

Neonatal asphyxia and associated factors among neonates on labor ward at debre-tabor general hospital, Debre Tabor Town, South Gonder, North Central Ethiopia

Abstract

Back ground: Birth asphyxia is defined as a harm to newborn (NB), caused by lack of oxygen (hypoxia) and/or lack of perfusion (ischemia) of various organs with sufficient intensity to promote changes in aerobic metabolism to anaerobic metabolism. It triggers metabolic acidosis and cardiovascular decomposition, such as peripheral vasodilatation and decreased cardiac output, resulting in severe fetal hypotension and reduced cerebral blood flow and consequently brain damage and organ dysfunction or fetal/neonatal death. Apgar score is used to determine the level of birth asphyxia.

Objectives: To assess neonatal asphyxia and associated factors among neonates on labor ward at DTGH, South Gonder, North Central Ethiopia, 2017.

Methods: Facility based cross sectional study design was conducted at DTGH from December 1 to 30/2017. Systematic random sampling technique was used to select study units. A total of 154 participants were involved in the study. Data were collected from participants using structured questionnaires. Data were entered into Epi data and exported into SPSS version 20 for analysis. Descriptive statistics, bivariate and multivariate binary logistic analyses were carried out. Finally, the findings were presented in text, figure and graph format.

Results: A total of 154 neonates and their respective mothers were participated in this study with a response rate of 100%. Among 154 neonate, 46 (29.9%) of them had birth asphyxia with Apgar score of less than seven. The predicted probability using logistic regression showed that gestational age, cord prolepses/presentation, mode of delivery, and meconium status were statistically associated with p-value <0.05.

Conclusion and recommendation: Neonatal asphyxia (low Apgar score ≤ 6) was generally 29.9% at DTGH during this study. Gestational age, cord prolepses/presentation, mode of delivery, and meconium status were statistically associated. Investigator recommends providers should get appropriate skill and strictly follow each laboring mother during labor and delivery to alleviate this problem.

Keywords: birth asphyxia, neonate

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Acronyms: ANC, Antenatal Care; AOR, Adjusted Odd Ratio; CI, Confidence Interval; COR, Crude Odd Ratio; CPD, Cephalopelvic Disproportion; CS, Cesarean section; DTGH, Debre Tabor General Hospital; EDHS, Ethiopic Demographic and Health survey; NA, Neonatal Asphyxia; NB, Newborn; SPSS, Statistical Package for Social Science; SVD, Spontaneous Vaginal Deliver; UK, United Kingdom; USA, United State of America; WHO, World Health Organization

Introduction

Birth asphyxia is defined as the failure neonates to initiate and sustain breathing at birth.¹ It is also defined as a condition that occurs when there is impairment of blood gas exchange that results in hypoxemia and hypercapnia.² The combination of hypoxia and ischemia will result in a cascade of biochemical changes in the body leads to brain neuronal death and brain damage.³ It can be caused by an events during antepartum or intra partum period. World Health

Organization (WHO) estimates that between four and nine million newborns develop birth asphyxia each year.⁴ The parameter of the Apgar score is used to determine the level of birth asphyxia, evaluated in the first and fifth minutes of life, with scores ranging from zero to ten. Values obtained from four to seven in the first minute of life indicate moderate birth asphyxia and the greater severity is between zero and three, suggestive of severe asphyxia.⁵

Birth asphyxia is one of the major causes of neonatal deaths and contributes to nearly 40% of under-five mortality.⁶ Malawi has made a steady progress in reducing under-five mortality from 244 to 71 deaths per 1000 live births between 1990 and 2012. Despite this progress, neonatal mortality rate is still high, 24 per 1000 live birth.⁷

Common risk factors of prenatal asphyxia includes maternal age under 16 or over 35 years old, gestational age <37 or >41 weeks, diabetes, utilization of illicit drugs and alcohol, hypertensive disorders, premature rupture of membranes, maternal infection, bleeding in the second or third trimester and labor > 24 hours.⁸ It has been shown that

