

Prevalence and associated factors of perinatal asphyxia among newborns in Dilla University referral hospital, Southern Ethiopia– 2017

This article was published in the following Dove Press journal:
Pediatric Health, Medicine and Therapeutics

Abebe Alemu¹
Getnet Melaku¹
Gerezgiher Buruh Abera²
Ashenafi Damte²

¹Department of Midwifery, College of Health Science and Medicine, Dilla University, Dilla, Ethiopia; ²Department of Nursing, College of Health Sciences, Mekelle University, Mekelle, Tigray, Ethiopia

Background: Globally, perinatal asphyxia is a significant contributing factor for neonatal morbidity and mortality. Thus, this study was aimed to assess the prevalence and associated factors with perinatal asphyxia among newborns in Dilla University referral hospital.

Methods: A cross-sectional study was conducted among newborns in Dilla University referral hospital, Ethiopia from February to April 2017. Systematic random sampling techniques were used to enroll a total of 262 study subjects. Multivariate logistic regression analysis was used to identify factors associated with the perinatal asphyxia among newborns.

Result: Of the newborns, 32.8% had perinatal asphyxia, and factors associated significantly were anemia during pregnancy (adjusted OR=2.99, 95%CI: 1.07–8.35), chronic hypertension (adjusted OR=4.89, 95%CI: 1.16–20.72), meconium-stained amniotic fluid (adjusted OR=3.59, 95%CI: 1.74–7.42), and low birth weight newborns (adjusted OR=3.31, 95%CI: 1.308–8.37).

Conclusion: Maternal anemia during pregnancy, chronic hypertension, meconium stained amniotic fluid, and low birth weight were significantly associated with perinatal asphyxia. Therefore, early screening and appropriate intervention during pregnancy, and intrapartum might reduce perinatal asphyxia among newborns.

Keywords: perinatal asphyxia, newborn, Dilla, Ethiopia

Background

Globally, perinatal asphyxia has significantly contributed to neonatal morbidity and mortality. Perinatal asphyxia is defined as the inability of the newborn to initiate and sustain adequate respiration after delivery.^{1,2} In developing countries neonatal mortality rate constitutes 42% of under-5 deaths.^{3,4} According to a World Health Organization report, perinatal asphyxia is the third leading cause of under-5 child deaths (11%) following preterm birth (17%) and pneumonia (15%).^{5,6}

In developing countries, neonatal deaths accounted for 52% of all under-5 child mortality in South Asia, 53% in Latin America and Caribbean, and 34% in sub-Saharan Africa due to preventable causes including perinatal asphyxia.^{7,8}

In Ethiopia, perinatal asphyxia is one of the leading causes of neonatal mortality, constituting 34%.⁸ A study revealed that perinatal asphyxia can lead to physical, mental and social incapability in newborns due to severe hypoxic-ischemic organ damage.⁹

Correspondence: Abebe Alemu
Department of Midwifery, College of Health Science and Medicine, Dilla University, PO Box 667, Dilla, Ethiopia
Tel +25 191 367 2730
Email aalemu72@yahoo.com

Studies showed that mother's age less than 20 years, mother's illiteracy, multiple pregnancy, and gestational age were the determinants of perinatal asphyxia.^{10,11} Perinatal asphyxia was associated with maternal anemia during pregnancy, pregnancy-induced hypertension, antepartum hemorrhage, antenatal care visits less than 3 and lack of ultrasound checkup.^{12,13}

The literature revealed that neonatal and intrapartum-related factors like breech presentation, mode of delivery, meconium-stained amniotic fluid (MSAF), prolonged rupture of membrane, prolonged labor, activity, pulse, grimace, appearance and respiration (APGAR) score <7, birth weight, and prematurity of the newborn were found to be significant factors for birth asphyxia.^{12,13}

According to the Ethiopian demographic health survey 2016, the reduction in neonatal mortality was comparatively low. The international community agreed to reduce neonatal mortality to at least as low as 12 deaths per 1,000 live births by 2030.¹²⁻¹⁴

In most developing countries, a small number of data are available on risk factors associated with perinatal asphyxia. There is a lack of evidence showing that maternal and neonatal factors play an important role in the occurrence of birth asphyxia.¹⁵⁻²¹

However, perinatal asphyxia has a high contribution to neonatal morbidity and mortality. There are insufficient studies conducted on perinatal asphyxia in the study area. Therefore, this study was aimed to assess the prevalence and associated factors with identifying determinants of perinatal asphyxia among newborns at Dilla University referral hospital, Southern Ethiopia, 2017.

