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Epidemiology of Early Neonatal Mortality in an Eastern Ethiopian NICU: Insights From Hiwot Fana Specialized University Hospital

AbdulmalikAbdela Bushra, MPH[1,2], NegaAssefa Kassa, PhD[1], Desalegn Admassu Ayana, PhD[1], Adisu Birhanu Weldesenbet, MPH[1], Mohammedin KebirHussen KebirMuhammad, MPH[1,2], Biniam Petros Chunkele, MPH[3], Ibsa Abdusemed Ahmed, MPH[1], and Alo Edin Huka, MPH[4]

Abstract

Background. Early neonatal mortality remains a significant public health challenge in Ethiopia. Therefore, this study is designed to investigate the magnitude and underlying factors associated with early neonatal mortality among infants admitted to the Neonatal Intensive Care Unit at Hiwot Fana Specialized University Hospital in Eastern Ethiopia. *Methods*. an institutional-based cross-sectional study was conducted from November 20 to December 20, 2021, by reviewing the medical records of 432 neonates admitted from September 11, 2018, to September 10, 2021. Data were cleaned, entered into Epi Data 3.1, and analyzed using Stata 15. Bivariable and multivariable logistic regression analyses were employed with statistical significance set at a *P*-value $<.05$. *Results*. The study found that the magnitude of early neonatal mortality was 10.6% (95% CI: 8.06, 13.94). The primary contributors to early neonatal mortality was early onset neonatal sepsis (56%), preterm birth (52.2%), and perinatal asphyxia (32.6%). Notably, early onset neonatal sepsis (Adjusted Odds Ratio [AOR] = 2.31, 95% confidence interval [CI]: 1.06, 5.05), respiratory distress syndrome (AOR = 3.98, 95% CI: 1.97, 8.05), and low birth weight (AOR = 3.70, 95% CI: 1.67, 8.18) were independently associated with early neonatal mortality. *Conclusion*. The study focuses on the significance of early neonatal mortality in Ethiopia, with key factors such as early onset neonatal sepsis, respiratory distress syndrome, and low birth weight contributing to this issue. The advancements in preventive interventions and early management of high-risk neonates offer promise in reducing early neonatal deaths.

Keywords
early neonatal mortality, Harar, Ethiopia

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Introduction

Early neonatal mortality, defined as the loss of newborns within the first 7 days of life,[1] represents a critical challenge to global public health. This period, known as the early neonatal phase, is marked by heightened vulnerability as neonates transition from the intrauterine environment to the extrauterine world, rendering them susceptible to various complications.[2] Alarmingly, the World Health Organization reports that approximately 6700 neonatal deaths occur worldwide each day, with nearly one-third transpiring within the initial 24 hours and a staggering two-thirds within the first week of life.[3,4]

Despite the overall reduction in global neonatal mortality over the past decade, early neonatal death continues to

[1]Haramaya University, Harar, Ethiopia
[2]East Hararghe Zonal Health Department, Harar, Oromia Regional State, Ethiopia
[3]Adilo Zuria Woreda Health Office, Central Ethiopia Regional State, Ethiopia
[4]Bule Hora University, Bule Hora, Ethiopia

Corresponding Author:
AbdulmalikAbdela Bushra, School of Public Health, College of Health and Medical Sciences, Haramaya University, 235, 1_2 main st. Harar, Ethiopia.
Email: abdum1009@gmail.com

account for over 70% of all postnatal deaths,[5] with a pronounced impact on developing nations, extending well beyond health and encompassing economic, social, and public health consequences.[6] In 2018, the global neonatal mortality rate was 18 deaths per 1000 live births. However, in Sub-Saharan Africa, this figure soared to 28 deaths per 1000 live births.[7] Reducing early neonatal mortality remains a cornerstone of the global public health agenda, especially within the framework of the Sustainable Development Goals (SDGs). The global commitment is to reduce neonatal mortality to 12 per 1000 live births by 2030[8] which aligns with the broader objectives of the SDGs. While there has been a decline in neonatal mortality rates in Ethiopia, as reported by the 2019 Ethiopian Mini Demographic and Health Survey (DHS), from 39 to 29 deaths per 1000 live births between 2005 and 2016, progress has stagnated since the 2016 survey.[9] This persistently high neonatal mortality rate signals inadequacies in the delivery of quality healthcare, particularly during the early neonatal phase.[10]

