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Magnitude of Birth Asphyxia and Associated Factors among Newborns Admitted in Neonatal Intensive Care Unit at Government Hospitals in Addis Ababa, Ethiopia, 2021: Multicenter Cross-Sectional Study

Misganaw Molla[1]*, Alemayehu Mekonnen[2], Yohannes Godie[3], Yitayal Guadie[4] and Dires Birhanu[4]

[1]Ras Desta Damtew Memorial Hospital, Addis Ababa, Ethiopia
[2]Ethiopian Public Health Associations, Addis Ababa, Ethiopia
[3]Debre Markos University, Debre Markos, Ethiopia
[4]Dilla University, College of Health Science, Department of Nursing, Dilla, Ethiopia

Abstract

Background: Birth asphyxia is failure to initiate and sustain breathing immediately after birth. According to world health organization (WHO), it is the third major cause of neonatal death after infections and Preterm births in developing countries, accounts for an estimated 23% of the annual 2.6 million neonatal deaths. Birth asphyxia is a serious clinical problem and a leading cause of neonatal mortality and morbidity worldwide. The majority of neonatal deaths arise in low- and middle-income countries.

Objective: To assess the magnitude of birth asphyxia and associated factors among newborns admitted in NICU at government hospitals in Addis Ababa, Ethiopia, 2020.

Methods: Facility based cross-sectional study was conducted from September, 2020 to October, 2020. The study was conducted in Addis Ababa governmental hospitals selected by lottery method. Systematic random sampling technique was utilized to select 337 respondents. Data was collected on participants using structured questionnaires. Data were entered into Epi data entry 4.6 and exported in to SPSS version 26 for analysis. Descriptive statistics, Bivariate and multivariate logistic regression analysis were carried out. Finally findings were presented in text, tables, figures and graphs format.

Results: Of the new-borns, 19.3% had birth asphyxia, and factors associated significantly were Prolonged labour (AOR=3.32, 95% CI: 1.16 – 9.49), APH (AOR=6.28, 95% CI: 1.52–25.89), preeclampsia (AOR=4.03, 95% CI: 1.47–11.06), fetal distress (AOR=3.17, 95% CI: 1.32–7.66) and meconium stained amniotic fluid (AOR=2.68, 95% CI: 1.12–6.44)

Conclusion: Prolonged labour, APH, preeclampsia, fetal distress and Meconium stained liquor were significantly associated with birth asphyxia. Therefore, early screening and appropriate intervention during pregnancy, and intra-partum might reduce perinatal asphyxia among new-borns.

Introduction

World Health Organization (WHO) defines birth asphyxia as failure to initiate and sustain breathing at birth. And also defines as persistent Apgar score of 0 to 3 for more than 5 minutes, neonatal neurological sequel such as seizure, coma, and hypotonic and multi-organ system dysfunction.

Another definition of birth asphyxia is oxygen deprivation that occurs around the time of birth and may be caused by several perinatal events. It is also stated as evolution from the utilization of a single indicator such as low APGAR score or delayed respiration to a multiple indicators approaches focusing especially on the neurological damage. The neonatal period is the first 28 days of life but also the most vulnerable time for survival. Globally, 45% under-five children death occurs during the neonatal period.

Birth asphyxia is oxygen deficit at delivery which can lead to severe hypoxic organ damage [heart, lungs, liver, gut, kidneys), but brain damage is of most concern and perhaps the least likely to quickly or completely heal. In more pronounced cases, an infant will survive, but with damage to the brain manifested as either mental, such as developmental delay or intellectual disability, or physical, such as spasticity[1].

