



# **Prevalence of Low Birth Weight and Associated Factors among New Born Babies in Ataye Primary Hospital, North Shoa, Ethiopia, 2018**

**Tenagnework Dilnessa<sup>1\*</sup>, Ewnetu Belete<sup>1</sup> and Mitiku Tefera<sup>1</sup>**

*<sup>1</sup>Department of Midwifery, College of Medicine and Health Sciences, Wollo University, Dessie, Ethiopia.*

## **Authors' contributions**

*This work was carried out in collaboration among all authors. Author TD wrote the proposal, collected all data, analyzed the data and drafted the manuscript. All authors' contribute equally.*

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## **ABSTRACT**

**Background:** Birth weight is an important indicator of health status of an infant and is a principal factor that determines the infant's, physical, survival and mental growth. Though efforts made in reducing incidences of low birth weight worldwide, the problem of low birth weight remains global health problem, especially in sub-Saharan Africa, including Ethiopia.

**Objective:** To determine prevalence of Low Birth Weight and associated factor, among the neonates born in Ataye primary hospital from June 1, 2017 GC- May 30, 2018 G.C.

**Methods:** A facility based cross sectional study was carried out on birth weight distribution. Data was collected from delivery registration book of obstetrics department and Medical records of the mother by using structured data collection format. Bivariate and multivariate logistic regression analyses were employed. Adjusted odd ratio with 95% CI was calculated to see strength of association and  $P < 0.05$  was taken as level of statistical significance.

**Results:** Total of 181 mothers Medical records and delivery registration book were reviewed. The magnitude of low birth weight among new born babies in Ataye primary Hospital was 6.1%. Lack of Ante natal care follow up (AOR = 1.6 (95% CI =1.776, 9.48)), Preterm birth (AOR = 0.79(95% +CI = 0.034-0.78)), female sex (AOR=1.1(0.004-0.297)) and Multiple gestation (AOR=1.65(95% CI 0.001-0.426)) were identified factors of low birth weight.

**Conclusion:** Prevalence of low birth weight was lower than that of countrywide figure. Lack of Antenatal care follow up, preterm birth, sex of the neonate and multiple gestations were significantly associated with low birth weight.

**Keywords:** Low birth weight; associated factors; prevalence; Ethiopia.

## ABBREVIATIONS

ANC	:Ante Natal Care
APH	:Ataye Primary Hospital
BW	:Birth Weight
EDHS	:Ethiopian Demographic And Health Survey
ELBW	:Extremely Low Birth Weight
HIV	:Human Immunodeficiency Virus
LBW	:Low Birth Weight
IQ	:Intellectual Quotient
IUGR	:Intra Uterine Growth Retardation
MUAC	:Mid Upper Arm Circumference
NBW	:Normal Birth Weight
PIH	:Pregnancy Induced Hypertension
UNICEF	:United Nations International Children'S Fund
VLBW	:Very Low Birth Weight
WHO	:World Health Organization

## 1. INTRODUCTION

World Health Organization (WHO) define low birth weight as infants with birth weight less than 2500 g. low birth weight (LBW) is considered as the single most important predictor of infant mortality, especially of deaths within the first months of life. This practical cut-off for international comparison is based on epidemiological observations that infants weighing less than 2500 g are approximately 20 times more likely to die than their heavier counterparts [1,2].

Globally over the last twenty years the world made extensive progress in reducing mortality among less than 28 days aged children. Despite progress over the past two decades, in 2017 alone, 2.5 millions of neonates died, due to low birth weight, prematurity and other preventable causes of neonatal death[3]. Child who have Low birth weight children have immature immune function are also prone to have increased risk of disease, lower intellectual quotient (IQ) and cognitive disabilities which could affect their performance in school, job opportunities as adults and may develop chronic illness like diabetes and coronary heart disease in adult hood [4,5].

According to WHO report, birth weight of an infant is dependent on amount of growth during pregnancy and the gestational age and these factors are also related to the genetic makeup of the infant and the mother, her lifestyle and her status of health. The weight of an infant at birth is an important milestone and also recognized not only as a reliable index of intrauterine growth but also as pertinent determinant of the probability of infant survival[6].

