

Prevalence for the Risk of Neonatal Death and Associated Factors in Awi Zone, Amhara Region, Northwest, Ethiopia

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Abstract

Background: Neonatal mortality is the death of the neonate within the first month of life. Globally each year over four million neonates died within 28 days of birth. In Ethiopia, the prevalence of neonatal mortality is not proportional across regions as such the Amhara region was the second highest neonatal mortality with 54 deaths per 1000 live births. Therefore, this study aimed to investigate the prevalence and associated factors of neonatal mortality in Awi zone, Amhara region, Ethiopia.

Methods: A community-based cross-sectional study was conducted on 1299 randomly selected neonates for the current study from March to May 2020. A multistage sampling technique with logistic regression model was conducted in current study. Administered structured questioner, prepared by WHO in 2016, was used for data collection. SPSS version 25 software was used for analysis and data entry too.

Results: The risk of neonatal mortality in the study area was 20.9 per 1000 live births. Among the predictor variable; the preterm neonates (AHR=4.54, 95% CI: 1.57, 13.17, p-value=0.005), neonates borne from primiparous mother (AHR=4.21, 95% CI: 1.39, 12.7, p-value=0.011), neonates from mothers who had a previous neonatal history (AHR 3.50, 95% CI: (1.33, 9.20), p-value=0.011), neonates borne for mothers who did not have antenatal care (AHR=3.20, 95% CI: (1.10, 9.30), p-value=0.033), neonates whose delivery not at health institutes (AHR=4.17, 95% CI: (1.24, 14.08), p-value=0.02) and neonates born from mothers with an abortion history (AHR=4.60, 95% CI: (1.90, 11.32), p-value=0.001) had significant role for the existence of neonatal death in the study area.

Conclusion: The risk of neonatal death was significantly associated with mother's order of birth, duration of pregnancy, antenatal care, history of neonatal mortality, place of delivery and history abortion. Health related education should be conducted for women of reproductive age to get the antenatal care service and to deliver at health institutes. Hence, it is important to encourage mothers to use antenatal care service and deliver in health institutions.

Keywords: Neonatal • Mortality • Risk of neonatal death • Prevalence • Death • Prematurity

Abbreviations: EDHS: Ethiopian Demographic Health Survey; SPSS: Statistical Package for Social Science; NNM: Neonatal Mortality; TBAs: Traditional Birth Attendants; SDG: Sustainable Development Goal; SRS: Simple Random Sampling; WHO: World Health Organization

Introduction

The neonatal period, accounted for the first 28 days of life, is one of the highest risks of mortality for the human lifespan [1]. Neonatal death is the probability that a child born in a specific year or period will be died in the first 28 completed days of life per 1000 live births. The neonatal deaths may be early neonatal death (death occurred in

the first seven days of life) and late neonatal deaths (deaths occurred after the seventh day but before the 28th days of life). It is also termed as the death of a neonate within the first month of life and is expressed as neonatal deaths per 1000 live births [2].

Globally each year over four million neonates died within 28 days of birth. Every minute 20 children under five die, leading to eight million

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deaths before they reach their fifth birthday due to the conditions which could be either avoided or treated. Neonatal mortality accounts for two-thirds of deaths of infants, and nearly two-fifths of all deaths in under-five children [3]. Neonatal mortality was the cause of 38% of all under-five deaths. Global, estimates indicate that annually 2.8 million neonatal deaths take place [4,5]. Globally, the neonatal mortality had a contribution of 60% for infant deaths [6]. As far as international public health policy and programs are concerned neonatal death do not get attention proportional to its health and economic burden [7].

Most neonatal mortalities, 99% occur in low and middle income countries, whereas half of the deaths occur at home [8,9]. Sub-Saharan Africa accounts the highest level of neonatal mortality in the world. This region has the highest risk of neonatal death in the first 28 days of life and showing the least improvement [10]. High mortality, high fertility and low life expectancy characterize the demography, as in most sub-Saharan African countries [11].