A diagnosis of birth asphyxia may be made when a baby has a < 7 APGAR score. Another way of identifying birth asphyxia is checking the acidity of the blood in the umbilical cord. If it is too acidic,**or,**arterial

pH is <7, it can be a sign that the baby has had a period of oxygen deprivation. When the new-born has at least one of the following signs, not breathing, gasping, <30 breaths per minute or <7 APGAR score. Perinatal asphyxia is a lack of blood flow or gas exchange to or from the fetus in the period immediately before, during, or after the birth process. Perinatal asphyxia can result in profound systemic and neurologic sequel due to decreased blood flow and/or oxygen to a fetus or infant during the per partum period. When placental (prenatal) or pulmonary (immediate post-natal) gas exchange is compromised or ceases altogether; there is partial or complete lack of oxygen to the vital organs. This results in progressive hypoxemia and hypercarbia. If the hypoxemia is severe enough, the tissues and vital organs (muscle,

liver, heart, and ultimately the brain) will develop an oxygen debt (obligation). Neonatal hypoxic-ischemic encephalopathy refers specifically to the neurologic sequel of perinatal asphyxia.

Globally birth asphyxia continues to present a major clinical problem and one of the common and leading causes of neonatal mortality and morbidity especially in developing countries. Almost all (99%) neonatal deaths arise in low-income and middle-income countries especially in sub- Saharan Africa. One-fourth of the deaths during the first four weeks of life are attributed to Ante-partum, Intra-partum "birth asphyxia" and postpartum care.

Globally Intra-partum asphyxia accounts for 814,000 death/year, and it is the 5th most common cause of death in under 5children and is responsible for 42 million disability adjusted life year.An estimated one million children who survive birth asphyxia live with chronic neuro-developmental morbidities, including cerebral palsy, mental retardation, and learning disabilities [2].

In Ethiopia NMR accounts for29/1000 live births. A large proportion of this death occurs during the first 48 hr. after delivery and still declined little. About 1 million babies have died due to birth asphyxia related complications in the 1st month of life, and millions have a lifetime of impairment. Birth asphyxia was one of the contributors of early neonatal death with 34% and followed by 25% prematurity and 18% sepsis and other infectious conditions.

Neonatal mortality remains unacceptability 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%.

Studies in northwest Ethiopia have shown that birth asphyxia is influenced by multiple factors stemming from the ante-partum period. However, factors relating to intra-partum are the predominant risk factors, accounting for 91% of asphyxia. Even though different studies in Ethiopia identified different factors associated with birth asphyxia, asphyxia is still one of the basic neonatal problems in the country. Therefore, this study aimed to investigate the magnitude and factors associated with birth asphyxia.

Materials and Methods

Study area, design and study period

The study was conducted in Addis Ababa. Addis Ababa city Administration, Addis Ababa is the capital city of Ethiopia and seat of African Union and the United Nations World Economic Commission for Africa. It covers an area of 527 square kilometers and subdivided into 10 sub cities. According to population projection value for 2019 the city has an estimated population of 4.592 million.

Addis Ababa city administration has 11 government Hospitals, six of them are owned by Addis Ababa Health Bureau, four by Ministry of Health and the remaining one by Addis Ababa University - Tikur Anbessa Specialized hospital. Ten of the 11 hospitals have NICU. The city additional owns23 health centers, 9 clinics and 34 health posts. The study will be conducted in three selected hospitals that include Gandhi Memorial hospital (GMH), Yekatit 12 hospital medical college (Y12HMC) and Ras Desta Damitew memorial hospital (RDMH).

Monthly on those selected hospitals, totally around 1,300 newborns are admitted, from these GMH 520, Y12HMC 420 and RDMH 360, among those more than 85 newborns monthly diagnosed with PNA according to each selected hospitals registration log book records. The study employs a quantitative study method in the form of facility based cross sectional survey from September to October, 2020 [3].

Population

All newborns admitted to public health facilities of Addis Ababa city administration were the source pf population and newborns admitted to NICU at selected hospitals of Addis Ababa city administration during the data collection period and fulfill the inclusion criteria were study population.

Inclusion and Exclusion Criteria

Newborns that were admitted at those selected governmental hospitals in NICU regardless of their outcome were the inclusion criteria and newborns delivered before 28 weeks of GA exclusion criteria..

