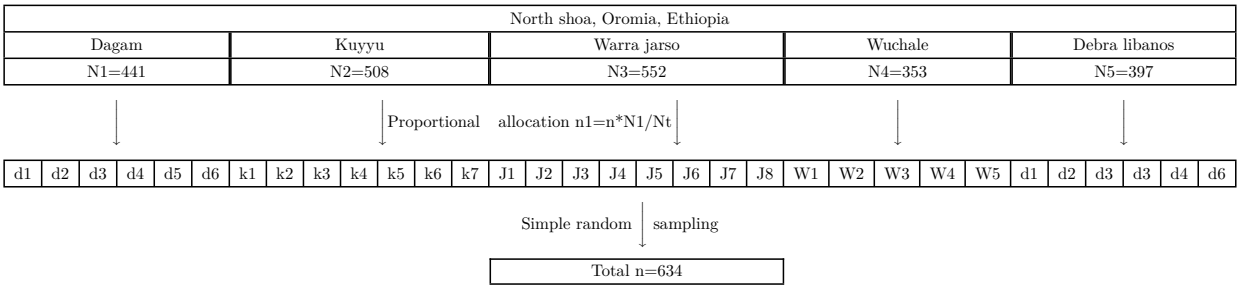
Inclusion and exclusion criteria

Babies who were born after 28 weeks of gestation and those who had more than one- thousand-gram weight up to the first 7 days after birth were included in this study.

Sample size determination

The sample size was determined using the single population proportion formula with a 5% margin of error and a 95% confidence level. A proportion of 50% was applied to maximize the sample size. To account for the design effect, the result was multiplied by 1.5, and an additional 10% was added for possible non-response. The final sample size was 634 participants.

Sampling procedure



A multi-stage sampling method was applied. First, five of the 14 districts in the North Shoa Zone were randomly selected. Within these districts, 32 kebeles (the smallest administrative units) were chosen by lottery. A census was then conducted in the selected kebeles to identify women who had given birth in the past month, yielding 2,251 eligible participants. From this group, 634 women were selected for this study by using random sampling technique.

Data collection method

An adapted data collection tool was used for data collection for different literature reviews and adjusted for this study in English [19-22] and translated to local language, Afan Oromo by an expert who has a BA in Afan Oromo language. The questionnaire was back-translated into English by an independent translator to ensure consistency. A pretest was conducted with 63 mothers (10% of the sample) in nearby Canco districts. It evaluated clarity, readability, completeness, accuracy, and the time required for interviews. Adjustments were made based on the pretest findings.

Data were collected through face-to-face interviews using a structured, pretested questionnaire in private settings to ensure confidentiality. Each interview lasted 30–40 minutes. Mothers who had lost newborns were interviewed at least ten days after the loss to allow time for recovery.

Ten trained data collectors and five supervisors, all with midwifery qualifications, conducted the fieldwork after a three-day training on study objectives, procedures, and data handling. The principal investigator and supervisors checked data daily for accuracy and completeness, and reliability was assessed using Cronbach's alpha.

Operational definitions

Early neonatal death is a death of a newborn within the first seven days of life [15].
Babies with Severe malformation refers to babies with incompatibility to survive after birth [23].
Prematurity is defined as a birth that occurs before 37 completed weeks of gestation [24].
Bad obstetric history refers to stillbirth, miscarriage, previous fatal outcomes of more abortions, Intrauterine growth restriction, and fetal death [25].

Data processing and analysis

Completed questionnaires were checked for accuracy and coded before entry into EpiData v4.2, then exported to SPSS v23 for analysis. Descriptive statistics (mean, median, frequency, percentage) were applied, and bivariate logistic regression identified candidate variables for multivariable analysis.

Variables with $p < 0.25$ were included in the multivariable logistic regression to identify independent predictors of obstetric violence. Associations were measured using adjusted odds ratios (AOR) with 95% confidence intervals, and significance was set at $p < 0.05$. Results were presented in text, tables, and figures. Model adequacy was confirmed by a non-significant Hosmer–Lemeshow test, a significant omnibus test, and checks for multicollinearity using VIF, tolerance, and standard error.