Materials and methods

Study design and period

This cross-sectional study was conducted from February to April 2017 in Dilla University referral hospital, southern Ethiopia.

Sampling procedure

A total of 262 postnatal mothers who have live newborns were enrolled using a systematic random sampling technique.

Inclusion and exclusion criteria

All live newborns during the data collection period were included in the study, but newborns with congenital anomalies were excluded.

Data collection and quality assurance

An interviewer-administered structured questionnaire was used to obtain information on socio-demographic characteristics and obstetric history and related risk factors. To assure data quality, training was given for data collectors, the questionnaires were checked for completeness before data entry by the principal investigator.

Data processing and analysis

Data were analyzed using SPSS version 22 software (IBM Corporation, Armonk, NY, USA). A binary logistic regression was done to examine association of dependent and independent variables, and variables with p -value <0.2 were entered into multivariate logistic regression analysis. The variables with p -value <0.05 in the multivariate analysis were significantly associated with the outcome variable.

Operational definition

Perinatal asphyxia is the inability of a newborn to initiate and sustain respiration, by scoring an APGAR score less than 7 persistently for more than 5 min after delivery.

Study variables

The dependent variable of this study was perinatal asphyxia, and independent variables were categorized maternal socio-demographic and obstetric characteristics.

Ethical consideration

Ethical clearance was obtained from the College of Health Sciences, Mekelle University. The permission was found from Dilla University referral hospital medical director office. An informed written consent was obtained from all mothers of the newborns that were included for the study.

Results

Maternal socio-demographic and obstetric characteristics

From total (N=262), 256 study participants responded to a questionnaire (response rate was 97.7%). More than three quarters of the study subjects were literate and 106 (41.4%) of them were housewives. Two hundred and twenty-nine (89.5%) of mothers had a singleton pregnancy, and 144 (56.3%) of them were multiparous (Table 1).

Table 1 Socio-demographic and obstetric history of mothers of newborns at Dilla University referral hospital, Southern Ethiopia 2017 (n=256)

Variables	Categories	Frequency	Percent
Mother's age	≤19 years	24	9.4
	20–24 years	76	29.7
	25–29 years	80	31.3
	30–34 years	61	23.8
	≥35 years	15	5.9
Maternal occupation	Housewife	106	41.4
	Merchant	45	17.6
	Private employee	46	18.0
	Government employee	41	16.0
	Others*	18	7.0
Maternal educational status	Unable to read and write	63	24.6
	Primary	67	26.2
	Secondary	67	26.2
	College/university	59	23.0
Current pregnancy status	Singleton	229	89.5
	Multiple (>2)	27	10.5
Parity	Primipara	112	43.8
	Multipara	144	56.3
Duration of current pregnancy	<37 weeks	66	25.8
	>42 weeks	33	12.9
	37–42 weeks	157	61.3
History of adverse pregnancy outcome	Miscarriage	35	13.7
	Still birth	28	10.9
	Child death	22	8.6
	No any history of bad pregnancy outcome	171	66.8

Note: *Others: students, farmers.

Neonatal characteristics

In the study, 129 (50.4%) women who participated delivered female neonates and 45 (17.6%) of newborns were low birth weight. Based on gestation age 66 (25.8%) of neonates were delivered at preterm; 157 (61.3%) born at term and 33 (12.9%) at post-term (Table 2).

