Low birth weight and associated factors among singleton neonates born at Felege Hiwot referral hospital, North West Ethiopia

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Abstract

Background: Low birth weight is one of the public health problems in the globe and it is an indicator of the health of the newborn survival and the mother's nutrition and health status. This study was aimed to determine the prevalence of low birth weight and its associated factors among mothers who gave birth at Bahir Dar Felege Hiwot referral hospital.

Methods: A cross-sectional facility based study was conducted from March 18 to May 18 / 2015. A total of 662 mothers were included in the study.The data was entered and analyzed using SPSS version 20 software. Bivariate and multivariable logistic regression was used to identify factors associated with low birth weight.

Results: The prevalence of low birth weight was found to be 11.6%. Age of the mothers (20-34 years) AOR= 0.4(95% CI: 0.19-0.93), low income AOR=2.6 (95%CI: 1.16-6.05), gestational age < 37 weeks AOR=18.2 (95% CI:9.26-35.94), MUAC<23 cm AOR =3.4 (95%CI:1.38-8.60) and pregnancy induced hypertension AOR=6.5 (95%CI:3.06-14.0) were factors associated with low birth weight.

Conclusion: The prevalence of low birth weight was in line with WHO estimate for sub-Saharan Africa. Nutritional counseling and early detection and management of pregnancy induced hypertension is recommended.

Keywords: Low birth weight, prevalence, Northwest Ethiopia.

DOI: https://dx.doi.org/10.4314/ahs.v18i4.42

Cite as: *Adane T, Dachew BA. Low birth weight and associated factors among singleton neonates born at Felege Hiwot referral hospital, North West Ethiopia. Afri Health Sci. 2018;18(4): 1204-1213. https://dx.doi.org/10.4314/ahs.v18i4.42*

Background

Low birth weight is defined by the (WHO) as the weight of an infant at birth of less than 2,500 grams. It can be further classified as very low birth weight (birth weight less than 1500 grams) and extremely low birth weight (which is less than 1000gram)[1]

The global prevalence of low birth weight is 15.5%, which means that more than 20 million such infants are born each year from 130 million annual births. Low birth weight remains a major public health problem in developing countries and contributes to 60 -80% infant mortality. Of 20 to 25 million babies born each year globally, nearly 93% of them are in developing countries[2]. The incidence of low birth weight in sub-Saharan African countries was estimated to be 13% to 15%[3]. Studies revealed that the prevalence of low birth weight in Ethiopia ranges from 8.4% to 28.3%[3-6].

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Preterm birth and growth restriction are the two main factors associated with low birth weight. Other factors associated with low birth weight include maternal age, pre-pregnancy weight, maternal under nutrition, vitamin and mineral deficiencies, maternal disease and infections during pregnancy[3,5,7-9].

Reducing the incidence of low birth weight by at least one third between 2000 and 2010 was a major goal of "A World Fit for Children" program of the United Nations[7]. However, low birth weight is still a major public health problem for developing countries; greatly contributing to neonatal and child mortality. It is an indicator of new born survival and also an indicator of mother's nutrition and health status[2,6]. However, there are limited researches in Ethiopia in general and no study in the study area which determines the prevalence of low birth weight and its associated factors. Therefore, this study amied to determine the prevalence of low birth weight and its associated factors among singleton births at Felege Hiwot referral hospital, North West Ethiopia. The findings from this study will provide information for planners and policy makers which target on designing reduction of low birth weight in the area.

Methods

Study setting: Bahir Dar is the capital city in Amhra region located 549 km away from Addis Ababa, the Capital city of Ethiopia. Bahir Dar Special Zone is one of the eleven zones in the Amhara Regional State, which is located in the North Western part of Ethiopia. According to the Ethiopian National census report, the total population of the Zone is 220,384; of this 180,094 (81.7%) people are urban dwellers while 40,250 (18.3%) people are rural dwellers. Out of the total population 122,077 are females with a pregnancy rate of 3.7%, which implies the total number of expected pregnant women in a given year is 12,200[8]. The study was conducted in Felge- Hiwot Referral Hospital, which is a public referral hospital in Bahir Dar City.

Study design and period: Institutional based cross-sectional study was conducted to determine prevalence of low birth weight and its associated factors in Bahir Dar Felge- Hiwot Referral Hospital from March 18 to May 18/2015.

Study population: All mothers who gave birth in Bahir Dar referral hospital during the study period were the study population for this study. All live newborns delivered at Feleg Hiwot Referral Hospital during the study period were included in the study, while newborns with major congenital anomalies, and twins or multiple births were excluded from the study.

Sample size: Sample size was determined using by single proportion formula with the assumption of 17% proportion (similar study in NorthWest Ethiopia)[9], 95 % confidence level (z) and marginal error (d) of 3%

$$n= Z^2 * p(1-p)/d^2$$

With this assumption the sample size was 602. Considering 10% non response rate the final sample size was 662. We also considred the second objective while determining our sample size, but prevalence estimate was used for sample size calculation since it gave a maximum figure (662) which can address both study objectives.

Systematic random sampling technique was used to select study participants and data was collected every other delivery for two months duration.

Variables: Low birth weight was an outcome variables for this study while independent variables included socio-demographic factors (like maternal age, residence, marital status, occupational status, educational status, average monthly income and sex of the neonate), maternal nutrition related factors (hemoglobin level, iron supplement, weight of the mother, height, MUAC, pre-pregancy BMI, and meal frequency), maternal morbidity (pregnancy induced hypertension, malaria and HIV status and anemia), obstetric factors (numbers of ANC visit, ANC starting time, parity, gravidity, birth interval and bad obstetric history) and behavioral factors (cigarette smoking and alcohol consumption).

