

# Proportion and factors of death among preterm neonates admitted in Aksum University compressive specialized hospital neonatal intensive care unit of northern Ethiopia 2019.

Teferi Gebru Gebremeskel<sup>1\*</sup>, Sintayehu Mamo<sup>2</sup>, Elsa Tesfa Berhe<sup>1</sup>

<sup>1</sup>Department of Reproductive Health, Aksum University, Aksum, Ethiopia

<sup>2</sup>Department of Medicine Health Sciences, Aksum University, Aksum, Ethiopia

## Abstract

**Objective:** The present study assessed the proportion and factors of death among preterm neonates admitted in Aksum university compressive specialized hospital neonatal intensive care unit northern Ethiopia.

**Methods:** An institution-based cognitive research study was conducted at Aksum Referral and general specialty hospital, Northern Ethiopia. All pre-natal isolates that were allowed to enter into a high-growth union during childbirth. The data collected will be cleared and entered into the Epi-info version 7 and exported to STATA version 12 for further analyses. Bivariable and multivariable analysis performed to determine the relationship between baseline and explanatory variables. Variables with a p-value of less than 0.05 will be the cut-off point.

**Results:** Overall mortality rate was 22.2%, with 95% CI (17.9-26.9), of which 18 (23.4%) died within weight (AOR:4.69 (2.29-9.63), kangaroo mother care (AOR:2.71 (1.20-6.11), Hypoglycemia (AOR:2.47 (1.30- 4.72), Breastfeeding initiated (AOR:6.35(4.62-11.98), APGAR score(AOR:8.63 (3.52-21.17), Age (AOR:4.19 (2.86-12.46) were predictor for the occurrence of preterm neonate death.

**Conclusion:** The proportion of preterm birth mortality was high. Provide quality care in maternity KMC, access the intensive care unit at maternity and professional health care institutions and take precautionary measures to prevent home delivery.

**Keywords:** Proportion, Death, Preterm birth, Neonate, Aksum.

**Abbreviation:** AOR: Adjusted Odd Ratio; APGAR: Appearance Pulse Grimance Activity Respiration; CI: Confidence Interval; COR: Crude Odd Ratio; EDHS: Ethiopian Demographic and Health Survey; NMR: Neonatal Morality Rate; GA: Gestational Age; KMC: Kangaroo Mother Care; NICU: Neonatal Intensive Care Unit; WHO: World Health Organisation.

Accepted on 03 July, 2021

## Introduction

Globally, 35% of all prenatal problems are a major cause of national prenatal problems associated with the cost of living worldwide. In developing regions, the likelihood of dying in childbirth is six times higher than in developed countries, eight times higher than in developed countries. Premature birth can have serious health consequences for the child, and many of the surviving children, often at the expense of family and community, are respiratory problems, mental illness, and mental disorders neurological problems. Globally in 2016, 2.6 million new-borns were killed. Of these, 99% of maternal deaths occur in low-income and middle-income countries. 39% were reported in South Asia, 39% in South Africa. Ethiopia is one of the five countries that have died in infants, children, Pakistan, Nigeria, and the Democratic Republic of the Congo. May according to the 2016 Ethiopian demographic health survey, the death to all from childbirth is 29 out of 1000 births. Studies reported that preterm neonatal mortality in Ethiopia there is regional variation 28.28% University of Gondar, Tigray region Northern Ethiopia 34%, and Jimma University Specialized Hospital, Ethiopia 34.9%, 47% rural Ethiopia, 63% Northern Ethiopia. According to different kinds of literature, factors that are associated with preterm neonatal mortality include; maternal age, residence, place of delivery, birth

weight, gestational age at birth, APGAR score, breastfeeding upon birth, Kangaroo Mother Care (KMC), antenatal care, pregnancy complications, labor and delivery complications and so on proper management and the use of timely guidelines improve effectively after childbirth [1]. The sustainable development goal of child deaths by 2030, it is possible to protect newborns, and children under 5 years of age, all of which are intended to reduce newborns mortality less than 12 death per 1000 live birth and death of under-five less than 25 death per 1000 live birth. Therefore, this study aims to assess the proportion and factors of death among preterm neonates admitted to Aksum University specialized hospital NICU.

## Materials and Methods

### Study design and setting

An Institution-based cognitive research study was conducted at Aksum Referral and general specialty hospital, Northern Ethiopia from June 2008 to May 2011 E.C. Aksum general specialty hospital offers higher education to more than seven million people in Ethiopia. The northwest country lies 1,024 km from Adiss Abeba capital city Ethiopia and 246 km from Mekele capital city of Tigray Region [2]. Neonatology is part

of the department of pediatrics and provides and provides services for the treatment of pediatrics patients.

