Original Research Article

Analysis of Determinants of Neonatal Mortality in Afar and Somalia Regions, Ethiopia

Abstract

Background: Children face the highest risk of dying in their first month of life. Ethiopia is one of the sub-Saharan countries with highest newborn deaths. Afar and Somalia regions in Ethiopia are among the regions with high death rates of newborn children. This study aimed to analyse and identify determinants of neonatal mortality in Afar and Somalia regions, Ethiopia.

Methods: This study used 2016 Ethiopian Demographic and Health Survey data for the analysis. The multivariable logistic regression model was used to identify the significant determinants of neonatal mortality. Adjusted odds ratio with a 95% confidence interval and p-value < 0.05 in the multivariable logistic regression model was reported to declare the statistical significance and strength of association between neonatal mortality and determinants.

Results: A total of 3761 newborn children were included in this study. Health facility delivery (AOR: 0.634; 95% CI: 0.409–0.982), being female (AOR: 0.206; 95% CI: 0.073–0.528), multiple births (AOR: 3.958; 95% CI: 2.293–11.208), small size at birth (AOR: 1.208; 95% CI: 1.003–1.728), secondary and above educational level of mothers (AOR: 0.484; 95% CI: 0.294–0.797) were statistically significant determinants neonatal mortality.

Conclusions: In this study, sex of child, place of delivery, birth type, size at birth, mother's educational level were found to be statistically significant determinants of neonatal death in Afar and Somalia regions, Ethiopia. Mothers with no education should be given health education and institutional delivery should be encouraged to improve the survival of the neonates in Afar and Somalia regions, Ethiopia.

Introduction

Neonatal mortality is defined as the death of a live-born infant within the first 28 days of life [1]. Children face the highest risk of dying in their first month of life, at a rate of 19 deaths per 1,000 live births globally [2].

Globally, 2.6 million new-borns died in 2016- approximately 7000 neonate deaths every day. Neonatal deaths accounted for 46 percent of all under-five deaths, increasing from 41 percent in 2000.The largest number of new-born deaths occurred in Southern Asia (39 percent), followed by sub-Saharan Africa (38 percent). Five countries accounted for half of all new-born deaths: India, Pakistan, Nigeria, the Democratic Republic of the Congo and Ethiopia [2].

In 2020, globally, 2.4 million children died in the first month of life – approximately 6,500 neonatal deaths every day – with about a third of all neonatal deaths occurring within the first

day after birth, and close to three-quarters occurring within the first week of life [https://data.unicef.org/topic/child-survival/neonatal-mortality/].

Annually, 1.12 million newborn deaths occur in WHO African Region. Main causes for this include prematurity and low-birth weight, lack of oxygen at birth, infections, and birth trauma [3]. In sub-Saharan Africa, the neonates face challenges in a diversity of lethal clinical conditions that seek serious interventions [4]. WHO and UNICEF recommend home visits by skilled health workers during a baby's first week of life to improve newborn survival [3].

According to 2016 Ethiopian Demographic Health Survey (2016 EDHS), neonatal mortality declined from 49 deaths per 1,000 live births in 2000 to 29 deaths per 1,000 births in 2016, a reduction of 41% over the past 16 years. However, there are some regions where still the neonatal mortality rate is high [5].

According to prior studies, neonatal mortality is determined by factors like sex of child, birth type, size of child at birth, birth weight, child's birth order, birth interval, region, place of residence, ANC visit, PNC visit, place of delivery, mode of delivery, age of mother, educational level of mother, educational level of father, religion of mother, family size, household wealth index, parity, and marital status of mother [6-22].

There had been regional variations in neonatal mortality rate in Ethiopia. Reduction in neonatal mortality rates were observed among all regions of Ethiopia except Afar and Somalia regions over the past five years. In Afar and Somalia regions, in 2011, the neonatal mortality rates were 33 deaths per 1000 births and 34 deaths per 1000 births respectively [23], and increased to 38 deaths per 1000 births and 41 deaths per 1000 births respectively in 2016 [5]. Moreover, Afar and Somalia regions are among the regions with high neonatal mortality rates in Ethiopia [5]. Neonatal mortality is a core indicator of neonatal health and wellbeing [1]. Hence, identifying the determinants of neonatal mortality is important to design intervention programmes which can increase the neonatal survival. Therefore, this study aimed to analyse and identify the determinants of neonatal mortality in Afar and Somalia regions based on the evidence from the 2016 Ethiopian Demographic and Health Survey.