Sample size and sampling procedure

Single proportion formula n= $\frac{Z^{\alpha}/_2 2p(1-p)}{d^2}$ was be used to

Where; Z = standard normal distribution value at 95% confidence level of $\frac{a}{2}$= 1.96,

n= sample size,

p= Prevalence of perinatal asphyxia among neonates among the selected Tigray hospitals was 22.1%

d= margin of error= 4%=0.04

Using the above formula the sample size calculated as:

z= 1.96 at 95% confidence

p= 22.1%=0.221

So, $n = \frac{Z^{\alpha}/_2 2\,p(1-p)}{d^2}$

$n = \frac{1.96^2 \times 0.221 \times 0.779}{0.04^2}$

n= 414

N.B: Then, by adding 10% of non-respondent rate, final desired sample size was 414 + 10% non-response rate n=455

But for the population less than 10, 000 the following correction formula was 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 for the selected three hospitals 1,300, Hence the desired sample size was

n= $\frac{455}{1+\frac{455}{1,300}}$ = 337

❖ Then, the final sample size was 337

Sampling procedure and technique

The study was conducted to selected governmental Addis Ababa hospitals. From the total public hospitals having admitted to NICU,

three hospitals were selected by simple random sampling technique [4]. The calculated sample for each hospital was proportionally be allocated based on an average number of newborns admitted in NICU in the past three months prior to the survey.

According to each hospital data admitted to NICU newborns in the past two months prior to the study period found under each hospital from January 1st, 2020 to February 30th, 2020.

The first participants were selected randomly by lottery methods. Another participant were selected every eight (k=4) intervals. The mother were interviewed every 4th intervals after determination of kth value. By using proportional allocation formula 135, 109 and 93 mother were selected randomly from Gandhi, Yekatit12Hospital Medical College and Ras-Desta Damtew Memorial Hospital respectively.

Study Variables

Birth Asphyxia was the dependent variable while, **Socio-demographic characteristics:** maternal age, occupation, educational status, residence and income **Ante-partum variables:** pregnancy condition: History of diabetes, Preeclampsia, Anemia and Any previous history of birth asphyxia**, ANC follow up, Previous still birth, Gravidity, Parity. Intra-partum variables:** Condition of labor started**, Duration of labor, Mode of delivery, Meconium stained, General Anesthesia received during C-section, Neonatal variables;** Gestational age, Birth weight, APGAR score, Fetal presentation and History of cry and seizure were independent variables [5].

Operational Definitions/ Definition of Terms

Birth asphyxia: new-born who is breathing poorly (less than 30 breaths per minute) Gasping or not breathing at all.

APGAR scoring: consists of five physical sign: color, heart rate, reflex irritability, muscle tone, respiratory effort. In our study Birth asphyxia is define when babies are unable to breathe at 5th min after birth and APGAR score <7 at 5th min.

Prolonged labor was considered when the labor, after the latent phase of first stage of labor, exceeds 12 hours in primi-gravida or 8 hours in multipara mothers.

Obstructed labor was considered when the presenting part of the fetus could not progress into the birth canal, despite strong uterine contractions.

Premature rupture of membranes (PROM) was defined as a rupture of the membrane of the amniotic sac and chorion occurred more than one hour before the onset of labor.

Mal-presentation was defined as any fetal presentation other than vertex

Data collection tool and procedure

Data were collected by six BSC degrees in those selected hospitals and three senior BSC Nurse Supervisors were recruited. Data were collected using a structured and pretested questionnaire adopted after review different literatures .The questionnaire were 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 appropriate place by trained data collectors after using the services. Training was given for data collectors and supervisors by principal investigator. The questionnaire was pre-test on 5% of study participants in each selected governmental Hospitals, that was 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 questioners.

Data Analysis Procedure

Data was cleaned manually, coded and entered into Epi data version 4.6 and exported to SPSS version 26 software for further analysis. After coding, and entering the data to the software descriptive statistics was used to calculate the result in proportion, frequencies, cross tabulation, and measure of central tendency. Tables and graphs were used to present the result. Bivariate and multiple logistic regression analysis were carried out. All variables with p-value ≤ 0.25 were taken into the multivariable model to control for all possible confounders [6]. The cut point to declare the presence of statistical association between dependent and independent variable were p-value<0.05 or AOR, 95% CI.