Ethiopia is one of the six countries which accounts for 50% of neonatal mortalities in under five children [12]. According to EDHS in 2016, Ethiopia is among the highly prevalent countries with the highest number of neonatal mortality accounts for 29 deaths per 1000 live births.

There is scarcity of researches on neonatal mortality in the study area. Most of the reports for any program planning and implementation have been used the EDHS data which is done every five years' period [13].

Most of the previous studies are institutional based which are based on secondary data and few studies on the community-based. Hence, the main objective of current study was to assess prevalence and associated factors for neonatal mortality in Awi zone, Amhara region, Ethiopia. This community-based study used the WHO verbal autopsy to identify the factors associated with the neonatal mortality in the study area.

Materials and Methods

Study area and period

A study was conducted in Awi zone, which is one of the 11 zones in Amhara national regional state, located 447 km away from Addis Ababa at Northwest direction. It has five governmental hospitals, 46 health centers and 125 private clinic in the zone [14]. The study was conducted from March to May 2020.

Study design

Community-based cross-sectional study was conducted for current investigation.

Study population

The randomly selected kebele women who gave birth in the last 12 months and caregivers in Awi zone were the study population.

Sample size determination

A single population proportion formula was used for sample size determination and to do this the significant independent variables were checked by using epi info [15]. From the above epi info result, the larger one was residence with sample size 866. The total sample size by considering the design effect 1.5 was 1299. Hence, the total sample of 1299 was distributed with probability proportional to size.

Sampling procedure and technique

Multi-stage sampling technique was implemented for the sampling procedure. The 12 woredas were divided into either town or rural and 25% of the woredas were selected using simple random sampling technique and among the 12 woredas Dangla, Banja and Injibara town woredas were selected randomly. In those selected woredas about 25% of kebeles were selected with simple random sampling proportional to the study population. Hence, among 65 kebeles in the selected three woredas, about 17 kebeles were included in the study. The lists of women who give birth in the last 12 months have been registered by health extension workers. Using such sampling technique, 1299 women were selected and included under current study.

Variables included in the study

Dependent variable: The variable of study under current investigation was neonatal mortality, whether the neonates died or not. Hence, it has two possible outcomes (death or not).

Independent variables: Socio-demographic factors include occupation, residence, marital status, maternal age, maternal education and antenatal follow up, income level. Maternal and health care service factors include a family history of neonatal mortality, maternal diseases, tetanus toxic vaccination. Obstetric factors include complication of pregnancy, mode of delivery, parity, place of delivery, attendant at delivery, the complication of labor and history of abortion. Neonatal factors include infection, congenital malformation, age of neonate at delivery time, breastfeeding, birth weight, and birth interval, sex of neonate and birth order of neonate at birth.

Data collection technique

The data was collected through a pre-tested interviewer-administered structured questionnaire. The verbal autopsy was developed and validated by WHO to make every baby count: Audit and review of stillbirths and neonatal deaths by capturing basic information on all births and deaths, as well as identifying the leading cause of death in selected cases for implementing ways to improve the quality of maternal and newborn care.

Data collection procedure

The data were collected by interview administered questioner methods. In the data collection process, 17 health professionals have participated and two to three physicians (doctors) were participated for identifying. One-day training was given for data collectors about variables included under investigation and on how to use verbal autopsy questioner and data collection.

The descriptive result was presented in the form of tables and graphs. Binary logistic regression analysis was conducted to discover the effect of each study variable on the outcome variable. Variables having p -value <0.05 were considered as significantly associated with outcome. The model adequacy check was done through Hosmer and Lemeshow test.

Results

Socio-demographic characteristics of respondents

Among the total 1299 live births, 1242 of them included in the study. Fifty-seven of them were non-respondents due to different reason and the total response rate for the study was 95.6%. Of the total 1242 live-births included in the analysis, 1058 (85.2) were from the rural residence. The majority, 657 (53.3%) of the mothers of the neonates were in the age group of 20-34 years. About 1116 (90.7%) of women were married. More than half of the mothers, 717 (57.9%), didn't attend any formal education. The great majority, 1013 (81.7%) of the mothers were housewives.