Methods

Data source

The study used 2016 Ethiopia Demographic and Health Survey (EDHS) data which were collected from January 18, 2016 to June 27, 2016. The 2016 EDHS data is openly available from the measure DHS website (https:// dhsprogram.com). The survey was implemented by the Central Statistical Agency (CSA) at the request of the Federal Ministry of Health. The primary objective of the 2016 EDHS was to provide up to date estimates of key demographic and health indicators.

Variables of the study

The response variable of this study was neonatal mortality. It is coded as 1 if the liveborn neonate died within 28 days of life and 0 if the newborn alive in the first month of life). The

independent variables included in this study were sex of child, birth type, size of child at birth, birth order, place of residence, place of delivery, mode of delivery, age of mother, educational level of mother, marital status, religion, parity and household wealth index

Statistical data analysis

The data were analysed using SPSS version 25. The background characteristics of the respondents were described using frequency and percent. Multi-collinearity and goodness of fit of the model were checked prior to logistic regression analysis. Both bivariate logistic regression and multivariable logistic regression analyses were conducted. Those variables found to be significant ($p < 0.05$) in bivariate logistic regression analysis were considered in the multivariable logistic regression analysis. Adjusted Odds Ratio with a 95% confidence interval in the multivariable logistic regression analysis was reported to declare the statistical significance and strength of association between neonatal mortality and determinants.

Results

A total of 3761 neonates were included in this study. Among 3761 neonates included in the study, 150 died in the first month of the life. Out of the total neonates included in the study, 2388(63.5%) of them were females. More than four-fifth (3199(85.1%)) of them were born at home. Majority 3746(99.6%) of them were born vaginally. 3746(99.6%) of them were singletons. 1420(37.8%) of them had small size at birth. Regarding birth order, 2683 (71.3%) of them had birth order of second to forth. More than three-fourth (2369(63.0%)) of them were born to families were the total number of ever born children were four or more. About half (1885(50.1%) of them were born to mothers who aged 25-34 years. Majority (3169(84.3%)) of them were born to mothers living in rural areas. 3230(85.9%) of them were born to mothers with no education. 3588(95.4%) of them were born to mothers who were married or living together with partners. More than nine-tenth (3692(98.2)) of them were born to Muslim mothers. More than three-fourth (3044(80.9%)) of mothers were poor.

Table 1: Background characteristics of mothers and neonates in Afar and Somalia regions, Ethiopia (n=3761)

Sex of child	**Frequency**	**Percent**
Male	1373	36.5
Female	2388	63.5
Place of delivery		
Home	3199	85.1
Health facility	562	14.9
Mode of delivery		
Vaginal	3746	99.6
Caesarean	15	0.4
Birth type		
single	3671	97.6
Multiple	90	2.4
Size of child at birth		
Large	932	24.8

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Average	1409	37.5
Small	1420	37.8
Birth order		
1	666	17.7
2-4	2683	71.3
5+	412	11.0
Parity		
1	355	9.4
2-3	1037	27.6
4+	2369	63.0
Age of mother		
15-24	1070	28.4
25-34	1885	50.1
35+	806	21.4
Place of residence		
Urban	592	15.7
Rural	3169	84.3
Educational level of mother		
No education	3230	85.9
Primary	406	10.8
Secondary/higher	125	3.3
Marital status		
Married/living together	3588	95.4
Widowed/divorced/ separated	173	4.6
Religion		
Orthodox	41	1.1
Catholic	8	0.2
Protestant	17	0.5
Muslim	3692	98.2
Traditional	3	0.1
House wealth index		
Poor	3044	80.9
Middle	147	3.9
Rich	570	15.2

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Bivariate analysis revealed that sex of child, birth type, birth order, size at birth, educational level of mother, place of delivery and household wealth were associated with neonatal mortality. Multivariate logistic regression analysis revealed that sex of child, birth type, size at birth, place of delivery and educational level of mother were significantly associated with neonatal mortality.

The odds of neonatal death among females was lower than males (AOR: 0.206; 95% CI: 0.073–0.528). Neonates born at health facilities were 0.634 times less likely to die than those

born at home (AOR: 0.634; 95% CI: 0.409–0.982). Neonates of multiple births were 3.958 times more likely to die than Neonates of single births (AOR: 3.958; 95% CI: 2.293–11.208). Neonates with small size at birth were 1.208 times more likely to die than those with large size at birth (AOR: 1.208; 95% CI: 1.003–1.728). Neonates born to mothers who had secondary and above education were 0.484 times less likely to die than those who were born to mothers with no formal education (AOR: 0.484; 95% CI: 0.294–0.797).