99% of these neonatal deaths take place in the developing countries where prenatal asphyxia contributes to almost 23% of these deaths. Over half of these deliveries occur at home.⁹ In the latest World Health Statistics 2013, neonatal deaths have decreased from 4.4 million in 1990 to 3 million in 2011.¹⁰ Globally, 130 million infants born each year and approximately 4 million baby's die before they reach the age of one month. Ninety-eight percent of these neonatal deaths take place in the developing countries with prenatal asphyxia and birth injuries together contributing to almost 29% of these deaths. Asphyxia has been shown to be the 3rd most common cause of neonatal death (23%), preterm birth (28%) and severe infections (26%).¹¹ Neonatal mortality remains unacceptably high across much of developing country. In Southern Nepal birth asphyxia deaths are 9.8/1000 live births and it accounts for 30% of neonatal mortality. In Ethiopia, neonatal mortality and morbidity are among the highest in the world. According to EDHS (Ethiopia Demographic Health Survey) 2016, Neonatal mortality in Ethiopia is still high (28%) per 1000 live births and know a day in Ethiopia the neonatal mortality rate decreased by 28% to 11%.¹²

Common outcomes after birth asphyxia includes cognitive impairment and epilepsy, have a strong and pervasive negative influence, not only on the quality of life the child, but also on the parents, the large majority of which will report anxiousness, depression, and other problems of coping.¹³ Over a third of babies surviving moderate and severe birth asphyxia have identifiable cerebral palsy at 2 years of age, often presenting as dyskinesia or spastic quadriplegia, with or without other impairments such as mental retardation, blindness, and epilepsy.¹³⁻¹⁵ Different interventions are designed and applied to alleviate problems of child morbidity and mortality. Focused Antenatal care service (FANC) is one of the Key interventions to improve maternal and child health and reduce both death. Extensive efforts have been made to improve reproductive health services to reduce maternal and child mortality but there is high neonatal mortality.¹⁶ Therefore, this study aims to assess neonatal asphyxia and associated factors among neonates on labor ward in Debre Tabor General Hospital.

There was no study conducted on neonatal birth asphyxia and factor associated with this problem during labor in our local context. So, this study will give an insight on neonatal birth asphyxia and associated factor during labor in Debre Tabor General Hospital in labor ward. It helps health care providers to identify birth asphyxia factors and initiate interventions based on a research finding. It will also help to improve health care providers' and women's knowledge on neonatal birth asphyxia during labor. It also gives a guide for policy makers and stakeholders with updated information for future planning and interventions. Finally, it will be used as a baseline for scientific community to conduct extensive study in this area.

Objectives

General objective: To assess neonatal asphyxia and associated factors among neonates on labor ward at Debre Tabor General Hospital, South Gondar, North West Ethiopia, 2017.

Specific objectives: To assess magnitude of neonatal asphyxia in DTGH, 2017

To identify factors associated with neonatal asphyxia in DTGH, 2017.

Method and materials

Study area and period

The study was conducted in DTGH, which is found in Debre Tabor town, South Gondar zone, and Amhara region of Ethiopia which is located 666 kilometer from Addis Ababa, capital city of Ethiopia and 103 kilometer far from Bahir Dar, capital city of Amhara Region. Based on 2009 E.C estimation, this town has a total population of 87,627, of whom 41,957 are men. Among the total women, 3.3% of them are estimated to be pregnant and 2476 of those will have ANC follow-up. Debre tabor Town has one General Hospital, three health centers and gives health service for the south Gondar Zone population; the service in MCH unit, Gynecology and Obstetrics unit, Laboratory unit, minor surgery, Inpatient unit and Outpatient unit, Major Surgery, Ophthalmic unit, Dentist and Pharmacy unit. The total numbers of DTGH health care professional are 226 and 105 non health staffs (Source, Debre Tabor Town Administrator and DTGH Humane Resource Department). The study was conducted from December 1 to 30/2017.

Study design

Facility based cross sectional study design was employed.

Source population: All neonates in Debre Tabor General Hospital.

Study population: All selected neonates that were delivered in labor ward at DTGH during the data collection period.

Inclusion and exclusion criteria

Inclusion criteria: Neonates that are delivered at DTGH in labor ward regardless of their outcome

Exclusion criteria: Neonates which were delivered at home and/or other health institutions that referred to DTGH. Mothers who are seriously ill.