According to UNICEF statistics, the global rate of LBW is 17%, out of which 6% is observed in industrialized countries and 21% in developing LBW is caused by preterm birth and intrauterine growth retardation (IUGR) or both[7,8]. Several studies in developing countries have reported risk factors for LBW were prim parity, preterm rupture of fetal membranes, maternal hypertension, ante partum hemorrhage and anemia in pregnancy, short inter-pregnancy interval and maternal malnutrition [9,10]. Other factors include maternal age under 20 and above 35 years old, low socioeconomic status, exposure to tobacco, inadequate antenatal care, as well as maternal height below 145 cm and non-pregnant weight less than 40 kg were associated with low birth weight [11] (Fig. 1).

Ethiopia, having an infant mortality rate of 59/1000 live births has limited data on BW estimates as most deliveries take place at home leading to a highly biased maternal subjective inclusion of a "very small baby" in the report. Previous survey in the country reported an increasing trend of LBW and a study revealed a 22.5% prevalence of LBW among health institution deliveries in the south western part of the country [4,6,12-14]. However, little attention is paid to birth weight improvement as a means of reducing child mortality [15].

In most developing countries, it was approximated that every ten seconds an infant dies from a disease or infection that can be attributed to LBW [3,16]. Therefore this study was aimed to assess the prevalence and factors associated with low birth weight among the neonate delivered at Ataye primary hospital, North shoa, Ethiopia.