Understanding the multifaceted drivers of early neonatal mortality in Africa, particularly Ethiopia, is of paramount significance. Numerous studies have identified a range of determinants that significantly influence early neonatal mortality, including maternal age, residential locale, duration of labor, utilization of antenatal care services,[11-13] parity, maternal and obstetric complications,[14] as well as various neonatal factors such as early-onset neonatal sepsis, low birth weight, respiratory distress syndrome, prematurity, birth order, malpresentation (including birth injuries), monochorionic pregnancies, birth asphyxia, and low Apgar scores score.[15]

Focusing on Ethiopia, in 2019, the Ethiopian Demographic and Health Survey (EMDHS) reported a neonatal mortality rate of approximately 30 deaths per 1000 live births.[9] This persistently high rate underscores the ongoing challenge Ethiopia faces in maintaining one of the highest neonatal mortality rates globally.

Most research efforts in this domain have been relatively limited, with a noticeable scarcity of comprehensive investigations focused on the first 7 days of life. Most studies tend to concentrate on the broader neonatal period of 28 days, particularly in Ethiopia, where mortality rates remain alarmingly high, and empirical evidence for effective interventions is lacking. Therefore, this study aims to shed light on the magnitude and determinants of early neonatal death among neonates admitted to the Hiwot Fana Specialized University Hospital (HFSUH) in Eastern Ethiopia, contributing to our understanding of this critical issue.

Materials and Methods

Study Design and Settings

This study employed an institutional-based cross-sectional design and was conducted in the neonatal intensive care unit (NICU) of Hiwot Fana Specialized University Hospital (HFSUH). Data were collected from November 20, 2021, to December 20, 2021. HFSUH is a prominent public teaching hospital in Harar, Eastern Ethiopia. It plays a vital role in providing healthcare services to approximately 5.8 million population in its catchment area.

Population

The study population included all early neonates admitted to the NICU for HFSUH between September 11, 2018, and September 10, 2021, who had complete medical records.

Eligibility Criteria

All early neonates who died or survived were reviewed among neonates admitted to the NICU of HFSUH within the specified timeframe and were considered eligible for inclusion in this study. Neonates with incomplete records were excluded from the study.

Sample Size and Sampling Procedure

Sample size calculation was performed using Epi info7 software Stat Cal. To estimate the magnitude of early neonatal death, a single population proportion was used, considering the magnitude of early neonatal death as 12.6%, based on a previous study conducted at the Ayder Comprehensive Specialized Hospital.[16] To identify factors associated with early neonatal death, a double population proportion was considered. The final sample size was calculated with a confidence level of 95%, a margin of error (d) of 5%, and an additional 10% for incomplete records. The final sample size was 440 participants. A simple random sampling technique was employed to select a predetermined sample size using the unique medical registration numbers obtained from the admission register as the sampling frame.

Data Collection Tools

Data were retrospectively extracted from medical records, the NICU registration logbook, and maternal records of newborns, using a structured data collection checklist. This checklist was adapted from the WHO document on the review and audit of neonatal deaths,[15,17-20] as well as the national registration book of admitted neonates, making it a validated data collection tool used in this study.

Data Quality Assurance

The data collection instrument consisted of 3 sections: sociodemographic, maternal, obstetric, and neonatal

factors. Data were collected by a team of 6 well-trained BSc nurses and supervised to ensure the quality of data extraction.

Study Variables

The dependent variable in this study was Early Neonatal Death, defined as the death of a Newborn within the first 7 days of life.[21] The independent variables included various sociodemographic, maternal, obstetric, and neonatal-related factors, as detailed in the following sections.

Independent variables. Socio-demographic factors:

- Residence: The location where the mother resides.
- Age of mother: The age of the mother at the time of childbirth.
- Sex of newborn: The gender of the Newborn.
- Age of newborn: The age of the Newborn at admission.

Maternal healthcare factors:

- ANC (Antenatal Careis a medical care and procedure carried out for pregnant women to ensure the health and well-being of both the mother and the developing foetus[22]): The utilization of antenatal care services during pregnancy.
- Number of antenatal care: The frequency of antenatal care contacts.
- Parity: The number of previous pregnancies resulting in viable offspring.
- Type of pregnancy: Refers to whether the pregnancy is a single or multiple gestation (eg, twins or triplets).
- Complications during the index pregnancy: Any complications or medical conditions experienced by the mother during pregnancy.
- Place of index birth: The location where the childbirth occurred.
- Duration of labor: The length of time for labor and delivery.
- Previous bad obstetrics history: Any adverse obstetric history in previous pregnancies.
- Kangaroo mother care (KMC): The provision of Kangaroo Mother Care to the Newborn.