Magnitude of perinatal asphyxia

The number of neonates assessed as perinatal asphyxia immediately after delivery was 84 (32.8%) and 172 (67.2%) neonates delivered were assessed as non-asphyxiated (Figure 1).

Factors associated with perinatal asphyxia

Multivariate logistic regressions analysis showed that anemia during pregnancy, chronic hypertension, meconium-stained amniotic fluid, and low birth weight were significantly associated factors with neonatal asphyxia among newborns.

Neonates delivered from mothers who had anemia during pregnancy were 3 times more likely to be asphyxiated as compared to neonates from mothers who were non-anemic during pregnancy (adjusted OR=2.992, 95%CI: 1.073–8.35) and neonates from mothers who had chronic hypertension were about 5 times more likely to be asphyxiated compared to those newborns from mothers who encountered no hypertension (adjusted OR=4.9, 95%CI: 1.16–20.7).

Neonates who were delivered with meconium-stained amniotic fluid were 3.5 times more likely to have perinatal

Table 2 Characteristics of neonates who were born in Dilla University referral hospital, Southern Ethiopia, 2017 (n=256)

Variables	Categories	Frequency	Percent (%)
Sex of the newborn	Male	123	48.0
	Female	133	52.0
Weight of the newborn at birth	<2.5 kg	45	17.6
	2.5–3.5 kg	136	53.1
	3.5–4.0 kg	62	24.2
	>4.0 kg	13	5.1
Birth weight class of the newborn	Very low birth weight	12	4.7
	Low birth weight	43	16.8
	Normal weight	201	78.5
Class of the newborn based on gestational age	Preterm	66	25.8
	Post term	33	12.9
	Term	157	61.3

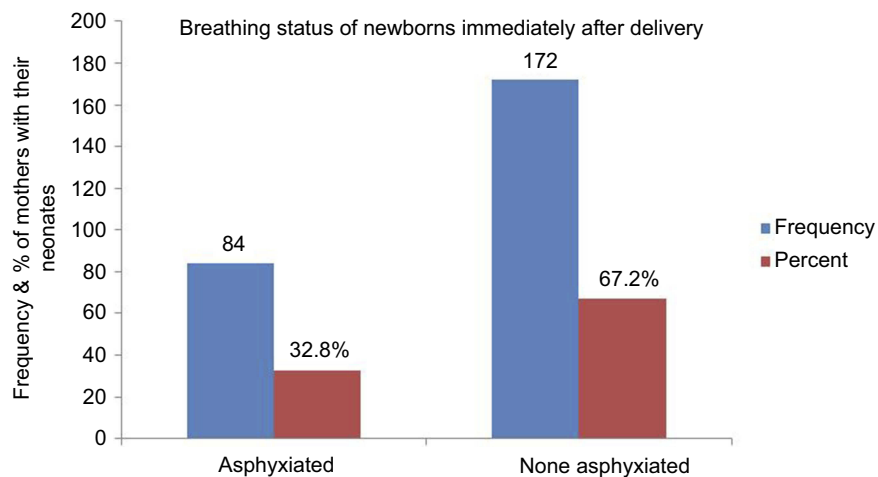


Figure 1 Breathing status of neonates immediately after delivery who were born at Dilla University referral hospital Southern Ethiopia, 2017 [n=256].

asphyxia as compared to those neonates delivered with clear amniotic fluid (adjusted OR=3.5, 95%CI: 1.739, 7.4), and low birth weight newborns were 3 times more likely to develop perinatal asphyxia compared to normal weight newborns (adjusted OR=3.309, 95% CI: 1.308, 8.368) (Table 3).

Discussion

The prevalence of perinatal asphyxia among newborns was 32.8%. This finding is higher than those of other studies conducted in India (6.6%), Nigeria (21.1%), Cameroon (8.5%), and also at hospitals in Jimma (11.1%), and Addis Ababa (16.2%) in Ethiopia, respectively.^{6,12,14,21} This finding inconsistency may be due to the difference in the study population, study area and time.