Result

Socio-demographic characteristics of the participants

Out of those, 337 live births were selected for this study; the response rate was 100% newborns/mother pairs were involved. About 199 (29.4%) of the mothers were aged 25 – 29 years and a median age of the mother was 28 years and (SD was 4.71). Majority 120 (39.3%) of the respondents were secondary education whereas 105(34.4%) of them were in primary educational level and 320 (95.0%) mothers were married. The mean income of participants were 4281.5 Ethiopia birr and (SD 2,694.9) per month **(Table 1).**

Hospitals from September to October, Addis Ababa, Ethiopia, 2020. (n=337).

Table 1: Socio-demographic characteristics of mothers whose newborns in selected government.

Variables	Frequency	Percentage (%)
Age_ group of the mother (year)		
20-24	58	17.2
25-29	175	51.9
30-34	61	18.1
≥35	43	12.8
Marital status_ group		
Married	320	95
Un married	17	5
Educational status		
No education	26	8.5
Primary education	105	34.4
Secondary education	120	39.3
College and above	54	17.7
Occupation status		
Housewife	106	31.5
Gov't employee	81	24
Prt employee	104	30.9
Merchant	38	11.3
Others	8	2.4
Residency		
Urban	300	89
Rural	37	11
Income_ quartile (Eth. Birr)		
<2400	78	23.1
2401-3600	81	24
3601-5000	91	27
>5001	87	25.8

Obstetrics and newborn factors of the birth asphyxia

The prevalence of birth asphyxia was 65 (19.3%). Almost all 58(17.2%) were unable to breath and were as 7(2.1%) of them are unable to feed, bluish discoloration, abnormal movement and others. Among respondents 327(97.0%) mothers were visit health facilities during their pregnancy time among those mother 106 (32.4%) had four times and above. Majority 185(54.9%) was mothers with newborns 37-42 weeks of gestational age. Regarding membrane about 67(19.9%) had rupture of member greater than 18 hours. In this study 154(45.7%) of mothers had complicated before giving birth or during delivery time such as 20(5.9%) Anemia, 23(6.8%) Ante-partum hemorrhage (APH), 58(17.2%) Obstructed lab our, 44(13.1%) Preeclampsia and 25(7.4%) Eclampsia. Regarding birth weight 214(63.5%) of newborns had ≥2.5kg (**Table 2**).

Table 2: Obstetrics and newborn factors of birth asphyxia among mothers with newborns in selected government hospitals from September to October, Addis Ababa, Ethiopia, 2020. (n=327).

Variables	Frequency	Percentage (%)
Birth Asphyxia		
Yes	65	19.3
No	272	80.7
Parity		
Multi	160	47.5
Prmi	177	52.5
Gestational age		
Pre-term	139	41.2
Term	185	54.9
Post-term	4	1.2
UN known	9	2.7
Mode of delivery		
SVD	179	53.1
Instrumentals	15	4.5
C/S	143	42.4
Fetal presentation		
Vertex	275	81.6
Non-vertex	62	18.4
Type of pregnancy		
Single	309	91.7
Double	28	8.3
Did the mother receive analgesics		
Yes	146	43.3
No	191	56.7
Duration of ROM		
<18hour	67	19.9
≥18hour	270	80.1
Prolonged labor		
Yes	47	13.9
No	290	86.1
Is there any complication		
Yes	**154**	45.7
No	183	54.3
Anemia (n=154)		
Yes	20	13
No	134	87
Ante-partum hemorrhage (n=154)		
Yes	23	14.9
No	131	85.1
Preeclampsia (n=154)		
Yes	44	28.6
No	110	71.4
Eclampsia (n=154)		
Yes	25	16.2
No	129	83.8
Is there any risk of BA		
Yes	**132**	39.2
No	205	60.8
Meconium stained liquor (n=132)		
Yes	64	48.4
No	68	51.6
Fetal distress (n=132)		
Yes	113	85.6
No	19	14.4
Chorioamnionitis (n=132)		
Yes	27	20.5
No	105	79.5
Birth weight (kg) (n=337)		
<2.5	123	36.5
≥2.5	214	63.5

Associated Factors of birth asphyxia among newborns with mothers

The association of the independent and dependent variable were first tested by using bivariate analysis variable which were associated (P≤0.25) with tested in the final multivariate analysis to see their significant association with birth asphyxia. Accordingly, as shown in Table 4 below, those bivariate regression associated with the crude odds ratios (COR) for Birth asphyxia such as age of the mother, education of the mother, residency, antenatal care follow up(ANC), Mode of delivery, received maternal analgesics, ROM, prolonged labour, obstructed labour, APH, preeclampsia, MAS, fetal distress and Birth weight.