Results

Socio-demographic characteristics of mothers

A total of 631 mothers who gave birth in rural areas of North Shoa Zone participated in this study, with a response rate of 99.5%.

Table 1 Socio demographic characteristics of mothers gave birth in North Shoa, Oromia

Variables	Characteristics	Frequency	Percent (%)
Maternal age	≤18	39	6.2
	19-34	492	78
	≥35	100	15.8
Marital status	Married	580	91.9
	Single	17	2.7
	Widowed	6	0.9
	Divorced	20	3.2
	Other	8	1.3
Occupational status	Housewife	404	64.02
	Private employee	70	11.1
	Government employee	76	12
	Laborer/merchant/student	81	12.8
Religion	Orthodox	541	85.7
	Protestant	29	4.6
	Muslim	61	9.7
Ethnicity	Oromo	541	85.7
	Amhara	82	12.99
	Other	8	1.3
Educational status	Unable to read and write	231	36.6
	Primary	280	44.4
	Secondary and above	120	19.0

The mean (±SD) age of the mothers was 26.68 (±5.96) years. The majority (78%) of mothers' age group were between 19-34 years old, with the remaining moms being under the age of 18 and greater than 35years old. About 580(91.9%) of them were married and the rest were single, widowed, divorced/other. Of the total participants 541(85.7%) were Orthodox, 61(9.7%) were Muslim and 29(4.6%) were protestant. Among the respondents, 286(45.3%) and 345 (54.7%) lived in urban and rural areas respectively (Table 1).

Obstetrics Characteristics of Study Participants

Among the total of 631 mothers included in the study, 273(43.3%) were primiparous followed by 252(39.9%) were multipara, while the rest, 106(16.8%) were grand multipara. From those who were multiparous and grand multiparous women, 86(24.0%) of mothers had a birth interval of less than two years, and 272(76.0%) had greater than or equal to two years based on their last delivery.

Table 2 Obstetrics factors of mothers who gave birth in North Shoa, Oromia

Variables	Characteristics	Frequency	Percent (%)
Parity	Primi-para	273	43.2
	Multipar	358	56.7
ANC Follow up	Yes	440	69.7
	No	191	30.3
Obstetric complication	Yes	207	32.8
	No	424	67.2
Number of ANC visit	1 time	217	49.3
	2 & 3 time	162	36.8
	4 time	61	13.9
Time of ANC initiation	<16 week	136	21.5
	≥ 16 weeks	495	78.5
Immediate PNC check- up	Yes	112	17.7
	No	519	82.3
Place of delivery	Hospital	127	20.1
	Health center	167	26.5
	Health post	58	9.2
	Home	279	44.2
Delivery assisted by	TBA	164	26
	Families	115	18.2
	HEW	58	9.2
	HCP	294	46.6
Having bad obstetrical history	Yes	151	23.9
	No	480	76.1
Length of nearest health facility	<30 minute	334	52.9
	≥30 minute	297	47.1
Birth Interval (among multi and grand paras)	<2 years	86	24.0
	>2 years	272	76.0

Among the respondents, 440 (69.7%) reported at least one antenatal care visit during their most recent pregnancy. However, only 136 (21.5%) attended before 16 weeks of gestation, as recommended. In addition, 334 (52.9%) indicated that reaching the nearest health facility required more than 30 minutes of travel.

Out of 631 participants, the majority, 574(91.0%), had no chronic illness; only 57(9%) had chronic illness. Of those who had a chronic illness, most, 23(40.4%) had chronic hypertension, followed by 19(33.3%) who were HIV posetive 10(17.5%) had diabetic mellitus, and the rest 5(8.8%) had anemia. Regarding the place of delivery, more than 279 (44.2%) of women gave birth at home, followed by 167 (26.5%) who gave birth at the health center and 12(20.1%) were at hospital, while the rest, 58 (9.2%) at the health post.