Early neonatal factors:

- Early onset neonatal sepsis (EONS): A diagnosis of sepsis occurring within 72 hours of birth.
- Respiratory distress syndrome (RDS) is characterized by clinical criteria, including rapid breathing, cyanosis, grunting, chest indrawing, decreased air entry bilaterally to the lung fields, low oxygen saturation with pulse oximetry, chest X-ray examination with typical findings for RDS, and symptom onset shortly after birth.

Additionally, other neonatal-related factors include:

- Hypothermia; a body temperature of less than 36.5°C[23] (temperature recording at admission was captured for every neonate).
- Jaundice.
- Newborns cry immediately at birth.
- Gestational age.
- Newborn weight.
- APGAR score.
- Length of stay.

Operational Definitions

- Early neonatal death: death of a Newborn within the first 7 days of life.[21]
- Neonatal mortality: death of a Newborn within the first 28 days of life.[17]
- Prematurity/preterm birth: a delivery that occurs after 28 weeks but before 37 weeks of gestation.[24]
- Perinatal death: Fetal death commences at or after 28 completed weeks (154 days) of gestation (stillbirth) and ends 7 completed days after birth (early neonatal death).[25]
- In this study, **Perinatal asphyxia** was diagnosed when the newborn had at least one of the following signs: not breathing or gasping, <30 breaths per minute, or <7 APGAR score, had neonatal neurologic sequelae (seizures, coma, and hypotonia), or multiple organ involvement (kidney, lungs, liver, heart, and intestines).[26]
- In the present study, **Neonatal sepsis**: According to the Federal Ministry of Health of Ethiopia's Neonatal Intensive Care Unit (NICU) guideline Neonatal sepsis is a clinical illness characterized by infection-related signs and symptoms in the first month of life, with or without bacteremia. The neonate may present with any of the systemic manifestations of danger signs (not feeding well, convulsions, drowsy or unconscious, movement only when stimulated or no movement at all), fast breathing (60 breaths per min), grunting, severe chest in-drawing, raised temperature, >38°C, hypothermia, <35.5°C, central cyanosis, or could be severe jaundice, severe abdominal distension, or localizing signs of

Table 1. Sociodemographic Factors of Early Neonates and Mothers Admitted to HFSUH, Harar, Ethiopia, 2021 (n = 432).

Variables	Category	Frequency	Percentage
Age of mother (years)	<20	65	15
	20-34	332	77
	≥35	35	8
Residence	Harar	196	45.4
	Out of Harar	236	54.6
Sex of newborn	Yes	238	55.1
	No	194	44.9
Age of newborn	<24 hours	267	62
	1-7 days	165	38

infection (Signs of pneumonia, many or severe skin pustules, bulging fontanelle, painful joints, joint swelling, reduced movement . . .) were diagnosed as having neonatal sepsis. Early-onset neonatal sepsis is defined as sepsis that occurs within 72 hours of delivery and <7 days in term infants.[27]

Data Processing and Analysis

The collected data were meticulously checked, cleaned, and entered into Epi Data 3.1, which was conducted using the Stata 15. Descriptive statistics including simple frequency tables, graphs, and charts were used to compute summary statistics. The goodness of fit of the statistical model was assessed using the Hosmer-Lemeshow statistic test, which was found to be non-significant (Pearson chi = 5.75, *P*-value = .6755), indicating a good model fit. Multicollinearity was assessed using the Variance Inflation Factor (VIF), and no variables with VIF > 10 were observed, indicating no significant multicollinearity. Bivariable analysis was conducted to identify candidate factors for inclusion in multivariate analysis at a significance level of <.25. Multivariable logistic regression analysis was used to assess the relative effect of the independent variables on the dependent variable. Associations between variables were measured using odds ratios (ORs) at a 95% confidence interval (CI), and statistical significance was declared at a *P*-value of less than .05.