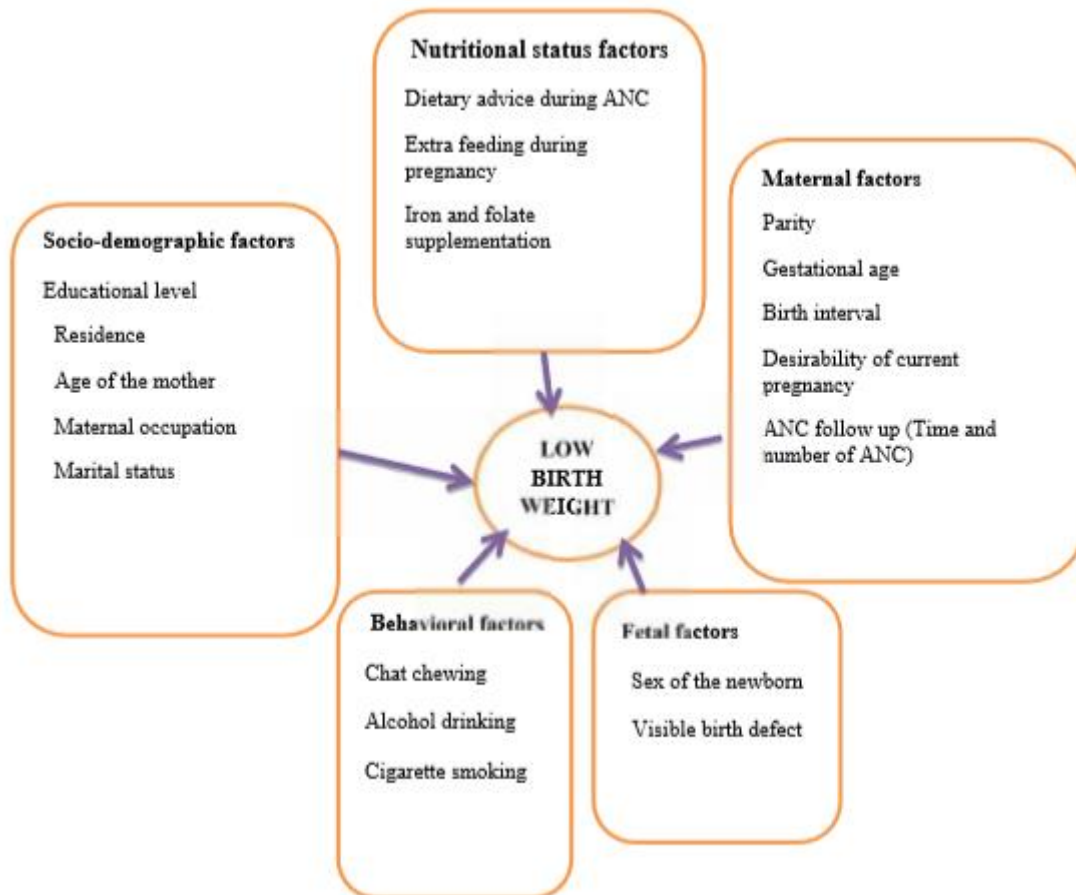


Fig. 1. Conceptual frame work shows association between Low Birth Weight and associated factors in Ataye primary Hospital, Amhara region, Ethiopia 2018 (N = 181)

## 2. MATERIALS AND METHODS

### 2.1 Study Area

A facility based retrospective cross sectional study was conducted at Ataye Primary Hospital which is found in Ataye town, North shewazone, Amhara, Ethiopia. Atayetown is found at a distance of 275 kms from the capital city of Ethiopia, Addis Ababa and 620 kms from Bahirdar regional state Amhara. The 2007 national census reported a total population of 26,579, of whom 13,772 were men and 13,308 were women. The temperature conditions of Ataye town are 14°C to 27°C.

### 2.2 Study Design and Period

A one year retrospective cross sectional study was conducted from June 1, 2017 to May 30, 2018.

### 2.3 Sample Size Determination

Sample size will calculate by using single population proportion formula by taking of 17.4% [17] as prevalence from the similar recent research performed in Gondar referral hospital, Northern Ethiopia. Using the desired precision 5%, confidence level 95%.

A total sample size was determined as follows: -

$$n = \frac{(Z_{\alpha/2})^2 p (1-p)}{d^2}$$

Where, n=sample size

d=desired precision 5%=( 0.05)

z=standard normal distribution value at confidence level 95%=1.96

p=prevalence rate of low birth weight=17.4%

Therefore, d=0.05

Therefore, the total sample size is 221

The formula for population (N) <10,000 so using correction formula by taking this sample size and total population size 1000. By adding non response rate the final total sample size became 200.

## 2.4 Sampling Procedure

There were a total of 1000 pregnant women delivered in Ataye Primary Hospital from June 2017 to May 2018, from those the required sample size (200) will obtain by Systematic random sampling method by calculating K. K become 5 and data was collected every 5 delivered mother Delivery registration book was used as a frame.

## 2.5 Data Collection Instrument and Procedure

Data were extracted by reviewing delivery registration book of Ataye primary hospital and Medical records of the mother. The data was collected using a structured pre-tested interviewer guided questionnaire which was prepared by reviewing similar literatures and Ethiopian demographic health survey 2011. Medical records were cross checked to confirm important variables such as patients' obstetric history and antenatal history. Five data collectors who are Diploma Midwives and two BSC Midwife supervisors were recruited. The data collectors and supervisor were trained for one day on the objectives of the study, relevance of the study, procedures during interviewing, confidentiality of client information, eligibility criteria, respondents' right, informed consent, ways of approach during interview.

## 2.6 Data Analysis

All filled questionnaires were checked for completeness, consistency, accuracy and entered in to EPI info version 7.0 then export to SPSS software version 20 for data analysis. Frequency, proportion, and summery statistics (table, pie chart and bar graph) were used to describe the study population in relation to the relevant variables. Bivariate logistic regression was used to check variables having association with the dependent variables. Then those variables found to have p-value less than 0.2 were fitted to multiple logistic regressions for controlling the effect of confounders. Odds ratio with their 95% of CI will be computed and variables having p-value less than 0.05 in the

multiple logistic regression models were considered as significantly associated with the dependent variable.