### Participants

The study population includes all who were in the advanced stages of birth from June 2008 to May 2011 E.C at the University of Aksum comprehensive specialized hospital. Those preterm neonates whose chart is not readily available in the chart room are excluded from the study.

### Sample size and sampling procedure

The sample size was determined by comparing into the classification because the estimated risk of premature mortality was 28.8% using a study by Gondar university using an accurate approach for population, Z-value of 1.96 at 95% confidence level and margin of error of 5% will be considered, but during the study, we made it easier to record 346 standardized checklists and used previously checked checklists.

### Operational definition

Death: Death from any cause of a preterm neonate.

Preterm: neonates who delivered less than 37 completed weeks of gestation.

### Data collection tools and quality assurance

All necessary adult client information to collect from hospital records is recorded from a table with qualified Midwives. To ascertain face validity and translation quality the form was tested on one- seven charts outside the study space by the data-collectors and supervisors throughout coaching [3-5]. Some queries, language clarity and data were revised and also the form was finalized for the study.

Data quality will be insured by closing data closures and reviewing available data and checking for inconsistencies, code errors, and range completion, accuracy, clarity, missing value and appropriate corrections.

### Data processing and analysis

The data collected will be cleared and entered into the Epi-info version 7 and exported to STATA version 12 for further analyses. Descriptive and summary statistics will be carried out and presented using texts, graphs, and tables. In variable and multivariable analysis performed to determine the relationship between baseline and explanatory variables. Once checking victimization chi-square takes a look at variables with tiny cell sizes that were unified into connected classes. Applicable model medical specialty and goodness of match tests were done. Multiple correlations were checked to take a look at to check correlation among predictor variables and test P-value ( $\geq 0.2$ ) were conducted to envision model fitness. Variables with a p-value of less than 0.05 in the invariable analysis will be the cut-off point for selection in the final analysis and the 95% CI is presented and interpreted.

### Ethics

Ethical clearance was obtained from the Institutional Review Committee (IRC), College of Medicine and Health Sciences, University of Aksum [6]. A permission letter was received from those administrative bodies of Aksum comprehensive specialized hospital, and then preceded with data collection.

### Results

#### Socio-demographic and obstetric characteristics of mothers

There were 346 participants in this study and a 100% response rate. 346 pre-existing neurological data were included in the analysis. 58.67% of the mothers in the city. Two-thirds (63%) of the mothers were between the age of 29 and 34 years. More than 90% of neonates delivered from the health facility. More than 252(72%) mothers have more than 4 times the regular scars maternity care (Table 1).

**Table 1.** Sociodemographic and obstetric characteristics of mothers of preterm neonates admitted in NICU at Aksum university comprehensive specialized Hospital from June 2008 to May 2011 E.C (n=346).

Serial no	Characteristics	Frequency	Percentage (%)	
1	Maternal age	≤ 20 year	72	20.8
		20-34 year	218	63
		≥ 35	56	16.2
2	Residence	Urban	203	58.67
		Rural	143	41.33
3	Place of delivery	Home	34	9.83
		Health center	150	43.35
		Hospital	162	46.82
4	Type of pregnancy	Singleton	329	95.09
		Multiple	17	4.91
5	Frequency of ANC visit	≤ 4 times	94	27.17
		≥ 4 times	252	72.83
6	Parity (number of births)	I	52	15.03
		II-IV	272	78.61
		≥ V	22	6.36
7	Previous bad obstetrics history	Yes	34	9.83
		No	312	90.17
8	Onset of labor	Spontaneous	325	93.93
		Induced	21	6.07
9	Mode delivery of	SVD	332	95.95
		CS	7	2.02

INSTRUMENTAL		7	2.02	
10	Cause of labor	Spontaneous	325	93.94
		Induced	21	6.06
11	History of PROM	Yes	54	15.61
		No	292	84.39
		Yes	21	6.07
12	History of PIH	No	325	93.93

### Characteristics of the preterm neonates

Of the 346 preterm infants, 180(52%) were female and 6(1.73%) were less than 1 kg. Approximately 21(6.06%) were employed and 110(31.8%) seniors were cared for by the kangaroo mother. Of the 276(79.8%) who started breastfeeding immediately [7]. 56(16.18%) had an APGAR score of less than or equal to 6 (Table 2).

**Table 2.** Characteristics of preterm neonates admitted in NICU at Aksum University comprehensive specialized Hospital from June 2008 to May 2011 E.C (n=346).