Maternal and obstetric factors

Among the mothers of neonate 419 (33.7%) of them had no ANC visit at all. Nearly half of them had 1-3 visit 618 (49.8%) and 205 (16.5%) of them had 4 or more ANC visit in their current pregnancy. Majority of women started their ANC visit in the second three months which were (50.4%). Less than half of women had PNC (35.2%). More than half 812 (65.4%) of women had a total birth of two to four births.

Of the total women majority of them had no vaginal bleeding in the last three months of pregnancy 1155 (94.9%). About 187 (15.1%) of women had high blood pressure during pregnancy and 65 (5.2%) of women had blurred vision. Among those women, 27 (2.2%) of them had a febrile illness. Only 23 (1.9%) of women had heart diseases and 19 (1.5%) of women had diabetic mellitus.

Of the total women, majority of them were delivered at home which was 767 (61.8%) and more than half 765 (61.6%) delivered by the non-skilled attendant. About 1125 (90.6%) of them were had a normal vaginal delivery. Around half 625 (50.3%) women delivered within 12-23 hours after the labor was started. Only 54 (4.3%) of women were delivered after 24 hours. About 12 (46.2%) of neonates were died at hospital. Likewise, 38.5% of neonates were died at home which indicates this much figure were died at home without getting appropriate medical treatment from highly skilled human power at health institutions. Besides, 7.7% of neonates were died on the way to the health institutions (Table 1).

About 54% of the neonates were females, 85.2% of them had normal birth size and 14.8% had smaller than the smaller than normal physical size. Regarding the duration of pregnancy 1049 (84.5%) of them were delivered in ≥ 37 completed weeks and 193 (15.5%) of them were delivered in less than 37 weeks. From all neonates, only 108 (8.7%) of them had within one-hour breastfeeding initiation whereas the rest 1134 (91.3%) had after one-hour breastfeeding initiation report. Finally, among the 1242 live births in the last 12 months, 26 neonates died with 20.9 per 1000 live births.

From the total of 26 deaths occurred, VAs were implemented for 23 cases. Initially, the two physicians were involved in assigning on the most probable cause of death but they agreed for only for 17 cases from 23 cases, for 6 cases the probable causes were different between the physicians. As a result, those cases were given to the third physician and three cases were agreed with one of the two physicians the rest three cases were not similar and classified as unspecified cause of death. With this, birth asphyxia 5 (19.2%), neonatal infections (sepsis and tetanus) 8 (30.8%), prematurity 6 (23.1%) and congenital malformation 1 (3.8%) unspecified cause 3 (11.5%) were the leading causes of neonatal mortality, 3 (11.5%) of them were unknown causes.

Bi-variable analysis of variables associated with neonatal mortality

From socio-demographic factors; the duration of pregnancy, number of births given by a given mother, history of previous neonatal death, antenatal care, delivery place, history of abortion, sex of neonates, tetanus vaccination were significantly affected the risk of neonatal death in the bivariate data analysis and were taken to data analysis in the multivariate data analysis.

Multivariable analysis of factors associated with neonatal mortality

From the total 16 variables that were entered in the bi-variable analysis, only eight of them were entered to multivariable analysis. The significant variables affected the variable of interest is described as follows:

The risk of preterm neonatal death was 4.54 times that of risk of neonatal death delivered at the expected time (AHR 4.54, 95% CI: 1.57, 13.17, p -value=0.005).

The risk of neonatal death with mothers who had two up to four births was decreased by 72% as compared to risk of neonatal death with mothers who gave birth greater than four times (AHR=0.28, 95% CI: 0.08, 0.99, p -value=0.008). However, the risk of neonatal death with primiparous was 4.21 times the risk of neonatal death with mothers who gave birth greater than four (AHR=4.21, 95% CI: 1.39, 12.7, p -value=0.011).