## 3. RESULTS

### 3.1 Socio Demographic Characteristics of the Respondent

Total of 181 mothers who gave birth in APH chart were reviewed. The reviewed was 90.5% response rate. The mean age of the respondents was 23.204 years. About 100(55.2%) were between 15-25 years. The majority of the respondents (58.6%) were orthodox. One hundred fifty eight 87.8% were House wife. Of the total most of them 149(82.3%) were Amhara. About 93(51.4%) of the respondents were live in urban area. (Table 1).

### 3.2 Prevalence of Low Birth Weight

The prevalence of low birth weight was 11(6.1%) (95%CI 2.8%-9.9%) (Fig. 2).

### 3.3 Maternal Obstetric and Baby Characteristics of the Participant

From total of low birth weight neonate two third 8 (72.72%) was females. Mean birth weight of infant was 2.814 kg. Almost half 87(48.1%) of the respondents were primi-parous. From the total 12(6.6%) mother had history of abortion. Almost more than half 56 (30.9%) of participants had greater than four ANC visit and of the total 118 (65.2%) mothers start ANC and visited 1-4 visit. More than two third 129(71.3%) mothers have TT vaccination during or before the current pregnancy. One hundred twenty five mothers (69.1%) were supplemented with iron/folic acid during the current pregnancy. From the total 6 (3.3%) has history of congenital anomaly at birth. One hundred sixty eight (92.8%) mothers were no history anemia during current pregnancy. Of the total 16(8.8%) had history of obstetric problem like pre-eclapsia& eclapsia, APH, PPH, IUFD and still birth. (Table 2).

### 3.4 Factors Associated with Low Birth Weight

In this study the association of different factors of the respondents with low birth was investigated using bivariate and multivariate logistic regression analysis. Different socioedemographic

and obstetric variables were entered in stepwise regression.

In the initial model, bivariate analysis there were eight variable; Number of ANC follow up, Multiple gestation, Apgar score of neonate, GA of the neonate, Iron intake during pregnancy, History of Abortion, residence of the mother, sex of the neonate showing statistically significant association with the outcome variable at p-value <0.2.

However, multiple logistic regressions showthat, Lack of ANC follow up, sex of the neonate, GA of the neonate and multiple gestations persisted as independent factors for outcome variable.

The odds of LBW was 1.6 times in mothers who had no antenatal care during pregnancy comparing to mothers having antenatal care follow up.(AOR = 1.6 (95% CI =1.776, 9.48)).

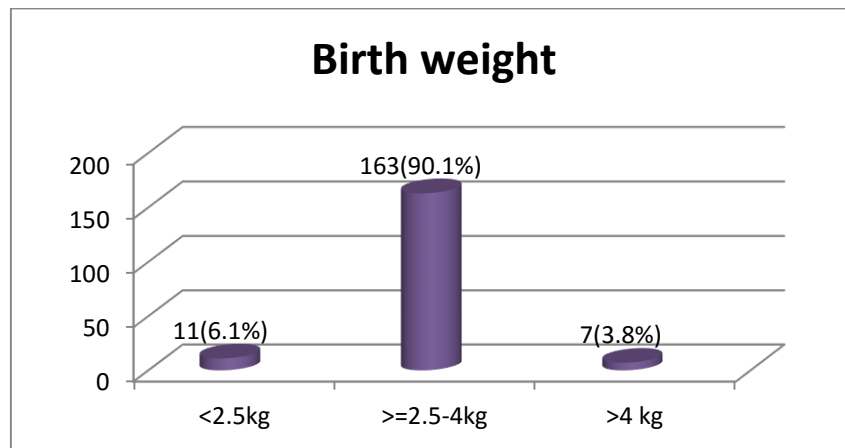


Fig. 2. Birth weight distribution of all singleton live births who were delivered in Atayae primary hospital during the study period

Table 1. Socio-demographic factors of the mothers in Ataye Primary Hospital, Amhara region, Ethiopia 2017/18 (n=181)