Serial no	Characteristics	Frequency	Percentage(%)	Remark
1	Sex of the neonate	Male	166	47.98
		Female	180	52.02
2	Weight for gestational age at birth	1.5-2.5	270	78.03
		1-1.5	70	20.23
		≤ 1	6	1.73
3	Gestational age (weeks)	≤ 32	42	12.14
		32-35	116	33.53
		35-37	188	54.34
4	Was the newborn develop low oxygen saturation	Yes	74	21.39
		No	272	78.61
5	First minute APGAR score	≤ 6	56	16.18
		≥ 7	290	83.22
6	Fifth minute APGAR score	≤ 6	7	2.02
		≥ 7	339	97.98
7	Was the baby start breastfeed	Yes	276	79.77
		No	70	20.23
8	Treatment for hypoglycemia	Yes	28	8.09
		No	318	91.91
9	Maternal fever during labor	≤ 36.5	104	30.06
		36.5-37.5	235	67.92
		≥ 37.5	7	2.02
10	Newborn received kangaroo mother care	Yes	110	31.79
		No	236	68.21

### The proportion of preterm neonatal death

In my study, the overall mortality rate was 22.2%, with 95% confidence interval (17.9-26.9), of which 18(23.4%) died within the first 48 hours and 59(76.6%) died the first 7 days of life (newborn death) [8]. The median survival time was 20 days. The causes of death are numerous, but the majority causes are complications prematurity 54%, PNA 22.1%, sepsis 14.3% and other 9.1%.

### Associated factors of proportions of death for preterm neonates

In binary logistic regression preterm neonates who were delivered from mothers above 35 years, neonates who were delivered at home, neonates who were delivered from mothers had a history of PROM and PIH, neonates delivered from mothers having less than 4 ANC follow up, neonates whose birth weight was between 1 to 1.5 kg neonates who were not received KMC, neonates who were treated for hypoglycemia, neonates who were not initiated breastfeed following delivery, neonates who were delivered from mothers who undergo induction and neonates whose APGAR score less than or equal to six were significantly associated with the death of preterm neonates. However, in the multi-variable analysis neonates whose birth weight was between 1 to 1.5 kg, neonates who were not received KMC, neonates who were treated for hypoglycemia, neonates whose APGAR score was less than or equal to six, preterm neonates who have not started breastfeeding, neonates who were delivered at home and neonates who were delivered from mothers above 35 years have remained statistically significant factors [9].

The odds of death among preterm neonates whose birth weight was between 1 to 1.5 kg was Five times [AOR=4.69; 95% CI(2.29-9.63)] more likely as compared to neonates whose birth weight was between 1.5-2.5 kg.

The risk of death among neonates who were delivered from mothers above the of 35 years 4 times [AOR=4.19, 95% CI(2.86, 12.46)] more vulnerable than neonates who were delivered from mothers in the age group of between 20-34 years.

The odds of death for preterm neonates who had ≤ 7 APGAR score at birth was nine times [AOR=8.63; 95% CI(3.52-21.17)] risk than those who had ≥ 7 APGAR score at birth.

Providing KMC for all preterm neonates reduces the odds of death by 96.5% as compared to neonates who do not provide KMC [AOR=2.71; 95% CI(1.20-6.11)].

The odds of death for preterm neonates who were delivered at home were five times [AOR=5.13, 95% CI(3.46-10.04)] risk than neonates who were delivered at the hospital. The causes of death majority are complications prematurity 54%, PNA 22.1%, sepsis 14.3% and other 9.1%.

The risk of death for preterm neonates who was not started breastfeeding was six times [AOR=6.35, 95% CI(4.62-11.98)] risk than their counterparts.

The odds of death for preterm neonates who were treated for hypoglycemia was 2 times [AOR=2.47; 95% CI(1.30-4.715)] more vulnerable than those who were not treated (Table 3).