Ethical Considerations and Consent of Participants

Ethical clearance was obtained from the Institutional Health Research Ethics Review Committee with an approval number [IHRERC/197/2021]. After discussing the purpose and method of the study, informed, voluntary, written, and signed consent was obtained from hospital administrators before commencing data collection. Given the retrospective nature of the study, the need for individual informed written consent from patients was waived by the ethics committee. Anonymity was strictly maintained using unique identification numbers instead of patient names. All collected data were kept confidential and were not shared with anyone other than the authors for ethical reasons. Furthermore, the research procedure was carried out in compliance with the Helsinki Declaration of the World Medical Association.

Results

Socio-Demographic Factors

A total of 440 early neonatal records were initially reviewed with a data completion rate of 98% (432 records). Excluding 8 incomplete records, this analysis focused on the remaining 432 records. The median age of mothers of early neonates was 26 years (Interquartile Range [IQR], 8 years). The majority of mothers (77%) were within the age range of 20 to 34 years, while 15% were below the age of 20 years. Among the neonates, 55.1% were male. Approximately 62% of the neonates were admitted within 24 hours of delivery (Table 1).

Maternal Care Related Factors

Among the mothers, 78% received antenatal care, with 71% having fewer than four antenatal care contacts. The majority (88.2%) of mothers had singleton pregnancies. The median duration of labor was 12 hours (IQR: 10 hours), and the majority (63.2%) of early neonates were born between 4 and 8 hours after the start of labor. Approximately 23.6% of mothers experienced complications during their index pregnancy, with premature rupture of membranes (PROM) being the most common (8.6%), followed by preeclampsia (7.9%), and antepartum hemorrhage (APH) (4.9%) (Table 2).

Table 2. Maternal Care Factors of Early Neonates Admitted to HFSUH, Harar, Ethiopia, 2021 (n = 432).

Variables	Category	Frequency	Percentage
Antenatal care	Yes	338	78
	No	94	22
Number of antenatal care (n = 338)	1-3	241	71
	≥4	97	29
Type of pregnancy	Singleton	381	88.2
	Multiple	51	11.8
Place of index birth	Home	16	3.7
	Health center	104	24.1
	Hospital	312	72.2
Duration of labor (hours)	<4	75	17.4
	4-8	273	63.2
	>12	84	19.4
Gestational age	Term	261	60
	Preterm	171	40
Parity	Primipara	143	33
	Multipara	210	49
	Grand multipara	79	18
Complications during the index pregnancy	Yes	102	23.6
	No	330	76.4
Complications during index pregnancy (n = 102)	PROM	37	8.6
	Preeclampsia	34	7.9
	Antepartum hemorrhage	21	4.8
	Chorioamnionitis	10	2.3
Previous bad obstetrics history	Yes	67	15.5
	No	365	84.5
Kangaroo mother care	Yes	14	3.2
	No	418	96.8

Early Neonatal Factors

The mean weight of the neonates was 2579.31 g (Standard Deviation [SD]: ±756.48 g). More than half (55%) of the neonates weighed ≥2500 g. The majority (67.10%) of the neonates had Apgar scores ≥7 at 5 minutes. Approximately 57% of the neonates were diagnosed with hypothermia. Around 62.5% of neonates cried immediately at birth, and the widely held (61.8%) were diagnosed with sepsis. Furthermore, 78% of neonates stayed in the NICU of the hospital for equal to or greater than 1 day (see Table 3).

The Magnitude of Early Neonatal Mortality

The overall magnitude of early neonatal mortality was 46, accounting for 10.6% (95% CI: 8.06, 13.94) of the study population. Among these cases, 45.65% of early neonates died within 24 hours of birth, whereas 54.35% died after 24 hours of birth.

Of those neonates who died early, 56% had early neonatal sepsis, 52.2% were preterm and 32.6% had perinatal asphyxia. Regarding admission problems, early onset neonatal sepsis (61.8%) was the leading cause of NICU admission, followed by hypothermia (57%), with prematurity (39.6%) as the third leading cause (Table 3).

Factors Associated With Early Neonatal Mortality

In the bivariate logistic regression analysis, several factors showed significance ($P < .25$), including maternal age, type of pregnancy, multiple pregnancies, complications during the index pregnancy, duration of labor, early onset neonatal sepsis, respiratory distress syndrome, and low birth weight. In the multivariable logistic regression analysis, early onset neonatal sepsis, respiratory distress syndrome, and Newborn weight were significantly associated with early neonatal death ($P < .05$).