In Multivariate analysis results showed that, there was statistically significance association found between birth asphyxia, parameters which showed p-value of below 0.05 were prolonged labour, APH, preeclampsia, fetal distress and Meconium stained liquor [7].

The odds ratio of newborns whose mothers born after complicated with Ante-partum hemorrhage were 6.28 (AOR=6.28, 95% CI: 1.52-25.89) times more likely to develop birth asphyxia compared to those newborns whose mothers are born after complicated without Ante-partum hemorrhage. On the other hand, newborns whose mothers are complicated with preeclampsia were 4.03 (AOR=4.03, 95% CI: 1.47-11.06) times higher to develop birth asphyxia compared to newborns whose mothers are without preeclampsia.

Prolonged labor was statistically significant factors of birth asphyxia in this study. Newborns who were born from mothers with prolonged labor were 3.32 (AOR=3.32, 95% CI: 1.16-9.49) times more likely to develop birth asphyxia compared with their counter-parts. In addition, newborns who had intra-partum fetal distress were 3.17 (AOR=3.17, 95% CI: 1.32-7.66) times more likely to develop birth asphyxia compared with those newborns who are normal fetal heart beat.

The odds ratio of Meconium stained liquor was also an important determinant factor of birth asphyxia in this study. Newborns who had Meconium stained liquor 2.68 (AOR=2.68, 95% CI: 1.12-6.44) times more likely to develop birth asphyxia than those newborns whose mothers are born after complicated without Meconium stained liquor (**Table 3**).

Keys: 1= Reference

Table 3: Bivariate and Multivariate logistic regression of magnitude of birth asphyxia and associated factors among newborns admitted NICU in government hospitals from September to October, Addis Ababa, Ethiopia, 2020. (n=337).

Variables	Birth Asphyxia		COR (95% of CI)	AOR (95% OF CI)
	No	Yes		
Age_ group of mothers				
20- 24				
25-29	47(81.0%)	11(19.0%)	0.44(0.18-1.08)	0.34(0.09-2.98)
30-34	144(82.3%)	31(17.1%)	**0.40(0.19-0.84)***	0.461.17-1.20) 0.47(0.12-1.78)
≥35	53(86.9%)	8(13.1%)	**0.28(0.11-0.75)***	1
	28(65.1%)	15(34.9%)	1	
Educational status				
No education	14(58.3%)	10(41.7%)	**3.13(1.18-8.29)***	3.07(0.86-10.99)
primary (1-8)	94(87.9%)	13(12.1%)	0.61(0.27-1.34)	0.39(0.13-1.24)
Secondary plus	94(78.3%)	26(21.7%)	1.21(0.61-2.43)	1.67(0.67-4.16)
College & above	70(81.4%)	16(18.6%)	1	**1**
Residency				
Urban	246(82.0%)	54(18.0%)	**0.52(0.24-1.11)***	0.87(0.29-2.62)
Rural	26(70.3%)	11(29.7%)	1	1
ANC				
1-3 times	181(81.9%)	40(18.1%)	**0.59(0.25-1.40)***	0.27(0.07-1.05)
≥4 times	81(76.4%)	25(23.6%)	1	1
Mode of delivery				
SVD	155(86.6%)	24(13.4%)	**0.39(0.23-0.70)***	0.66(0.26-1.68)
Instrumentals	14(93.3%)	1(6.7%)	0.18(0.02-1.45)	0.10(0.01-1.46)
C/S	103(72.0%)	40(28.0%)	1	1
Did the mother receive analgesics				
Yes				
No	111(76.0%)	35(24.0%)	**1.69(0.98-2.92)***	0.45(0.17-1.19)
	161(84.3%)	30(15.7%)	1	1
ROM				
≥18 hour	48(71.6%)	19(28.4%)	**2.22(1.14-4.32)***	0.73(0.29-1.79)
<18 hour	224(83.0%)	46(17.0%)	1	1
Prolonged labor				
Yes	32(68.1%)	15(31.9%)	**2.25(1.13-4.46)***	**3.32(1.16-9.49)****
No	240(82.8%)	50(17.2%)	**1**	**1**
Obstructed labor				
Yes	37(63.8%)	21(36.2%)	**2.03(0.99-4.17)***	2.21(0.86-5.65)
No	238(84.2%)	44(15.8%)	1	1
APH				
Yes	11(47.8%)	12(52.2%)	**3.67(1.47-9.16)***	**6.28(1.52-25.89)****
No	261((83.1)	53(16.9%)	**1**	**1**
Preeclampsia				
Yes	25(56.8%)	19(43.2%)	**4.08(2.08-0.01)***	**4.03(1.47-11.06)****
No	247(84.3%)	46(15.7%)	**1**	**1**
Meconium stained				
No	33(51.6%)	31(48.4%)	**6.60(3.59-12.13)***	**2.68(1.12-6.44)****
Yes	239(87.5%)	34(12.5%)	1	1
Fetal distress				
Yes	71(62.8%)	42(37.2%)	**0.17(0.50-0.59)***	**3.17(1.32-7.66)****
No	201(89.7%)	23(10.3%)	1	1
Birth weight group				
<2.5 kg	91(74.0%)	32(26.0%)	**1.93(1.12-3.34)***	1.39(0.66-2.98)
≥2.5 kg	181(84.6%)	33(15.4%)	1	1