**Table 3.** Bivariate and multivariate analysis of neonatal and obstetric factors predicting preterm birth outcomes.

Variables		Status		COR (CI)	AOR(CI)
		Survived	Died		
Age	≤ 20	55(76.4%)	17(23.6%)	2.56(1.35-4.86)	1.31(0.43-3.94)
	20-34	197(90.4%)	21(9.6%)	1	1
	≥ 35	17(30.4%)	39(69.6%)	11.04(6.47-18.85)	4.19(2.86-12.46)*
Place of delivery	home	7(16.3%)	36(83.7%)	7.05(4.17-11.92)*	5.13(3.46-10.04)*
	HC	128(90.8%)	13(9.2%)	0.7(0.41-1.29)	0.84(0.75-1.64)
	Hospital	134(82.7%)	28(17.3%)	1	1
PROM	Yes	19(35.2%)	35(64.8%)	6.496(4.13-10.21)	1.17(0.67-2.01)
	No	250(85.6%)	42(14.4%)	1	1
PIH	Yes	10(47.6%)	11(52.4%)	4.25(2.112-7.60)	1.38(0.77, 2.47)
	No	259(79.7%)	66(20.3%)	1	1
Frequency of ANC	≤ 4	59(62.8%)	35(37.2%)	2.40(1.53-3.76)	1.13(0.65-1.99)
	≥ 4	210(83.3%)	42(16.7%)	1	1
Birth weight	1.5-2.5	240(88.6%)	31(11.4%)	1	1
	1-1.5	29(38.7%)	46(61.3%)	7.1(4.48-11.19)	4.69(2.29-9.63)**
	Yes	75(68.2%)	35(31.8%)	1	1
KMC	No	194(82.2%)	42(17.8%)	3.52(1.33-7.81)	2.71(1.20-6.11)*
Hypoglycemia	Yes	7(25%)	21(75%)	5.58(3.37-9.25)	2.47(1.30-4.72)*
	No	262(82.4%)	56(17.6%)	1	1
Breastfeeding initiated	Yes	248(89.9%)	28(10.1%)	1	1
	No	21(30%)	49(70%)	9.22(5.78-14.71)	6.35(4.62-11.98)*
Cause of labor	Spontaneous	262(80.6%)	63(19.4%)	1	1

	Induced	7(33.3%)	14(66.7%)	4.69(2.62-8.41)	3.08(0.83-11.52)
1stminute APGAR score	≤ 7	28(50%)	28(50%)	3.26(2.05-5.21)	8.63(3.52-21.17)**
	≥ 7	241(83.1%)	49(16.9%)	1	1
5thminute APGAR score	≤ 7	0(0%)	7(100%)	4.8(2.2-10.48)	1.28(0.55-3.06)
	≥ 7	269(79.4%)	70(20.6%)	1	1

**Abbreviation:** \*P-value ≤ 0.05, \*\* P-value ≤ 0.001, COR-Crude Odds Ratio, AOR-Adjusted Odds Ratio.

## Discussion

On-going problems in developing country the recurrent problem are the lack of general information and general reports on the burden of preterm infants. In contrast to developed communities where reliable statistics are available and provide specific information, it directs every decision regarding early childhood care [10]. The mortality rate among preterm infants was 22.2% at maternity university General specialty hospital. The cause of death is not a single problem leading to death, with the major causes being the first 54.55%, PH 22.1%, and sepsis 14.3%. In several birth analyses, Trinidad and Tobago were 12.4%, Cameroon 15.7% in different parts of Ethiopia.

The birth rate and preterm infant were significantly higher (22.25%). This may be due to the number of studies that have been exposed only to the study stations and to the most vulnerable conditions. In contrast, the finding was below the level of research conducted in a different part of the world

To save the life and growth of children worldwide reported that preterm neonatal mortality was 36.15 and 29.3 percent respectively, Jimma University special Hospital, Ethiopia 34.9%, Gondar University Hospital, Ethiopia 28.28%. This may be due to the decrease in maternal mortality, increased health care services, pre-referral, community health search and use behavior, and access to trained healthcare providers.

Neonates whose birth weight was between 1-1.5 kg, neonates who were not received KMC, neonates who were treated for hypoglycemia and neonates whose APGAR score was less than or equal to six have remained statistically significant factors.

The odd of death among preterm neonates whose birth weight was between 1-1.5 kg was five times more likely as compared to neonates whose birth weight was between 1.5-2.5 kg. This result compares with studies conducted in Nigeria.

Hypoglycemia is significantly associated with premature mortality in premature infants [AOR=2.47;95% CI2.76 (1.30-4.71)]. This result is consistent with studies conducted at the university in Gondar. This is due to the possibility of adipose fat tissue, which serves as a source of glucose until they can feed on additional embryos [11].

The odds of death were increased by nine times for a neonate with the first minute APGAR score ≤ 7 at birth as compared to the counterpart with. The results were obtained from the

Nigeria, Tikur Anbesa specialized hospital, Ethiopia, University of Gondar hospital. Ethiopia.

This finding showed that the difference in mortality among older siblings decreased by 96.5% in kangaroo mother care [AOR=2.71; 95% CI2.41 (1.20-6.11)]. This is similar to study conduct at the University of Gondar. This may be KMC that prevents hypothermia by reducing the body surface area to the outside surface and helps easily accessing breast milk.