The risk of neonatal death with mothers who had a previous neonatal death history was 3.50 times (AHR=3.50, 95% CI: 1.33, 9.20,

p-value=0.011) that of the risk of neonatal death with mothers without previous neonatal death history. Similarly, the risk of neonatal death with mothers without antenatal care was 3.20 times that of the risk of neonatal death with mothers who had antenatal care (AHR=3.20, 95% CI: 1.10, 9.30, p-value=0.033).

The risk of neonatal death delivered out of health institution was 4.17 times that of the risk of neonatal death delivered at health institution

(AHR=4.17, 95% CI: 1.24, 14.08, p-value=0.02).

The risk of neonatal death with mothers who had history of abortion was 4.60 times that of mother without abortion history (AHR=4.60, 95% CI: 1.90, 11.32, p-value=0.001)(Table 1).

Variable	Category	Neonatal status		AHR (95% CI)	P-value
		Died	Alive		
History of neonatal death	Yes	9 (34.6%)	172 (14.1%)	3.50 (1.33, 9.20)	0.011*
	No (ref)	17 (65.4%)	1044 (85.9%)		
Total birth/order of birth	1 birth	15 (57.7%)	219 (18.0%)	4.21 (1.39, 12.7)	0.011*
	2-4 birth	5 (19.2%)	807 (66.4%)		
	>=5 birth (ref)	6 (23.1%)	190 (15.6%)		
Duration of pregnancy	<37 week	8 (30.8%)	185 (15.2%)	4.54 (1.57,13.17)	0.005**
	>=37 week (ref)	18 (69.2%)	1031 (84.8%)		
Antenatal care	No	21 (80.8%)	784 (64.5%)	3.20 (1.10,9.30)	0.033*
	Yes (ref)	5 (19.2%)	432 (35.5%)		
Tetanus vaccination	None	14 (53.8%)	413 (34.0%)	1.88 (0.61,5.79)	0.27
	1 dose	6 (23.1%)	337 (27.7%)		
	2 and more (ref)	6 (23.1%)	466 (38.3%)		
Sex of neonates	Male	19 (73.1%)	551 (45.3%)	2.10 (0.82,5.40)	0.12
	Female (ref)	7 (26.9%)	665 (54.7%)		
Place delivery	Out of institution	21 (80.8%)	746 (61.3%)	4.17 (1.24,14.08)	0.02*
	In institution (ref)	5 (19.2%)	470 (38.7%)		
Abortion history	Yes	14 (53.8%)	171 (14.1%)	4.60 (1.90,11.32)	0.001**
	No (ref)	12 (46.2%)	1045 (85.9%)		

Note: *means p value less than 0.05, **means p value less than 0.01, AHR: Adjusted Hazard Ratio

Table 1. Multivariable analysis of factors associated with neonatal mortality.

Discussion

The current study revealed that the risk of neonatal death was 20.9 per 1000 live births. A study in Addis Ababa showed that the neonatal mortality was 23.3% [16] which indicates the risk in Addis Ababa is greater than the current result. The finding is also lower than a report from EDHS 2016 report. This discrepancy may arise due to the study area, sample size difference, study period and the place where information was gathered and type of design used [17-20].

One of the most common contributing factors of neonatal death in this study was duration of pregnancy. Hence, a neonate who was delivered before the expected date may be exposed for different risks

and this further leads to death as compared to those neonates whose delivery was at the expected date. This finding is in line with the findings of several other studies. A study conducted with 2016 EDHS data analysis revealed that, the risk of preterm neonatal death was 15.07 times that of the risk of the term neonatal death. This result is also similar with result obtained in the study conducted in Felege-Hiwot Referral Hospital, Bahir Dar which states the neonates who were born before expected time were two times higher to be died than who were delivered term. This is happened due to being preterm will expose the neonate for different conditions as they have many physiologic challenges to adapt extra uterine life due to poor lung maturation, resulted in unable to breathe and hypoxia, and also they are exposed to different fatal conditions like hypothermia, different

cardiovascular problem, hyper bilirubinuria, an immature immune defense which exposes them to infections, poor feeding.