Multivariable analysis indicated that newborns with early onset neonatal sepsis were 2.31 times more likely to die than their counterparts were [(AOR = 2.31, 95% CI:1.06, 5.05)]. The odds of death were 4 times higher among early neonates diagnosed with respiratory distress syndrome compared to those without the condition

Table 3. Factors among Early Neonates Admitted to the NICU of HFSUH, 2021.

Variables	Category	Frequency	Percentage
Newborn weight (g)	<1000	16	3.7
	1000-1499	40	9.2
	1500-2499	139	32.1
	≥2500	237	55
Apgar score on 5 minutes	<7	142	32.90
	≥7	290	67.10
Hypothermia	Yes	246	57
	No	186	43
Prematurity	Yes	171	39.6
	No	261	60.4
Respiratory distress syndrome	Yes	91	21.1
	No	341	78.9
Jaundice at admission	Yes	37	8.6
	No	395	91.4
Newborns cry immediately at birth	Yes	270	62.5
	No	162	37.5
Perinatal asphyxia	Yes	130	30.1
	No	302	69.9
Early onset of neonatal sepsis	Yes	267	61.8
	No	165	38.2
Length of stay at the hospital (hours)	<24	94	22
	≥24	338	78

[AOR = 3.98, 95% CI (1.97, 8.05)], and newborns weighing <2500 g were 3.70 times more likely to die than newborns weighing ≥2500 g [AOR = 3.70, 95% CI (1.67, 8.18)] (Table 4).

Discussion

In this study, our primary aim was to assess both the magnitude and the key factors associated with early neonatal mortality. The study revealed an overall rate of early neonatal death of 10.6% (95% CI: 8.06, 13.94). Notably, we identified early-onset neonatal sepsis, respiratory distress syndrome, and Newborn weight as significant factors associated with early neonatal death.

Despite concerted efforts to improve neonatal health, early neonatal death persists as a pressing public health challenge in developing nations including Ethiopia. A significant proportion of early neonatal deaths are attributed to preventable and treatable causes. The primary contributing factors include poor maternal health, insufficient prenatal care, inadequate management of pregnancy and delivery complications, suboptimal hygiene practices during delivery and the immediate postnatal period, and a lack of essential newborn care.

In comparing our findings with existing research, we found that the overall magnitude of early neonatal death in our study (10.6%) was consistent with some prior studies, such as those conducted in Nekemte (8%),[28] Mekelle (12.65%),[16] and Uganda (11.7%).[29] However, variations emerged when we compared our results with those of studies conducted in other Ethiopian regions. For instance, our findings were lower than those reported in Wolaita Sodo (13%)[30] and Debre Markos (17.7%).[31] Conversely, our results were higher than those of studies in the Somali Region (7%),[32] Jimma (3%),[20] and Sidama (5%).[33] Several factors could explain this discrepancy. First, sociodemographic and socioeconomic variations across Ethiopian regions influence healthcare service utilization, including the utilization of healthcare facilities for delivery and neonatal care. Geographical factors also play a role in these variations.[18,34] Additionally, our study focused exclusively on neonates admitted to the neonatal intensive care unit (NICU), which primarily admits critically ill infants. This selective approach could have contributed to the differences in reported mortality rates. Furthermore, discrepancies may stem from variations in study settings, sample sizes, and study durations.[35]

In this study, we identified early onset neonatal sepsis (56%), preterm birth (52.2%), and perinatal asphyxia (32.6%) as major contributors to early neonatal death in the study area. These findings are consistent with research conducted in Ethiopia, which has consistently identified these factors as leading causes of neonatal

Table 4. Factors Associated with Early Neonatal Death at HFSUH, 2021.