According to the study participants, health care providers were the main birth attendants (294, 46.6%), followed by traditional birth attendants (164, 26%), family members or relatives (115, 18.2%), and health extension workers (58, 9.2%). Most respondents (394, 62.4%) delivered through spontaneous vaginal birth. Only

112 (17.7%) reported receiving postnatal care within the first week after delivery. Of the 631 participants, 151 (23.9%) had a history of adverse obstetric outcomes unrelated to the current pregnancy. Among these, 61 (40.4%) had experienced abortion, 49 (32.4%) had a stillbirth, and 41 (27.1%) had neonatal loss.

Newborn characteristics

Of the total 631 newborns, the majority, 364(57.7 %), were male newborns, while the rest, 267(42.3%), were female newborns. The majority, 511(81.0%), were born after 37 and below 40 weeks of gestational age, followed by 120(19.0%), who were delivered before 37 weeks of gestational age. Among all babies, 13(2.1%)had congenital anomalies, and 618(97.9%) were born without congenital anomalies. From the total 631 babies, 79(12.5%), were admitted to NICU. Among those who were admitted to NICU, 32(40.5%) were due to prematurity, followed by 21(26.6%) due to unable to feed, 19(24.1%) with neonatal infection and 7(8.8%) did not know the reason of her baby admitted to NICU.

The majority, 502(79.5%) of newborns cry immediately after delivery and the rest, 129(20.5%) did not cry immediately after delivery.

Magnitude of early neonatal death

Of the total 631 newborns, 59(9.4%) died in the early neonatal period (95%, CI: 7%-11%). From this neonatal death, the majority, 32(54.2%) neonatal deaths occurred within the first 24 hours of neonatal life in the study area as can be seen in figure 1.

Results of multivariate logistic regression analysis

In bivariate logistic regression, factors associated with early neonatal mortality were the maternal educational status of being unable to read and write, maternal age less than 18 years, no regular antenatal care follow-up, gestational age<37 weeks, having bad obstetric history, history of chronic illness, place of birth, short interpregnancy and status of the newborn immediately after birth.

Finally, after nine variables (with P-value less than 0.25 in bivariate logistic) were subjected to multivariate logistic regression, four variables were found to be significantly associated with early neonatal death. Maternal age less than 18 years, gestational age<37 weeks, immediate cry, and educational status were factors significantly associated with early neonatal death.

Factors associated with early neonatal death among babies born in North Shoa, Oromia, Ethiopia

In this finding, babies whose mothers are less than 18 years old were 1.67 times more likely to report early neonatal death (AOR 1.67(1.162-2.936)).

Table 3 Bivariate and multivariate analysis of factors associated with early neonatal death among babies born in North Shoa, Oromia

Variables	END status		COR (95% CI)	AOR (95% CI)	P value
	Dead	Alive			
Education status					
Unable to read and write	34	197	2.786(1.67-4.122) *	1.96(1.367-3.635)**	0.001
Primary	18	262	1.115(0.63-2.56)	0.654(0.251-1.706)	
Secondary & above	7	113	1	1	
Maternal age					
≤18	6	33	2.090(1.090-3.320) *	1.67(1.162-2.936)	0.00
19-34	50	442	1.301(0.790-3.320)		
≥35	8	92	1		
NICU admission					
Yes	8	71	1.106(0.542-2.793)		
No	51	501	1		
ANC					
Yes	33	407	1		
No	23	168	1.688(1.092-3.593)*		
Gestational age					
<37	23	97	3.129 (2.172-4.773)*	2.231(1.562-3.332)**	0.001
≥37	36	475	1		
Immediate PNC check-up					
Yes	9	103	1		
No	50	469	1.220(0.184-1.473)		
History of chronic disease					
Yes	8	49	1.674(1.016-2.921)*		
No	51	523	1		
Bad obstetric history					
Yes	20	131	1.726(1.283-3.277)*		
No	39	441	1		
Status of neonate immediately after birth					
Cry	37	465	1		
Not cry	22	107	2.583(1.715-4.122)*	1.686(1.0151-3.242)**	0.003
Birth attendant					
HCP	22	272	1		
HEWs	6	52	1.426(0.395-2.012)		
Other	31	248	1.545(0.695-2.25)		
Place of delivery					
Facility	25	327	1		
Home	34	245	1.815(1.1295-3.032)*		
Distance from nearest health facility					
<30 minute	27	307	1		
≥30 minute	32	265	1.373(0.295-2.455)		
Interpregnancy interval					
<2 years	46	313	2.927(1.951-4.53)*	1.786(1.251-3.644)**	0.00
>2 years	13	259	1	1	