Sample size determination

The Sample size was determined by using single population proportion formula with the assumption of a 95% confidence interval, 5% margin of error, The magnitude of neonatal asphyxia is 23% taken from EDHS 2011. Therefore, (p=0.23).

$$n = \frac{\left(z_{\frac{\alpha}{2}} \right)^2 * p(1-p)}{d^2}$$

Where

n = the desired sample size

Z= standard normal distribution value at 95% confidence level of $\alpha/2= 1.96$

P = proportion of neonatal asphyxia=0.23

d = margin of error= 5% or 0.05

$$n = \frac{(1.96)^2 * 0.23(1-0.23)}{0.05^2} = 272$$

But for the population less than 10, 000 the following correction formula is used.

$$n = \frac{no}{1 + \frac{no}{N}}$$

Where; no =desired sample for population less than 10, 000

n=desired sample size for population greater than 10, 000.

N=estimate of the population size= 289. Hence the desired sample size is

$$nf = \frac{272}{1 + \frac{272}{289}} = 140$$

Then, by adding 10% of non-respondent rate, final desired sample size was 154.

Sampling procedures

Participants were selected by systematic random sampling technique from obstetrical ward. The first participant was selected randomly by lottery methods. Another participants were selected every two (K=2) intervals (k= 289/154=2). The mother was interviewed every 2nd intervals after determination of Kth value.

Variables of the study

Dependent variable: Neonatal asphyxia

Independent variables: Socio demographic variables of the mother

- Age
- Occupation
- Marital status
- Educational status
- Residence
- Income

Obstetric variables

- Pregnancy condition
- Condition of labor started
- Gravidity
- Parity
- Duration of labor
- Mode of delivery
- ANC follow up
- Previous still birth

Neonatal variables

- Gestational age
- age of neonate
- Sex
- Birth weight
- APGAR score
- Meconium status
- Fetal presentation
- Type of delivery

Operational definition

Birth asphyxia-a newborn who is breathing poorly (less than 30 breaths per minute) gasping or not breathing at all.¹⁷

Asphyxia- Is a condition in which APGAR score ≤ 6 .^{5,18}

Moderate Asphyxia- Is a condition in which APGAR ≤ 6 to 4.^{5,18}

Sever asphyxia- Is a condition in which APGAR ≤ 3 .^{5,18}

Preterm - is birth of the baby before 37 completed weeks of gestational age.¹⁹

Antenatal care- is the care given for pregnant mother during her pregnancy period before delivery.²⁰

Data collection procedures

Three diploma midwifery for data collection and two BSC nurses for supervision were recruited. The data were collected using a structured and pretested questionnaire adapted after review different literatures. The questionnaire was first developed in English and translated into Amharic versions and re-translated back into English by language experts to assure its consistency. Participants were interviewed in appropriate place by trained data collectors after using the services.

Data quality control

Training was given for data collectors and supervisors by principal investigator. The questionnaire was pre-test on 5% (8 respondents) of study participants in Addiszemen Hospital, who were not involved in actual data collection and modification was done accordingly. During data collection, trained supervisors strictly supervised the correctness of the questionnaire. Principal investigator also checked the completeness and correctness of filled questionnaires. Data were entered using Epi data version 3.1.

Data processing and analysis

The questionnaires were coded and entered into Epi data version 3.1 and exported to SPSS version 20 for analysis. Data were summarized and presented using descriptive statistics. Chi-square test was used to check variables having association with the dependent variable. Then, those variables found to have p-value of less than 0.05 was considered as significant variable. Finally the finding was presented by text, graph and table formats as appropriate.

Ethical considerations

Ethical clearance was obtained from Debre Tabor University College of health Science Ethical Review Board. Official letter was written to Debre Tabor General Hospital. Participants' confidentiality and anonymity was kept. Informed verbal and written consent were also taken individually, and any respondents who were not assured given a full right to refuse to participate in the study without any negative connotation on their future service.

Result and discussion

Socio demographic characteristics

A total of 154 respondents were interviewed at this study after delivery. Mean age of respondents were 91 (59.1%) which belong age group of 24-34. Majority of respondents 145(94.2%) were orthodox and married 152(98.7%). Majority respondents [110 (71.4 %)] also come from urban area. Further detail Table1.

Antenatal care and obstetric characteristics of laboring mothers

Among respondents, 150 (97.4%) laboring women visited health facilities during their pregnancy and 139(92.1%) had four times

and above ANC follow up. Majority, 140 (90.9%) mothers had no history of previous neonatal deaths. Among the neonatal deaths (14), 7 (46.7%) of newborns died within the first 24 hours of delivery. Majority of pregnancy 142(92.2%) were wanted. Further for detail see Table 2.