According to several studies in different areas, the risk of death among maternal-born 35 and above year peers is 4 times higher than that of 20 to 34 years. The world has reported that maternal mortality over 35 years is a prerequisite for premature deaths. The mortality rate of premature infants born at home is five times as high as those at the same hospital supported by studies conducted in Johannesburg, South Africa and Jimma, Ethiopia [12]. The rate of death for premature infants who do not start breastfeeding is six times higher than their units. Therefore, the early onset of childbirth has been reported to be a preventive measure for premature death.

### Limitation of this Study

This study was a secondary source of information may not have some important variables that affect the output variables. It was a series-section study and may not reveal the cause and effect relationship.

### Conclusion

In this study the proportion of preterm birth mortality was high. The Median survival time was 20 days. In neonates whose birth weight was between 1-1.5 kg, neonates who were not received KMC, neonates who were treated for hypoglycemia, neonates whose APGAR score was less than or equal to six, preterm neonates who have not started breastfeeding, neonates who were delivered at home and neonates who were delivered from mothers above the of 35 years remained statistically significant factors. Therefore, Aksum university specialized hospitals must provide quality care in maternity care, give special care for preterm and low birth weight neonate to start breast feeding and to receive KMC, access the intensive care unit at maternity and professional health care institutions and take precautionary measures to prevent home delivery.

### Acknowledgments

We are highly indebted to all participants of the study, supervisors of data collection and data collectors for their worthy efforts and participation in this study.

### Funding

The authors received no specific funding for this work.

### Availability of Data and Materials

The datasets used during the current study available from the corresponding author on reasonable request.

### Competing Interest

The authors declare that they have no competing interests.

### Consent for Publication

Not applicable.

### References

1. Jabiri A, Wella HL, Semiono A, et al. Prevalence and factors associated with neonatal sepsis among neonates in Temeke and Mwananyamala Hospitals in Dar es Salaam, Tanzania. *Tanzan J Health Res.* 2016;18.
2. Agonafir M, Shimbre MS, Hussen S, et al. Community based essential newborn care practices and associated factors among women who gave birth at home in last twelve months in amaro woreda, Southern Ethiopia. *Glob Pediatr Health.* 2019;8.
3. Yismaw AE, Tarekegn AA. Proportion and factors of death among preterm neonates admitted in University of Gondar comprehensive specialized hospital neonatal intensive care unit, Northwest Ethiopia. *BMC research notes.* 2018;11:867.
4. Mengesha HG, Wuneh AD, Lerebo WT, et al. Survival of neonates and predictors of their mortality in Tigray region, Northern Ethiopia: Prospective cohort study. *BMC Pregnancy Childbirth.* 2016;16:202.
5. Debelew GT, Afework MF, Yalew AW. Determinants and causes of neonatal mortality in Jimma zone, southwest Ethiopia: A multilevel analysis of prospective follow up study. *Plos one,* 2014;9:e107184.
6. Weldearegawi B, Melaku YA, Abera SF, et al. Infant mortality and causes of infant deaths in rural Ethiopia: A population-based cohort of 3684 births. *BMC public health.* 2015;15:770.
7. Mengesha HG, Lerebo WT, Kidanemariam A, et al. Pre-term and post-term births: Predictors and implications on neonatal mortality in Northern Ethiopia. *BMC Nursing.* 2016;15:48.
8. Lawn JE, Cosens S, Zupan J, et al. 4 million neonatal deaths: When? Where? Why? *The Lancet.* 2005;365:891-900.
9. Jehan I, Hillary H, Sohail S, et al. Neonatal mortality, risk factors and causes: A prospective population-based cohort study in urban Pakistan. *Bull World Health Organ.* 2009;87:130-138.
10. Gizaw M, Molla M, Mekonnen W. Trends and risk factors for neonatal mortality in Butajira District, South Central Ethiopia,(1987-2008): A prospective cohort study. *BMC pregn childbirth.* 2014;14:64.
11. Risso SDP, Nascimento LFC. Risk factors for neonatal death in neonatal intensive care unit according to survival analysis. *Rev Bras Ter Intensiva.* 2010;22:19-26.

12. Haghghi L, Nojomi M, Mohabbatian B, et al. Survival predictors of preterm neonates: Hospital based study in Iran (2010-2011). *Iran J Reprod Med.* 2013;11:957.

**\*Correspondence to**

Dr. Teferi Gebru Gebremeskel

Department of Reproductive Health

Aksum University

Aksum

Ethiopia

E-mail: teferigebru12@gmail.com