CI=confidence interval, COR=crude odd ratio, AOR=Adjusted odd ratio. *=significantly associated in bivariate analysis, **=significantly associated in multivariate analysis

Mothers who were unable to read and write were 1.96 times more likely to have early neonatal loss as compared to those who were primary and above (AOR, 1.96(1.367-3.635)).

Babies born before the completion of 37 weeks gestation were 2.2 times more likely to die than babies born in greater or equal to 37 weeks (AOR, 2.231(1.562-3.332)). Babies who hadn't cried immediately after delivery were eight times more likely to die during the early neonatal period than those who immediately cried after delivery (1.686(AOR, 1.0151-3.242)).

Babies born having short interpregnancy intervals (less than two years' interval) were1.786 times more likely to die than long interpregnancy intervals 1.786 (1.251-3.644). See table 3.

Discussions

Magnitude of early neonatal death

In this study, early neonatal death is 9.4 % (95%, CI: 7%-11%), which indicates more than eight babies are expected to die out of 100 babies born before they celebrate their first week of birth. Our findings are notably higher than those reported in cross-sectional studies from South Africa (2.92%) and East Iran (1.68%) [26-28]. This finding may be due to the setting of the study since it targeted rural communities, where inaccessible health facilities for early neonatal treatment; it may be due to poor transport access, which leads to home birth and traditional neonatal treatment. This finding is also higher than the study conducted in six developing countries (Argentina, Egypt, India, Peru, and South Africa), where about 9 early neonatal deaths per 1000 live births [29].

The discrepancy may be explained by the setting of the study in which the previous study was conducted only on institutions as it missed home birth, which could affect the survival of the neonatal period because of disadvantages (unsafe delivery) in home birth over birth in health facilities. In addition, the figure in the previous study is an average value of the number of deaths in six countries that might minimize the magnitude of early neonatal death.

Our findings are lower than in studies conducted at Hawassa University Specialized and Referral Hospital and Wolaita Sodo Comprehensive Specialized Hospital [19, 21, 30]. This study is also lower than other studies conducted in Ethiopia [31]. The difference may be attributed to the setting of the study. In the case of this study, the study was conducted in a community where much more early neonatal death may be expected as it addresses all neonates, including neonates born at home. Therefore, it is not surprising to be higher in this. The present study is supported by the study conducted in Cameroon, where more than 12% of early neonatal deaths occur [32].

Factor associated with Early Neonatal Death

Short interpregnancy interval in the present study is significantly associated with early neonatal death. It may be explained by the fact that as the interpregnancy interval becomes shorter, the probability of overlapping breastfeeding and pregnancy also increases, which affects pregnancy outcomes, including weight and early neonatal death [33, 34]. Evidence suggests that preterm birth, low birth weight, neurodevelopmental delay, and perinatal or neonatal mortality are all more likely to occur when the birth interval is short. The finding is in line with the findings from Sweden and Afghanistan [35, 36].

In the present study, the absence of an immediate cry after birth was associated with early neonatal death. This result may be associated with distal causes that lead to the inability of a neonate to cry, which is indicative of interruption of the entrance of air to the lung of a baby and then finally able to cause early neonatal death [37]. The finding is also similar to the study conducted in Cameroon [32].