Table 2: Factors associated with neonatal mortality in Afar and Somalia regions, Ethiopia (n=3761)

Variable	COR (95% CI)	AOR (95% CI)	P-value of AOR
Sex of child			
Male	Ref	Ref	
Female	**0.357(0.114, 0.790)**	**0.206(0.073, 0.528)**	0.023
Place of delivery			
Home	Ref	Ref	
Health facility	**0.523(0.303, 0.805)**	**0.634(0.409, 0.982)**	0.040
Mode of delivery			
Vaginal	Ref		
Caesarean	1.440(0.956, 2.176)		
Birth type			
single	Ref	Ref	
Multiple	**2.707(1.236, 10.064)**	**3.958(2.293, 11.208)**	0.000
Size of child at birth			
Large	Ref	Ref	
Average	1.760(0.997, 2.912)	1.035(0.839, 1.994)	0.083
Small	**1.614(1.483, 1.829)**	**1.208(1.003, 1.728)**	0.009
Birth order			
1	Ref	Ref	
2-4	**0.642(0.433, 0.952)**	0.884(0.729, 1.208)	0.829
5+	**0.701(0.497, 0.924)**	0.526(0.394, 1.826)	0.305
Parity			
1	Ref		
2-3	0.615(0.342, 1.07)		
4+	0.817(0.488, 1.367)		
Age of mother			
15-24	Ref		
25-34	1.051(0.627, 1.761)		
35+	0.795(0.289, 2.185)		
Place of residence			
Urban	Ref		
Rural	1.071(0.839,1.407)		
Educational level of mother			
No education	Ref	Ref	
Primary	**0.630(0.422.0.939)**	0.528(0.395, 1.829)	0.153
Secondary/higher	**0.440(0.389, 0.752)**	**0.484(0.294,0.797)**	0.004
Marital status			
Married/living together	Ref		
Widowed/divorced/ separated	1.342(0.672, 2.680)		

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Religion			
Orthodox	Ref		
Catholic	0.121(0.088, 1.250)		
Protestant	0.362(0.171, 1.234)		
Muslim	1.682(0.230, 12.319)		
Traditional	0.068(0.042, 0.150)		
House wealth index			
Poor	Ref	Ref	
Middle	**0.454(0.248, 0.867)**	0.732(0.618, 1.407)	0.827
Rich	**0.564(0.323, 0.987)**	0.890(0.457,2.142)	0.539

COR = Crude Odds Ratio, AOR = Adjusted Odds Ratio, CI= Confidence interval, Ref= Reference category

Discussion

Factors sex of child, birth type, size at birth, place of delivery and educational level of mother were found to be statistically significant determents of neonatal mortality. Female neonates were less likely to die than male neonates. This is consistent with studies [13, 16, 19, 20, 22, 24]. This might be due to the fact that males being biologically weaker and more susceptible to diseases and mortality than the females.

Neonates born to mothers who attained secondary education and above were less likely to die than neonate born to mothers who did not have formal education. This result is consistent with studies [7, 16, 20, 22, 25-28]. This could be due to that educated mothers may more attend ANC and PNC, and deliver at health facilities compared to uneducated mothers.

Neonates with small size at birth were more likely to die than neonates with large size at birth. This is consistent with studies [25, 28, 29]. Multiple births were more likely to die in the first month of birth than singletons. This is consistent with studies [6, 13, 20, 22, 25]. Neonates born at health facilities were less likely to die than neonates born at home. This is consistent with the studies [25, 29, 30]. This could be due to that mothers who give birth at health facilities may be given health information regarding the care of the child.

Conclusion

The aim of this study was to analyse and identify determinants of neonatal mortality in Afar and Somalia regions, Ethiopia. Neonatal mortality was significantly associated with sex of child, birth type, size at birth, place of delivery and educational level of mother in Afar and Somalia regions, Ethiopia. Mothers with no education should be given health education and institutional delivery should be encouraged to improve the survival of the neonates in Afar and Somalia regions, Ethiopia.

ABERRATIONS

ANC: Antenatal Care
AOR: Adjusted odds ratio
CSA: Central Statistical Agency
DHS: Demographic and Health Survey
EDHS: Ethiopian Demographic and Health Survey
PNC: Postnatal Care

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WHO: World Health Organization

ETHICAL APPROVAL

As this study used publicly available Secondary data, the ethical approval was not necessary.

CONSENT

It is not applicable.

AVAILABILITY OF DATA

Data used for the analysis of this study are available from corresponding author upon reasonable request**.**

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