Variable	Frequency	Percentage (%)
<b>Age</b>		
15-25	100	55.2
26-36	76	42.0
37-47	05	2.8
<b>Religion</b>		
Muslim	69	38.1
Protestant	06	3.3
Orthodox	106	58.6
<b>Marital Status</b>		
Married	181	100
<b>Occupation</b>		
House Wife	159	87.8
Government employ	12	6.6
Merchant	09	5.0
Daily labor	1	0.6
<b>Ethnicity</b>		
Amhara	149	82.3
Oromo	30	16.6
Other	2	1.1
<b>Residence</b>		
Urban	93	51.4
Rural	88	48.6

**Table 2. Maternal obstetrics and newborn factors of the respondents in Ataye Primary Hospital, Amhara region, Ethiopia, 2017/18 (n=181)**

<b>Variables</b>	<b>Frequency</b>	<b>Percentage (%)</b>
<b>Parity</b>		
One	87	48.1
Two	50	27.6
Three	23	12.7
Four and Above	21	11.6
<b>Abortion</b>		
Yes	12	6.6
No	169	93.4
<b>Pregnancy type</b>		
Wanted and planed	175	96.7
Unwanted	5	2.8
Unplanned	1	0.6
<b>Number of ANC follow up</b>		
Unbook	63	34.8
<4 visit	62	34.3
>4 visit	56	30.9
<b>Iron intake</b>		
Yes	125	69.1
No	56	30.9
<b>Number of iron</b>		
30 tab	17	9.4
60 tab	59	32.6
90 tab	57	31.5
Not take	48	26.5
<b>TT-immunization status</b>		
Yes	129	71.3
No	52	28.7
<b>HIVstatus</b>		
Non -reactive	161	89
Reactive	3	1.7
Unknown	17	9.4
<b>VDRLstatus</b>		
Non -reactive	147	81.2
Reactive	1	0.6
Unknown	33	18.2
<b>Bad obstetric history</b>		
Yes	6	3.3
No	175	96.7
<b>Medical illness</b>		
Yes	6	3.3
No	175	96.7
<b>Hemoglobin status</b>		
Normal	167	92.3
Abnormal	14	7.7
<b>Degree of anemia</b>		
No anemia	168	92.8
Mild anemia	10	5.5
Moderate anemia	2	1.1
Severe anemia	1	0.6
<b>Gestational Age</b>		
Pre -term<37wek	23	12.8
Term>=37wek	158	87.3

Variables	Frequency	Percentage (%)
<b>Birth Weight</b>		
<2.5kg	11	6.1
>=2.5-4kg	163	90.1
>4 kg	7	3.9
<b>APGAR score</b>		
<7	35	19.3
>=7	146	80.3
<b>Sex of neonate</b>		
Male	97	53.6
Female	84	46.4
<b>Multiple gestation</b>		
Yes	3	1.7
No	178	98.3

**Table 3. Binary and multivariate analysis of factors in relation to low birth weight (n=181)**

Variables	Low birth weight		COR	AOR
	Yes	No		
<b>No. of ANC</b>				
No ANC follow up	7(11.1%)	56(88.9%)	1.22(0.24-29.26)	1.6(1.78-9.48)*
1-3	3(2.6%)	111(97.4%)	1.29(0.97-115.9)	1.7(4.27-29.4)
More than 4 visits	1(25.0%)	3(75.5%)	1	1
<b>Multiple gestation</b>				
Yes	1(33.3%)	2(66.7%)	1.267(0.01-1.43)	1.65(0.001-0.426)*
No	10(5.6%)	168(94.4%)	1	1
<b>Apgar score</b>				
Less than 7	8(22.2%)	27(77.1%)	0.71(0.02-0.28)	
Greater than 7	3(2.1%)	143(97.9%)	1	
<b>GA of neonate</b>				
Less than 37wk	5(21.7%)	18(78.3%)	0.66(0.04-0.51)	0.79(0.034-0.78)*
Greater than 37wk	6(3.8%)	152(96.2%)	1	1
<b>Iron intake during pregnancy</b>				
Yes	4(3.2%)	121(96.8%)	1	
No	7(12.5%)	49(87.5%)	0.65(0.07-0.83)	
<b>Sex of Neonate</b>				
Male	3(5.3 %)	90(92.8%)	1	1.1(0.004-0.297)*
Female	8(7.2%)	80(95.2%)	0.65(0.44-5.51)	1
<b>History of abortion</b>				
Yes	2(16.7%)	10(83.3%)	0.85(0.05-1.48)	
No	9(5.3%)	160(94.7%)	1	
<b>Residence of the mother</b>				
Urban	2(22.2%)	91(97.8%)	1	
Rural	9(10.2%)	79(89.9%)	0.79(0.04-0.92)	