In this study, younger maternal age is associated with early neonatal death. This is because most of the mothers in this age group are primiparous, and they may give birth to babies with low birth weight, small for gestational age, which

in turn increases early neonatal death. In addition, they may lack experience in handling and caring for their babies. Furthermore, they may lack awareness about the course of pregnancy, labor, adequate advice on birth preparedness and complication readiness during prenatal care [38]. This finding is similar to the study conducted in Afghanistan [36]. However, this study contradicts a study conducted in Nigeria [39]. The disagreement may be explained by the study setting and sample size variations.

In the present study, gestation during the birth of a newborn was associated with early neonatal death, whereas babies born with gestational age less than 37 weeks were significantly associated with early neonatal death. This may be attributed to the immature development of organs in preterm infants, which limits their ability to adapt to life outside the womb. Other contributing factors could include insufficient antenatal care, limited counseling on danger signs, and inadequate long-term training in neonatal nursing, particularly since this study involved births that occurred at home [40]. This result is similar to the study conducted at Hawasa University Specialized Hospital [30].

Conclusion and Recommendations

North Shoa, Oromia, has a high rate of early newborn death, which requires additional attention when compared with data in EDHS 2016. Significantly correlated characteristics included maternal age under 18 years, gestational age under 37 weeks, short inter-pregnancy interval, and newborn status right after delivery.

Acknowledgments

We are thankful to the study participants for giving their fruitful time to participate in this study and for their unlimited support throughout the data collection.

Ethics approval and consent to participate

Ethical approval and clearance were obtained from the Institutional Health Research Ethics Review Committee (IHRERC), College of Health and Medical Sciences of Haromaya University. Official letters were submitted to the North Shoa Oromia Health Bureau. Permission was also obtained from the concerned bodies. Written informed consent was obtained from their mothers/parents/legal guardians (legally authorized representatives).

Participation was voluntary, and respondents could withdraw at any stage without restriction. Confidentiality was ensured by omitting names from questionnaires, and all data were securely stored and used solely for the study. Ethical approval followed the principles of the Declaration of Helsinki.

Consent for publication

Not applicable

Availability of data and materials

All data included in this manuscript can be accessed from the corresponding author upon request through the email address.

Computing interests

The authors declare that they have no competing interests.

Funding

No, any funding was received from any organization.

Author contributions

(**AW**) conceptualized, designed the study, collected, analyzed, and interpreted the data, and drafting of the manuscript. (**TGA**), (**MBG**), (**MA**), and (**AA**) Designed the study, analyzed and interpreted the data and drafting of the manuscript, and advised the whole research paper.

All authors read and approved the final manuscript.

Authors' information

AW: BSc in Midwifery, MSc in maternity and Neonatology health. Email: are.wud16@gmail.com Lecturer at Dilla University, Department of Midwifery.

TGA: BSc in medical doctor, MSc in maternity and Neonatology health. Lecturer at Dilla University, Department of Midwifery. Email: tesgugsa217@gmail.com
AA: BSc in Midwifery, MSc in maternity and Neonatology health. Lecturer at Dilla University, Department of Midwifery. Email: absalat5@gmail.com
MA: Dilla University, Department of Midwifery, Dilla, Ethiopia. Email: mesfiaau@gmail.com
MBG: BSc in Midwifery, MSc in maternity health nursing. Lecturer at Selale University, Midwifery Department. Email: mogasbeya@gmail.com

References

1. Kananura RM, Tetui M, Mutebi A, Bua JN, Waiswa P, Kiwanuka SN, et al. The neonatal mortality and its determinants in rural communities of Eastern Uganda. Reproductive health. 2016; 13(1):1-9.

2. Oliver., Ezechi, David AN. Overview of Global Perinatal Mortality. Division of Clinical Sciences, Maternal, Reproductive and Child Health Research Programme, Nigerian Institute of Medical Research, Lagos.