Place of delivery was another predictor variable affected the risk of neonatal death in current investigation. Hence, the risk of neonatal death with mothers delivered outside of the health institution was greater than that of risk of neonatal death with mothers who delivered in the health institution. This result is consistent with researches conducted previously. This result is also consistent with another study. The potential reason for this might be delivering at health institution has a lot of advantages on the side of saving neonate's life as there is a skilled professional in such institutions.

The number of delivery/birth order given by the mother significantly affected the risk of neonatal death in this investigation. The risk is higher for neonates with mothers at the first birth and those mothers who gave more than four deliveries was by far greater than the risk of neonates with mothers whose delivery is between two and four given that the other conditions constant. In several studies, birth order of a neonate leads to controversial research findings of neonatal death. Some studies showed that first birth was at the higher risk of neonatal death while others showed that higher-order births were at higher risk. A result is consistent with another study conducted in India which states that neonates with first and higher-order births experienced a high risk of death.

In this investigation, antenatal care plays important role in regard to neonatal death reduction which is similar thought with other studies. This may be due to proper prenatal and postnatal visit which help in early detection and management of the problems related to the mother as well as neonate which ultimately improves the neonatal outcome. This result is consistent with another previously conducted research.

History of previous neonatal death affected the variable of interest. Hence, neonates born from mothers with previous neonatal death have greater risk as compared to those neonates born from mother without history of previous neonatal death. This result is consistent with another study conducted in West Gojjam which states that previous history of neonatal mortality was significantly associated with neonatal mortality. This result is also consistent with other previously conducted studies. The potential reason for this might be the fact that mothers who had previous neonatal death may have stress and this further lead to other complications.

Abortion history of mothers has significant effect for the variable of interest (risk of death of neonates). Hence, the risk of neonatal death for mothers with previous abortion history was greater as compared to that of the risk of neonatal death with mothers without previous abortion history. The potential reason for this might be the fact that mothers with previous abortion history may lead to mental stress and related disease which might further leads to another abortion. This result is similar to another study conducted in India.

Conclusion

The descriptive data analysis in this study showed that the neonatal mortality was 20.9 per 1000 live births. The risk of neonatal death was significantly associated to mothers' order of births, durational of pregnancy, antenatal care follow-ups, place of birth, neonatal death history and abortion history.

Due attention should be given for mothers with previous abortion history, previous history of neonatal death, mothers with first birth and those mothers who had more than four deliveries previously. More attention should be also given for mothers whose delivery was outside of the health institutions or mothers delivered by unskilled persons. Attention should be given for mothers without antenatal care follow-ups.

Health related education should be forwarded to mother with reproductive age to deliver at health institution with proper antenatal care. Counselling should be given for mothers with previous history of abortion and neonatal death history to be free from stress during their pregnancy.

Limitation of Study

This study was not without limitation. One of the limitation was some important variables related to neonatal death are not included here. The authors recommended further research related to factors associated to risk of neonatal death including additional variable not included in current study such as education level of mothers.

Ethics Approval and Consent to Participate

Ethical approval was obtained from the Debre Markos University College of Health Sciences. First formal letter was written from Debre Markos University College of Health Sciences to Zonal Health Department. Then the letter of cooperation was obtained from Zonal Health Department to each respective woreda and kebeles to conduct this study.

Availability of Data

The data used in current investigation are available within the hands of corresponding author.

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Authors' Contributions

ZT, GM, T.K and MT participated in developing the proposal, data collection analysis and wrote the manuscript. AST participated in data

analysis, editing the manuscript carefully and give constructive comments for the betterment of the manuscript. All authors read and approved the manuscript to be submitted to this journal.

Consent for Publication

Not applicable.

Competing Interests

The author(s) declare that they have no competing interests.

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