Sex of the neonate was significantly associated with low birth weight; being female is 1.1 times more likely to have low birth weight (AOR=1.1(0.004-0.297)) than being male during delivery.

With regard to GA , Newborn babies who were delivered before gestational age of 37 weeks were 21% more likely to have low birth weight

When compared to babies born at gestational age of 37 weeks and more(AOR = 0.79(95% +CI = 0.034-0.78)).

Multiple Gestation was significantly associated with low birth weight; multiple gestation were 1.65 time more likely to have low birth weight than in the counterpart (AOR=1.65(95% CI 0.001-0.426)).

The variables such as Apgar score of the neonate, residence of the mother, History of Abortion, and Iron intake during pregnancy had no significant association with low birth weight in this study (Table 3).

#### 4. DISCUSSION

In this study magnitude of low birth weight among new born babies in Ataye hospital was found 6.1%(2.8%-9.9%) (n=11). In multivariate logistic regression model Not having antenatal care follow up, Gestational age before 37 week at delivery, Apgar score less than 7 and Multiple gestation were significantly associated with low birth weight.

Magnitude of low birth weight in this study was in line with study conducted in Jimma Medical center which was 7.8% [6] and in Nigeria which was 7.1% [1], Hosana town (10%).

This finding is inconsistent with that of the national figure which is 16%. This difference might be due to the difference in sample size, study setting, delivery site, and types of health facilities, as this study is carried out only among the neonate delivered in one center located in Ataye hospital, while the study at national levels included the neonate delivered in multi center and multiple region. Another possible reason for lower magnitude of low birth weight in our study area could be due to unreported home deliveries. This is evidenced by most labor of low birth weight is not difficult as compared to normal birth weight neonates.

The finding value is much lower than study conducted in Gondar, Dessie, Bahir Dar, Tigray, Kenya, Uganda ranged from 14.6% - 23% (17.1%, 15.6%, 14.6%, 22%, 23%) [7,17-21]. The possible explanation between the variations might be the difference in geographical variation which might had difference in health service utilization and nutritional status of mothers during pregnancy.

The odds of no ANC follow up among mothers who delivered LBW babies were higher than those who had normal weight babies. This result is in line with studies done in Bale zone hospitals in southern Ethiopia and University of Gondar in Northern Ethiopia and on A study done on the prevalence and associated risk factors of adverse birth outcomes among women attended maternity ward at Negest Elene Mohammed memorial general hospital in Hosana

town, SNNPR, Ethiopia shows lack of antenatal care had more likely to deliver LBW than those who had antenatal care follow up [12,14-17,22]. This is due to Antenatal visits of the pregnant mothers are very important as they provide chances for monitoring the fetal wellbeing and allow timely intervention for fetomaternal protection. This may be described to the routine provisions of nutritional and medical advice or care and supplementations offered during ANC visits.

Regarding newborns with gestational age less than 37 weeks were more likely to be delivered low birth weight than those new born greater than or equal to 37 weeks of gestation. So, significant association is found between gestational age and birth weight. This result is in line with studies done in Kenya, Uganda and India [2,8,9,18]. Gestational age plays an important role in determining infants' birth weight. Infants who are delivered prematurely (less than 37 weeks) are at higher risk to have low birth weight infants. The World Health Organization estimated about one third of low birth weight infants is caused by prematurity. In addition it is clear that babies born premature before completing their term due to any gynecological, medical, or other causes are not completing their normal physical development in the womb and at higher risk to have low weight at birth. In this regard, it could be important that any gynecological, medical, or other condition that could be possible cause of premature delivery should be timely recognized and properly managed during pregnancy [11,19].