3. UNICEF, WHO. Levels & Trends in Child Mortality. 2014.

4. Branco de Almeida MF, Guinsburg R, Eulógio Martinez F, Procianoy RS, Rodrigues Leone C, Martins Marba ST, et al. Perinatal factors associated with early deaths of preterm infants born in Brazilian Network on Neonatal Research centers. Revista de la Sociedad Boliviana de Pediatría. 2010; 49(1):48-57.

5. Migoto MT, Oliveira RPd, Silva AMR, Freire MHdS. Early neonatal mortality and risk factors: a case-control study in Paraná State. Revista Brasileira de Enfermagem. 2018; 71:2527-34.

6. Lawn JE, Cousens S, Zupan J, Team LNSS. 4 million neonatal deaths: when? Where? Why? The lancet. 2005; 365(9462):891-900.

7. Lehtonen L, Gimeno A, Parra-Llorca A, Vento M, editors. Early neonatal death: a challenge worldwide. Seminars in Fetal and Neonatal Medicine; 2017: Elsevier.

8. . UN Inter–agency Group for Child Mortality: Child Mortality Estimates September 2015. 2015.

9. Kananura RM, Tetui M, Mutebi A, Bua JN, Waiswa P, Kiwanuka SN, et al. The neonatal mortality and its determinants in rural communities of Eastern Uganda. Reproductive Health. 2016; 13(1):13.

10. WHO, UNICEF. Every Newborn: an action plan to end preventable deaths. Executive summary. 2014.

11. Mohangoo, Be´ atrice Blondel, Mika Gissler, Petr Velebil, Alison Macfarlane, Zeitli J. International Comparisons of Fetal and Neonatal Mortality Rates in High-Income Countries: Should Exclusion Thresholds Be Based on Birth Weight or Gestational Age? PLoS ONE 2013; 8(5).

12. Mohangoo, Be´ atrice Blondel, Mika Gissler, Petr Velebil, Alison Macfarlane, Zeitli J. International Comparisons of Fetal and Neonatal Mortality Rates in High-Income Countries: Should Exclusion Thresholds Be Based on Birth Weight or Gestational Age? PLoS ONE 2013; 8(5).

13. Oza JEL, Daniel R Hogan, Colin Mathers, Simon N Cousensa. Neonatal cause of death estimates for the early and late neonatal periods for 194 countries 2000–2013. Bull World Health Organ. 2015; 93(19–28).

14. Vogel, JP Souza, R Mori, N Morisaki, P Lumbiganon, M Laopaiboon, et al. Maternal complications and perinatal mortality: findings of the World Health Organization Multicountry Survey on Maternal and Newborn Health. Maternal and Newborn Health Research Network. 2013.

15. EDHS. Central Statistical Agency [Ethiopia] and ICF. 2016. Ethiopia Demographic and Health Survey 2016. Addis Ababa, Ethiopia, and Rockville, Maryland, USA: CSA and ICF. 2016.

16. Organization WH. Reaching the every newborn national 2020 milestones: country progress, plans and moving forward. 2017.

17. CSA. Population and Housing census of Ethiopia. 2012.

18. Oromia NS. Zonal Report on the number of mothers who gave birth in a year of 2017 217.

19. Ahmed Y. Perinatal Mortality and associated Factor in Jimma University Specialized Hospital, Gynecology & Obstetrics. 2016; 6(11 • 1000409).

20. Getiye, Fantahun. Factors associated with perinatal mortality among public health deliveries in Addis Ababa, Ethiopia, an unmatched case control study. BMC Pregnancy and Childbirth 2017; 17(245).

21. Mihiretu, Negash, Elazar. Perinatal Death and Associated Factors in Wolaita Sodo Referral Hospital, Southern Ethiopia: a Facility Based Cross-Sectional Study. Prim Health Care. 2017; 7(2).

22. Yirgu, Mitike Molla, Lynn Sibley, Gebremariam A. Perinatal Mortality Magnitude, Determinants and Causes in West Gojam: Population-Based Nested Case-Control Study. PLoS ONE. 2016; 11(7).