*P≤0.25, COR, Statistically significant by Bivariate analysis

**P<0.05, AOR, Statistically significant by Multivariate logistic regression

Discussion

This study aimed to assess the magnitude of birth asphyxia and associated factors among newborns admitted NICU in government hospitals in Addis Ababa, Ethiopia.

In this study, the prevalence of birth asphyxia among newborns admitted NICU in government Hospitals in Addis Ababa was 19.3%. In this study, the prevalence of birth asphyxia was 22.6% in the 1st minute of birth. This finding is lower compared to a study conducted

in northeast Amhara, Ethiopia 22.6% in the 1st minute of birth, in Delia 32.8%, in Jimma hospital Southwest, Ethiopia (32.9%) in the first minute) and in Nigeria (21.1%. This variation is could be due to this study include more than 97% of new-borns' with mothers are visiting ante natal care. In addition, in Addis Ababa good infrastructure, health facilities easily availability, good awareness of the family may have positive influence on lower prevalence of birth asphyxia in our study. **But it was higher** compared to a retrospective study which was conducted in Dilchora referral hospital in Dire-Dawa, Ethiopia (3.1%), Cameroon (8.5%)and in India (6.6%). From this we can explain that this finding inconsistency may be due to the difference in the study population, study area and time [8].

In this study prolonged labor was statistically significant factors for birth asphyxia. The odds of Birth Asphyxia were 3.32 times greater in newborns who were delivered from prolonged labor. This finding agrees with findings of in Tigray, Gondar, Dire-Dawa and Pakistan, This may be due to prolonged labor makes the baby to be involved in labor for prolonged time that carries higher risk of birth trauma; In addition, many conditions associated with prolonged labor make newborns more likely that the baby will be exposed to Pitocin and instrumental assisted deliveries. All of this issue can cause the baby to have birth asphyxia. Another explanation, if the labor does not progress normally, the woman may experience serious complications, such as dehydration, exhaustion, or rupture of the uterus. It is also clear that when labor is prolonged, there is a high probability for the fetus to become distressed.