Factors associated with birth asphyxia

In bivariate logistic regression analysis, gestational age, birth weight, duration of labor, cord prolapses/presentation, mode of delivery, meconium status, and obstetrics complication were statistically associated with birth asphyxia with p-value <0.2 at 95% C.I. After bivariate analysis only those variables which were significantly related (p-value <0.2) were entered for further multivariate analysis. Finally, gestational age, cord prolapses/presentation, mode of delivery, and meconium status were statistically associated with p-value <0.05 at 95% C.I. in multivariate analysis (Table 3). Gestational age < 37 weeks were 3.81 times more likely to be asphyxiated as compared to normal gestation (37-42 weeks) AOR =3.81(1.752, 8.285) at 95% CI. A newborn who had no meconium were 98.5% less likely to be asphyxiated as compared to a newborn that had GIII meconium AOR 0.015(0.002, 0.118).

Discussion

Neonatal Asphyxia is the third major problems of neonates next to sepsis in Ethiopia. It also accounts 23 percent of neonatal death. There is an evidence that shows major case of neonatal asphyxia were preterm, low birth weight, prolonged labor, mal presentation, post term, cord complication, instrumental delivery, intrauterine meconium stained, induction and augmentation and other associated factors. This study attempted to assess neonatal asphyxia and associated factors among neonates who was delivered at DTGH. Overall prevalence of neonatal birth asphyxia was 29.9%. This means, 46 (29.9%) neonates had low Apgar score less than or equal to six (≤ 6) in the first minute immediately after delivery regardless of classification of asphyxia. This high rate could be explained by the fact that this hospital is the state referral center where complicated cases are referred from different health institution of the catchment area. From this study, we had got neonates delivered at gestational age less than 37 weeks, 48.8% (n=20), had low Apgar score (≤ 6) which is associated with Gestational age <37 weeks. The finding is concurrent with study conducted in Brazil on risk factor associated with asphyxia.⁸

Neonate who was born with gestational age of < 37week and > 42 week were 3.81 and 6.667 time more likely develop birth asphyxia as compared to neonate with gestational age within 37-42 week. Neonates who were born with cord presentation was 4.135 more likely develops birth asphyxia as with non-cord presentation. This finding is in line with study conducted in Brazil which examined prevalence of prenatal asphyxia in a reference maternity.⁸ This study also reveal that neonate delivered by using C/S and instruments were 3.23 and 3.06 times more likely develop birth asphyxia as compared with vaginal delivery. This find confront with study in which the perinatal asphyxia had more frequently in vaginal deliveries. The discrepancy might be due to difference of study participant, availability of necessary equipments in that study area.²¹

Absence Intra uterine meconium stained newborns, G-I and G-II were 98.5%, 96.9% and 90% less likely to be borne with APGAR score less than seven at 95% CI (AOR 0.015(0.002, 0.118), 0.031(0.003, 0.351), and 0.102(0.011, 0.965) respectively. This is similar with

study conducted in Sweden indicates that intrauterine meconium stained is associated with neonatal asphyxia.²²

Generally, this study reveals significant proportion (29.9%) of newborns had low Apgar score (≤ 6) due to maternal and fetal related obstetric complications including gestational age, cord prolapses/presentation, mode of delivery meconium status and were statistically associated.

Limitations of the study

Since it is cross-sectional study, it is difficult to claim causal relationship and gives only evidences of neonatal birth asphyxia status within times of study period. There might be social desirability bias as the interview conducted at health facility.

Conclusion

Birth asphyxia is one of the leading causes of neonatal deaths. Neonates who suffer birth asphyxia can have long-term neurological complications which might affect their quality of life. Findings of this study have shown that associative factors for birth asphyxia at DTGH were gestational age, cord prolapses/presentation, mode of delivery, meconium status and were statistically associated.

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Author contributions

WN: conceptualized, designed the study, collect, analyses and interpretation the data and also drafted the manuscript. AY: designed the study; analyses; interpret the data; drafted and approved the manuscript.

Conflicts of interest

The authors report there was no conflicts of interest in this work.

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