This study showed that sex of the new born has significant association with birth weight of the newborns. This finding was consistent with the other similar study. Usually boys have lower birth weights compared to girls in every society which is also true in this study.

In this study multiple gestation of the mother has significant association with low birth weight. Theoretically multiple gestations have risks of preterm births: The smaller is the baby and higher the risk of healthy and these findings are consistent with the study done in Ataye hospital.

#### 5. LIMITATION

The study was conducted with cross sectional study design so it does not show cause and effect relationship.



## 6. CONCLUSION

This study shows that the prevalence of LBW in Ataye hospital, North shoa, Amhara region, was found to be 6.1%. It was found to be associated with lack of ANC follow up, preterm birth, being female sex and Multiple gestation.

## 7. RECOMMENDATION

**For Health care provider & managers:** It is better to give more emphasis on focused antenatal care to ensure risk of low birth weight is detected early and treated appropriately.

**Health care providers undertake Prevention strategies for preterm deliveries:** The regional health bureau is better to strengthen the newly focused goal oriented ANC service utilization as it can improve birth outcomes.

**For North shoa zone & Ataye town health office:** Monitoring and evaluation about the effectiveness of focused antenatal care program & its challenges should be done.

**For researchers:** Community based further studies are also needed to identify the effects of seasonal variations of nutrition on the effects of birth outcome.

## DATA AVAILABILITY

The [low birth weight.spss.sav] data used to support the findings of this study are available from the corresponding author upon request.

## CONSENT

As per international standard or university standard, patient's written consent has been collected and preserved by the author(s).

## ETHICAL APPROVAL

Ethical clearance was obtained from Wollo University College of Medicine and health sciences, school of Nursing and Midwifery, department of Midwifery and official letters were written to respective department heads. Confidentiality was kept.

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## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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## ANNEX

### QUESTIONNAIRE

#### English Version Questionnaires

##### Part one: Socio demographic characteristics of the mothers

1. Age of client? .....
2. Current religion?
  - a. Muslim
  - b. orthodox
  - c. Protestant
  - d. others (specify).....
3. Marital status of client?
  - a. Married
  - b. Single
  - c. divorced
  - d. Widowed
4. Occupation stats of client?
  - a. House wife
  - b. Government employ
  - c. Merchant
  - d. daily laborer
  - e. Other (specify).
5. Ethnicity of client?
  - a. Amhara
  - b. Oromo
  - c. others (specify).....
6. Residence?
  - a. Urban
  - b. Rural

7. Parity.....

**Parttwo: Obstetric, medical, and health-related characteristics of the mothers**

8. History of abortion
  - a. Yes b. No
9. Alive number of children \_\_\_\_\_
10. Birth interval from last child \_\_\_\_\_ months
11. Pregnancy type
  - a. Wanted & planned b. Unwanted c. unplanned
12. ANC status
  - a. Un booked b. <4 visits c. ≥4 visits
13. Iron/folic acid intake
  - a. Yes b. No
14. If yes number of tabs taken
  - a. 30 b. 60 c. ≥ 90
15. Tetanus toxoid immunization
  - a. Yes b. No
16. HIV status
  - a. Nonreactive (-ve) b. Reactive (+ve) c. Unknown
17. VDRL stats
  - a. Nonreactive b. Reactive c. Unknown
18. Bad obstetric History
  - a. Yes b. No
19. Medical illness
  - a. Yes b. No
20. Hemoglobin status
  - a. Normal b. Abnormal
21. Degree of severity of anemia
  - a. No anemia b. Mild c. Moderate d. Severe
22. Congenital malformations
  - a. Yes b. No
23. Gestational age of this pregnancy by LNMP? (if no LNMP se FH or U/S) \_\_\_\_\_(weeks)
24. Sex of neonate
  - a. Male b. Female
25. APGAR score \_\_\_\_\_ and \_\_\_\_\_ within the 1<sup>st</sup> and 5<sup>th</sup> minute
26. Weight of the neonate in gram.....

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