In this study, perinatal asphyxia was significantly associated with maternal anemia during pregnancy, maternal chronic hypertension, meconium-stained amniotic fluid and low birth weight of newborns.

In this study, anemia during pregnancy was found to be significantly associated with perinatal asphyxia. This is consistent with other study findings in rural districts of Pakistan and India.^{18,20} Anemia during pregnancy might affect fetal development and complicate the birth. Thus, having antenatal follow up during pregnancy may prevent anemia.

In this study, maternal history of chronic hypertension was found to be significantly associated with perinatal asphyxia. Neonates from mothers with chronic hypertension were found to be asphyxiated compared to newborns from mothers who encountered no disease during pregnancy. This finding is in line with other studies that

reported chronic hypertension was found to be a risk factor for perinatal asphyxia in Ethiopia, Cameroon, and India.^{14,20,22} This might be maternal hypertension directly affect the fetal wellbeing in the uterus, which directly contributes to neonatal asphyxia at birth.

This study showed that meconium-stained amniotic fluid was a significantly associated factor with perinatal asphyxia. Newborns who were delivered with meconium-stained amniotic fluid were found to be asphyxiated when compared to those neonates delivered with clear amniotic fluid. This finding is in agreement with other studies that have found the meconium-stained amniotic fluid was a risk factor for perinatal asphyxia.^{13,23} This is because when amniotic fluid is stained due to different factors, there is a risk of fetal distress which might lead the newborn to be asphyxiated at birth.

Low birth weight was found to be a significant factor for perinatal asphyxia in this study. This finding is in corroboration with previous study findings in Ethiopia, Tanzania, and Indonesia, but it is inconsistent with a study conducted in Nigeria.^{9,11,12,18,22,23} This finding discrepancy might be due to the difference in the socio-economic status of the study population and the study time.

The limitation of this study was there was selection bias because only neonates delivered at the hospital were included. It is known that many mothers gave birth at home with risk; those neonates were not incorporated in this study. Thus, it may not represent the whole rural area.

Conclusion

Of the newborns, 32.8% had perinatal asphyxia, and factors significantly associated were anemia during

Table 3 Associated factors with perinatal asphyxia among newborns at Dilla University referral hospital, southern Ethiopia, 2017 (n=256)

Variables	Asphyxia		Crude OR (95%CI)	Adjusted OR (95%CI)	P-value
	Yes (n=84)	No (n=172)			
Complication/illnesses during pregnancy					
Anemia	16	14	4.134(1.836, 9.309)	2.992(1.073, 8.348)	0.036*
Preeclampsia/eclampsia	10	18	2.010(0.849, 4.755)	2.001(0.643, 6.229)	0.231
Chronic hypertension	8	7	4.134(1.400, 12.213)	4.894(1.156, 20.721)	0.031*
APH	11	7	5.685(2.048, 15.779)	3.233(0.832, 12.565)	0.090
PROM	5	3	6.029(1.371, 26.510)	3.981(0.658, 24.067)	0.132
No illness	34	123	Ref	Ref	
Volume of amniotic fluid					
There is no AF checkup	41	69	1.997(1.106, 3.604)	1.618(0.750, 3.493)	0.220
Polyhydramnios	4	4	3.360(0.783, 14.411)	1.199(0.177, 8.107)	0.852
Oligohydramnios	14	15	3.136(1.335, 7.369)	1.179(0.375, 3.707)	0.779
Normal	25	84	Ref	Ref	
Mode of delivery					
SVD	36	118	Ref	Ref	
Assisted vaginal delivery	28	30	3.059(1.620, 5.779)	1.816(0.778, 4.243)	0.168
Non-vaginal (C/S)	20	24	2.731(1.355, 5.506)	2.088(0.844, 5.165)	0.111
Duration of labor					
>12 hrs (prolonged)	39	53	1.946(1.137, 3.330)	1.085(0.531, 2.218)	0.823
<12 hrs (not prolonged)	45	119	Ref	Ref	
Types of complication					
Convulsion	3	7	1.238(0.304, 5.044)	0.374 (0.062, 2.241)	0.282
Fever	8	15	1.541(0.603, 3.937)	0.210 (0.056, 0.788)	0.021
Excessive bleeding	15	12	3.611(1.546, 8.436)	0.886 (0.277, 2.834)	0.838
Abnormal presentation	9	10	2.600(0.979, 6.907)	0.609 (0.169, 2.199)	0.449
Abnormal cord present	13	24	1.565(0.722, 3.393)	1.017 (0.377, 2.744)	0.974
No complication	36	104	Ref	Ref	
Color of AF					
Clear	28	120	Ref	Ref	
Meconium stained	48	43	4.784(2.674, 8.561)	3.593(1.739, 7.424)	0.001*
Bloody stained	8	9	3.810(1.350, 10.750)	1.940(0.488, 7.710)	0.347
GA of the NB at birth					
Preterm	36	30	4.509(2.430, 8.367)	2.278(0.957, 5.422)	0.063
Post term	15	18	3.131(1.428, 6.868)	2.426(0.905, 6.504)	0.078
Term	33	124	Ref	Ref	
Birth weight					
Low birth weight (<2.5 kg)	30	15	5.765(2.872, 11.572)	3.309(1.308, 8.368)	0.011*
Macrosomia/big baby (>4 kg)	3	10	0.865(0.229, 3.266)	0.541(0.103, 2.844)	0.468