23. Tomita T, Ogiwara H. Primary (congenital) encephalocele. UpToDate. Waltham, MA (updated May 2013).

24. Mathews TJ, MF M. Infant mortality statistics from the 2005 period linked birth/infant death data set. 2008; uptodate. 2013; 57(1).

25. WHO. Partnership for Maternal, Newborn & Child Health, Save the Children. Born too soon: the global action report on preterm birth cross reference. 2012.

26. Allanson, Mari Muller, Pattinson RC. Causes of perinatal mortality and associated maternal complications in a South African province: challenges in predicting poor outcomes. BMC Pregnancy and Childbirth 2015; 15(37).

27. Ghorat, Reza Ghafarzadeh, Esfehan RJ. Perinatal Mortality and Its Associated Risk Factors: A Study in the North-East of Iran. Iranian Journal of Neonatology 2016; 7(1).

28. Dare S, Oduro AR, Owusu-Agyei S, Mackay DF, Gruer L, Manyeh AK, et al. Neonatal mortality rates, characteristics, and risk factors for neonatal deaths in Ghana: analyses of data from two health and demographic surveillance systems. Global health action. 2021; 14(1):1938871.

29. Ngoc NTN, Merialdi M, Abdel-Aleem H, Carroli G, Purwar M, Zavaleta N, et al. Causes of stillbirths and early neonatal deaths: data from 7993 pregnancies in six developing countries. Bulletin of the World Health Organization. 2006; 84:699-705.

30. Getachew, Yifru. Perinatal Mortality and Associated Risk Factors: A Case Control Study. Ethiop J Health Sci 2012; 22(3).

31. Worku B, Kassie A, Mekasha A, Tilahun B, Worku A. Predictors of early neonatal mortality at a neonatal intensive care unit of a specialized referral teaching hospital in Ethiopia. Ethiopian Journal of Health Development. 2012; 26(3):200-7.

32. Koum D, Essomba N, Odile N, Ngwe I, Ndanga M, Ndombo PK, et al. Factors associated with early neonatal morbidity and mortality in an urban district hospital. Int J Latest Res Sci Technol. 2015; 5(3):9-43.

33. López-Fernández G, Barrios M, Gobernado-Tricas J, Gómez-Benito J. Breastfeeding during pregnancy: A systematic review. Women and Birth. 2017; 30(6):e292-e300.

34. Marquis GS, Penny ME, Diaz JM, Marín RM. Postpartum consequences of an overlap of breastfeeding and pregnancy: reduced breast milk intake and growth during early infancy. Pediatrics. 2002; 109(4):e56-e.

35. Stephansson O, Dickman PW, Cnattingius S. The influence of interpregnancy interval on the subsequent risk of stillbirth and early neonatal death. Obstetrics & gynecology. 2003; 102(1):101-8.

36. Al Kibria GM, Burrowes V, Choudhury A, Sharmeen A, Ghosh S, Mahmud A, et al. Determinants of early neonatal mortality in Afghanistan: an analysis of the Demographic and Health Survey 2015. Globalization and health. 2018; 14(1):1-12.

37. Palme-Kilander C, Tunell R. Pulmonary gas exchange during facemask ventilation immediately after birth. Archives of disease in childhood. 1993; 68(1 Spec No):11-6.

38. Sharma, Joanne Katz, Luke C Mullany, Subarna K Khatry, Steven C LeClerq, R. S, et al. Young Maternal Age and the Risk of Neonatal Mortality in Rural Nepal NIH. 2009; 162 (9):828–35.

39. Dahiru T. Determinants of early neonatal mortality in Nigeria: results from 2013 Nigeria DHS. Journal of Pediatrics & Neonatal Care. 2015; 2(5).

40. Cunningham, Kenneth J. Leveno, J. Steven L. Bloom, John C. Hauth, Dwight J. Rouse, Catherine Y. Spong. william obstetrics 23^{rd} ed: McGraw-Hill; 2010. 1404 p.