Another factor found to have significantly associated with birth asphyxia was intra-partum fetal distress. Neonates with intra-partum fetal distress had 3.17 times higher risk of birth asphyxia than those born with normal fetal heart rate. A similar result was obtained in a previous study done in Gondar, Ethiopia Karachi and Al-Diwaniya Maternity and Children Teaching Hospital. The possible explanation is fatal distress happens when the foetus does not receive adequate amounts of oxygen during pregnancy or labour so that this can further cause difficulty to initiate and sustain breathing after birth and fetal distress is the main indication of emergency CS which is a known risk factor for birth asphyxia.

Ante-partum hemorrhage had significant association with birth asphyxia. Mothers who had ante-partum hemorrhage had 6.28 times higher risk than those who hadn't ante-partum hemorrhage to the outcome of birth asphyxia. This study is in line with studies reported previously in Tigray, Dire-Dawa, Ethiopia, Pakistan and Indonesia. This could be due to the fact in the ante-partum bleeding; there is decreased blood flow from mother to placenta so the hypoxemia can occur in the fetus [9]. This condition can lead to birth asphyxia. It may also be due to the delay to go to the nearby health institution after the happening of antepartum hemorrhage.

Newborns whose mothers had Preeclampsia were 4.03 times higher to develop Birth Asphyxia compared to non-asphyxiated newborns. Moreover, this finding is consistent with a study conducted in Dire-Dawa referral hospital, Eastern Ethiopia, in Jimma zone public hospitals, Southwest Ethiopi, in Nigeria Public Hospital, Nigeria and in Karachi Hospital in Pakistan.Preeclampsia have been associated with increased risk of birth asphyxia in multiple hospital-based studies in Nepal. Births which result after a complicated labor like Preeclampsia may be affected in several different ways, which may increase their risk and which result in vulnerable babies that are prone to asphyxia, as compared to uncomplicated labor. This can be due to the fact labor complications such as preeclampsia related problems, may decrease the blood and oxygen supply to the infant and, in turn, lead to birth asphyxia.

Finally, in this study, Newborns whose mothers had meconium stained amniotic fluid was 2.68 times higher to develop Birth Asphyxia when compared to non-asphyxiated newborns. A similar studies which was conducted in Gondar, Ethiopia in northeast Amhara, Ethiopia 22.6% in the 1st minute of birth,in Debre Tabor Hospital, south Gondar, Ethiopia,in Tigray [10] Ethiopia and UgandaThis might be due to the reason, newborns delivered from mothers with meconium-stained amniotic fluid are more predisposed to aspirate it and fill smaller airways and alveoli in the lung. This can further lead to lung inflammation, obstruction, and limited lung movement. Then due to limited gas exchange birth asphyxia could occur.

Conclusion

Birth asphyxia is one of the worldwide problems of neonates. It raises different complications if the cases left untreated and lead to death. There are different factors which are the causes of birth asphyxia. The findings of this study suggest that among neonates admitted to NICU at government hospitals prolonged labour, APH, preeclampsia, fetal distress and Meconium stained liquor was significantly associated with birth asphyxia.

Declaration

Ethical Consideration

The ethical clearance was obtained from Addis Ababa Public health research and emergency management directorate and institutional review board (IRB) of Santé Medical College, Institute of Public Health, College of Medicine and Health Science, Department of Reproductive health. Informed verbal consent was obtained from each respondent after explaining the purpose and procedure of the study. No name or other identifying information was included in the instrument. Formal letter was submitted to GMH, Y12HMC and RDMH NICU department in order to get permission to carry out the study. The eligible study participants were enrolled in the study only after they give written informed consent and were not forced to participate.

Considering the sensitivity of this research, all the basic principles of human research ethics (respect of persons, beneficence, voluntary participation, confidentiality and justice) were respected.

The information regarding the study participants was kept confidential by using specific identification for each of them and was not used apart from this study. Other medical information which is not necessary for the study purpose was not accessed.

Consent for publication

All authors approved that this manuscript is eligible for publication.

Availability of data and materials

The data and other documents used in this study are available from the corresponding author.

Competing interests

The authors declare that they have no conflict of interest.

Funding

Author's contribution

MM: conceptualization, methodology, data entry, data cleaning, data analysis, writing original draft, AM, YG,YG and DB, validation, tool evaluation, methodology, reviewing and editing. Finally, all authors approved the manuscript.

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