Note: *P<0.05.

Abbreviations: APH, antepartum hemorrhage; PROM, premature rupture of membrane; AF, amniotic fluid; SVD, spontaneous vaginal delivery; C/S, cesarean section; GA, gestational age; NB, newborn; Ref, reference.

pregnancy, chronic hypertension, meconium-stained amniotic fluid, and low birth weight. Therefore, early screening during pregnancy and providing health care is mandatory in order to reduce perinatal asphyxia among newborns.

Abbreviation list

ANC, Antenatal care; DURH, Dilla University Referral Hospital; EDHS, Ethiopian Demographic and Health Survey; LBW, low birth weight; MCH, maternal and child health; MSAF, meconium-stained amniotic fluid;

NICU, neonatal intensive care unit; NMR, neonatal mortality rate; PMR, perinatal mortality rate; PROM, prolonged rupture of membranes; SDG, sustainable development goals; SNNPR, South Nations Nationalities Peoples; UNICEF, United Nation Children's Fund.

Acknowledgments

We would like to thank all our study participants for their patience and for participating in this research.

Author contributions

All authors contributed toward data analysis, drafting and revising the paper, gave final approval of the version to be published, and agree to be accountable for all aspects of the work

Disclosure

The authors report no conflicts of interest in this work.

References

- Lawn JE, Cousens S, Zupan J. Lancet neonatal survival steering team 4 million neonatal deaths: When? Where? Why? *Lancet*. 2005;365:891–900. doi:10.1016/S0140-6736(05)71048-5
- World health organization, Global Health Organization (GHO) Data. Available from: <http://www.who.int/whoghod/whoghod/>. Accessed November 20, 2016.
- WHO; World Health Statistics: Part II Global health indicators 2015. Available form: http://www.who.int/whosis/whostat/EN_WHS2011_Full.pdf. Accessed November 20, 2016.
- FMOH, UNICEF. Countdown to a healthier Ethiopia: building on successes to accelerate newborn survival; 2015. Available from: (www.ephi.gov.et). Accessed November 20, 2016.
- WHO. World health statistics: part I global health indicators; 2015. Available from: (http://www.who.int/whosis/whostat/EN_WHS2011_Full.pdf). Accessed November 20, 2016.
- WHO. Global health observatory data repository world health organization; 2015. Available from: <http://apps.who.int/ghodata/>. Accessed November 24, 2016.
- Liu et al. Distribution of causes of neonatal and under-five deaths, CHERG/WHO/UNICEF. *Lancet*. 2014;388:3027–3035.
- United Nations Children's Fund, World Health Organization, World Bank and United Nations. *Levels & Trends in Child Mortality Report 2015*. New York (NY), Geneva and Washington (DC). Available from: http://www.unicef.org/publications/files/Sept_15.pdf. Accessed December 28, 2016.
- Olga G., Yeghiazaryan K, Cebioglu M et al. Birth asphyxia as the major complication in newborns: moving towards improved individual outcomes by prediction, targeted prevention and tailored medical care. *EPMA J*. 2011;2:197–210. doi:10.1007/s13167-011-0087-9