Variables	Early neonatal death		COR (95% CI)	AOR (95% CI)	*P*-value
	Yes (%)	No (%)			
Maternal age					
<20	3 (0.7)	62 (14.3)	0.38 (0.11, 1.29)	0.37 (0.10, 1.33)	.129
20-34	37 (8.6)	295 (68.3)	1	1	
≥35	6 (1.4)	29 (6.7)	1.64 (0.64, 4.23)	1.64 (0.55, 4.86)	.367
Type of pregnancy					
Singleton	36 (8.3)	345 (79)	1	1	
Multiple pregnancies	10 (2.3)	41 (9.5)	2.33 (1.08, 5.05)	1.13 (0.46, 2.78)	.781
Complications during the index pregnancy					
Yes	14 (3.2)	88 (20)	1.48 (0.75, 2.89)	0.78 (0.36, 1.69)	.537
No	32 (7.4)	298 (69)	1	1	
Duration of labor (hours)					
<4	5 (1.3)	70 (16.2)	0.50 (0.18, 1.33)	0.41 (0.14, 1.18)	.100
4-12	34 (7.8)	239 (55.3)	1	1	
≥12	7 (1.6)	77 (17.8)	0.63 (0.27, 1.49)	0.59 (0.21, 1.53)	.271
Early onset neonatal sepsis					
Yes	34 (7.9)	233 (54)	1.86 (0.93, 3.71)*	2.31 (1.06, 5.05)*	.035
No	12 (2.9)	153 (35.4)	1	1	
Respiratory distress syndrome					
Yes	24 (5.5)	67 (15.5)	5.19 (2.75, 9.80)	3.98 (1.97, 8.05)	.000
No	22 (5)	319 (73.8)	1	1	
New-borns cry immediately at birth					
Yes	20 (4.6)	250 (57)	1	1	
No	26 (6)	136 (31.5)	2.38 (1.28, 4.43)**	1.82 (0.91, 3.63)	.089
New-born weight (g)					
<2500	35 (8.1)	160 (37)	4.44 (2.21, 9.11)	3.70 (1.67, 8.18)**	.001
≥2500	11 (2.5)	226 (52.3)	1	1	

Abbreviations: CI, confidence interval; COR, crude odds ratio; AOR, adjusted odds ratio.
*Significant with $P < .05$.
**Significant with $P < .001$.

mortality.[15,18,36,37] These situations are enthusiastically escapable. The current study indicated that a high early neonatal mortality, exclusively within the first 24 hours of birth, signifies that neonatal survival interventions have to target the intrapartum along with the immediate and early neonatal periods.

Our study also revealed that neonates with early onset neonatal sepsis were 2.31 times more likely to die than their counterparts. This finding aligns with similar studies conducted in Ethiopia (Gondar, Mekelle, and Northwest Ethiopia) and Ghana.[38-41] The increased risk of mortality associated with neonatal sepsis can be attributed to its potential complications, including abscess formation, venous thrombosis, neurologic damage, and multiorgan dysfunction.[42] The other indicates that the high occurrence of neonatal infections in developing countries, compared to developed countries, can be attributed to factors such as low socioeconomic status and the presence of additional risk factors such as prematurity, low birth weight, prolonged labor, and membrane rupture.[43] Effective postnatal care and appropriate healthcare services in the neonatal intensive care unit (NICU) can mitigate neonatal sepsis-related deaths.[44] Evidence shows that neonates receiving proper care in the NICU have a reduced risk of death due to sepsis.[45] Therefore, strengthening the essential care in the NICU and implementing infection prevention measures are crucial steps in reducing early neonatal mortality.

Our findings also demonstrated that early neonates diagnosed with respiratory distress syndrome had a four-fold higher risk of death. This result is consistent with that of studies conducted in Harar and Gondar.[46,47] This elevated risk highlights the importance of promptly recognizing the symptoms and addressing the underlying causes of respiratory distress in newborns. Failure to do so can lead to both short- and long-term complications,

including chronic lung disease, respiratory failure, and ultimately, death.[48]

Furthermore, newborns with a birth weight of less than 2500 g were 3.70 times more likely to die than those with a birth weight of ≥2500 g. This finding aligns with a body of evidence indicating an independent association between low birth weight and early neonatal death.[26,49] Similar results were observed in a cross-sectional study conducted in Senegal and Mali, which highlighted the significant association between low birth weight and perinatal death.[50] This indicates that the increased risk can be attributed to the susceptibility of low-birth-weight newborns to infections and complications such as respiratory distress syndrome, intracranial hemorrhage, and necrotizing enterocolitis. These vulnerabilities result from the immaturity of their immune systems and other defense mechanisms, rendering them more susceptible to neonatal diseases.[51] Our findings emphasize the necessity for essential care aimed at low birth weight infants, including proper feeding, temperature monitoring, hygienic cord care, and early recognition and treatment of infections and complications, which can significantly reduce neonatal mortality.[5]

The strengths of our study include the use of a standardized and pre-tested checklist adapted from the WHO and the national neonatal registration book, which allowed comparisons of early neonatal mortality and associated factors on both national and international scales. However, it is crucial to acknowledge the limitations inherent in the cross-sectional nature of our study as cause-and-effect relationships cannot be established. Future research should explore causal relationships and investigate the quality of care and targeted preventive measures.