- Bilkisu G. *Prevalence and Risk Factors for Perinatal Asphyxia as Seen at a Specialist Hospital in Gusau, Nigeria*. 2016. IP: 8.37.232.140.
- Foumane P, Nkomom G, Mboudou ET et al. Risk factors of clinical birth asphyxia and subsequent newborn death following nuchal cord in a low-resource setting. *Open J Obstet Gynecol*. 2013;3(642):647.
- Central Statistical Agency (CSA) [Ethiopia] and ICF. 2016. Ethiopia Demographic and Health Survey 2016. Addis Ababa, Ethiopia, and Rockville, Maryland, USA: CSA and ICF.
- Fdre M Health Sector Transformation Plan (HSTP) 2015/16-2019/20 (2008-2012 EFY) Draft_V2. Oct2015.
- WHO Global Health Observatory (GHO) data. Under-five mortality; 2016. Available from: http://www.who.int/gho/child_health/mortality/mortality_under_five_text/en/. Accessed December 28, 2016.
- Farhana T, Rizvi A, Ariff S, Soofi S, Bhutta ZA. Risk factors associated with birth asphyxia in rural district matiari, pakistan: a case control study. *Int J Clin Med*. 2014;5:1430–1441. doi:10.4236/ijcm.2014.521181
- Lee ACC, Darmstadt GL, Mullany LC. *Risk Factors for Birth Asphyxia Mortality in a Community-Based Setting in Southern Nepal*. MPH Baltimore: Capstone Johns Hopkins School of Public Health; 2007.
- Bahubali G., et al. Antenatal and intrapartum risk factors for perinatal asphyxia: A case control study. *India Curr Pediatr Res*. 2013;17(2):119–122. .
- Getachew B, Yifru B. perinatal mortality and associated risk factors: a case control study. *Ethiop J Health Sci*. 2012;22(3).
- Bekana K, Abebaw G, Hardeep RS, Sisay Y. Prevalence and associated factors of neonatal mortality in North Gondar Zone, Northwest Ethiopia. *Ethiop J Health Dev*. 2012;26(2):66–71.
- Gurmesa T, Mesganaw F, Alemayehu W. Determinants and causes of neonatal mortality in Jimma Zone, Southwest Ethiopia: a multilevel analysis of prospective follow up study. *Plos one*. 2014;9(9): e107184.
- Berhan Y, Berhan A. Perinatal mortality trends in Ethiopia. *Ethiop J Health Sci*. 2014. doi:10.4314/ejhs.v24i1.4S
- Martono T. Risk factors for birth asphyxia: folia Medica Indonesiana. 2011;47(4):211–214.
- S B SS, Nair CC, G N M, Srinivasa S, Manjunath MN. Clinical profile and outcome of perinatal asphyxia in a tertiary care centre. *Curr Pediatr Res*. 2015;19(1 & 2):9–12.

Pediatric Health, Medicine and Therapeutics

Dovepress

Publish your work in this journal

Pediatric Health, Medicine and Therapeutics is an international, peer-reviewed, open access journal publishing original research, reports, editorials, reviews and commentaries. All aspects of health maintenance, preventative measures and disease treatment interventions are addressed within the journal. Practitioners from all disciplines are

invited to submit their work as well as healthcare researchers and patient support groups. The manuscript management system is completely online and includes a very quick and fair peer-review system. Visit <http://www.dovepress.com/testimonials.php> to read real quotes from published authors.

Submit your manuscript here: <http://www.dovepress.com/pediatric-health-medicine-and-therapeutics-journal>