Conclusions

The present study revealed a pronounced magnitude of early neonatal mortality, which necessitates focused attention. This study identified significant associations between early neonatal death and early onset neonatal sepsis, respiratory distress syndrome (RDS), and newborn weight. Notably, a substantial proportion of early neonatal deaths stem from conditions that are amenable to prevention and treatment. Therefore, strengthening the essential care in the NICU and implementing infection prevention measures are crucial steps in reducing early neonatal mortality.

Consequently, enhancement of maternity care, especially during the perinatal period, fortification of preventive measures, and augmentation of the overall quality of maternity care, spanning from preconception to postpartum, constitute pivotal strategies for averting neonatal mortality within the study locale.

Moreover, the Neonatal Intensive Care Unit (NICU) should prioritize early diagnosis, proper management, and palliative continuous care. Furthermore, hospital administration should invest in enhancing service delivery within the maternity unit and NICU. It is advisable to undertake a comprehensive examination of care quality and institute targeted preventive interventions in future research.

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Author Contributions

Conceptualization: AbdulmalikAbdela Bushra, NegaAssefa Kassa, Desalegn Admassu Ayana. **Data curation:** Adisu Birhanu Weldesenbet, Alo Edin Huka, Ibsa Abdusemed Ahmed, Mohammedin KebirHussen KebirMuhammad, Biniam Petros Chunkele. **Formal analysis:** AbdulmalikAbdela Bushra, Adisu Birhanu Weldesenbet, Ibsa Abdusemed Ahmed, Mohammedin KebirHussen KebirMuhammad, Biniam Petros Chunkele, Alo Edin Huka. **Methodology:** AbdulmalikAbdela Bushra, NegaAssefa Kassa, Desalegn Admassu Ayana, Ibsa Abdusemed Ahmed, Mohammedin KebirHussen KebirMuhammad, Biniam Petros Chunkele, Alo Edin Huka. **Project Administration**: AbdulmalikAbdela Bushra, NegaAssefa Kassa, Desalegn Admassu Ayana. **Resources:** AbdulmalikAbdela Bushra, Alo Edin Huka, Ibsa Abdusemed Ahmed. **Supervision:** AbdulmalikAbdela Bushra, NegaAssefa Kassa, Desalegn Admassu Ayana. **Validation**: AbdulmalikAbdela Bushra, NegaAssefa Kassa, Desalegn Admassu Ayana. **Writing – original draft:** AbdulmalikAbdela Bushra, NegaAssefa Kassa, Desalegn Admassu Ayana. **Writing – review & editing:** AbdulmalikAbdela Bushra, NegaAssefa Kassa, Desalegn Admassu, Mohammedin KebirHussen KebirMuhammad, Biniam Petros Chunkele, Adisu Birhanu Weldesenbet, Ibsa Abdusemed Ahmed, Alo Edin Huka. **All authors reviewed and approved the final manuscript.**

Data Availability

The data used to support the findings of this study are available in this article and its supplementary information files.

Declaration of Conflicting Interests

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Ethical Considerations and Consent of Participants

Ethical clearance was obtained from the Institutional Health Research Ethics Review Committee of the College of Health and Medical Sciences, Haramaya University, Ethiopia, with an approval number [IHRERC/197/2021]. After discussing the purpose and method of the study, informed, voluntary, written, and signed consent was obtained from hospital administrators before commencing data collection. Given the retrospective nature of the study, the need for individual informed written consent from patients was waived by the ethics committee. Anonymity was strictly maintained using unique identification numbers instead of patient names. All collected data were kept confidential and were not shared with anyone other than the authors for ethical reasons. Furthermore, the research procedure was carried out in compliance with the Helsinki Declaration of the World Medical Association.

ORCID iDs

AbdulmalikAbdela Bushra https://orcid.org/0000-0002-0590-8689
NegaAssefa Kassa https://orcid.org/0000-0003-0341-2329

Supplemental Material

Supplemental material for this article is available online.

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