Data collection tools and procedures:

Data was collected using pre-tested and structured questionnaire. The instrument was pre-tested and the reliability of the tool was checked using Cronbach's alpha reliability test with a score of 0.8. The data were collected by 2 diploma female trained nurses and 1 female degree holder nurse supervisor. One day training was given for data collectors and the supervisor. The data collectors took the weight of the newborn within 1 hour after delivery. The newborns were weighted naked using a digital scale. Data collectors and facilitators were under close supervision and the collected data were reviewed and

checked for completeness, clarity and accuracy on a daily basis prior to data entry.

Data processing and analysis: The collected data were coded, entered by using EPI-INFO version 7 software and analyzed using SPSS version 20. Descriptive statistics like percentages, proportions, mean and standard deviation was used. The result was presented in tables and texts. Bivariate and multivaraible analysis logistic regression anlyses were performed to identify factors associated with low birth weight. A p-value of 0.2 was used as a screening criterion for including variables in the multivariable model. P - Values less than 0.05 were considered statistically significant. Model fitness was checked using Hosmer and Lemeshow goodness of a fit test.

Ethical consideration: Ethical clearance was obtained from the Institutional Review Board of Bahir Dar University. Written informed consent was also obtained from the study subjects. Confidentiality was maintained at all levels.

Results

Socio-demographic characteristics

From 662 sampled populations, 647 were participated in the study with a response rate of 97.7%. The mean age of respondents was 26.3 ±5. 5 years and 304 (47%) of respondents were in the age group of 20-34 years. Five hundred ten (78.8%) of the participants were urban dwellers (Table 1).

Table 1. Socio-Demographic characteristics of Respondents at Felege Hiwot referral hospital, North West Ethiopia (n=647)

Variable	Frequency	Percent
Age of mothers		
<20	53	8.2
20-34	510	78.8
35-49	84	13
Residence		
Rural	272	42
Urban	375	58
Religion		
Orthodox	591	91.3
Muslim	50	7.7
Protestant	6	0.9
Marital status		
Married	638	98.6
Divorced	9	1.4
Educational status		
Cannot read and write	265	41
Elementary(1-8)	107	16.5
secondary and certificate	140	21.6
Diploma and above	135	20.9
Occupational status		
House wife	481	74.3
Employee	111	16.7
Merchant	31	. 4.8
Student	15	2.3
Daily labourer	9	1.4
Average monthly income (USD)		
<70	159	24.6
70-175	327	50.5
≥175	161	24.9
Sex of neonate		
Male	323	49.9
Female	324	50.1

Obstetric characteristics of mothers

Among the participants 347 (53.6%) were primiparas and 171 (26.7%) of the mothers had a history of cesarean section delivery. Around 95% of the mothers had at least one antenatal care visit (Table 2).

Table 2. Obstetric characteristics of respondents at Felege Hiwot referral hospital, North West Ethiopia, (n= 647)

Variable	Frequency	Percent
Gravida		
I	332	51.3
≥ II	315	48.7
Parity		
I	347	53.6
≥II	300	46.4
History of abortion		
Yes	40	6.2
No	607	93.8
Birth interval (n=315)		
<2years	31	9.8
≥2years	284	90.2
History of C/S		
Yes	171	26.7
No	476	73.6
Time of first ANC		
In the first 3 months	150	23.2
3-6 month	437	67.5
6-9 month	27	4.2
Not attained ANC	33	5.1
Number of ANC visit		
Once	11	1.8
Two	42	6.8
Three	111	18.1
Four	450	73.3

CS =Cesarean section, ANC= Antenatal care

Nutritional status of mothers

Of the respondents, 77.3% mothers received ferrous sulfate supplementation while they are pregnant. From those around 30% of the mothers took for less than one month. Mean height and Mid-upper arm circumference (MUAC) of the respondents were 155.8 ±6. 4 cm and 23.5±2.6 cm respectively Table 3.

Table 3. Nutritional characteristics of respondents at Felege Hiwot referral hospital, North West Ethiopia, 2015 (n= 647)

Variable	Frequency	Percent
Height of mothers in cm		
<150	101	15.6
≥150	546	84.4
Mid-upper arm circumference		
< 23 cm	350	.54.1
23- 25 cm	131	20.3
> 25cm	166	25.6
BMI (kg/m^2)		
<18.5	155	24
18.5-24.9	419	64.7
>25	73	11.3
Nutritional counseling		
Yes	411	63.5
No	236	36.5
Frequency of meal/day		
two times	59	9.1
three times	396	61.2
≥four times	192	29.7
Ferrous sulphate intake		
Yes	506	78.2
No	141	21.8
Hemoglobin level		
<11g/dl	38	5.9
≥11g/dl	609	94.1

Maternal morbidity

Among the total mothers who gave birth during the study period, 47 (7.2%) had pregnancy induced hypertension, and 46 (7.1%) had malaria, 27 (4.17%) had anemia, 6 (0.92%) had HIV/AIDS and 5 (0.77%) had asthma.

Prevalence of low birth weight

The prevalence of low birth weight was found to be 75 (11.6%) (Figure 1). The mean birth weight of the new-borns was 2907.7 ± 518.4 gm. While the minimum weight was 1000 grams, the maximum was 5000 grams. Forty two (56%) of the low birth weight babies were term (>37 weeks of gestational age).

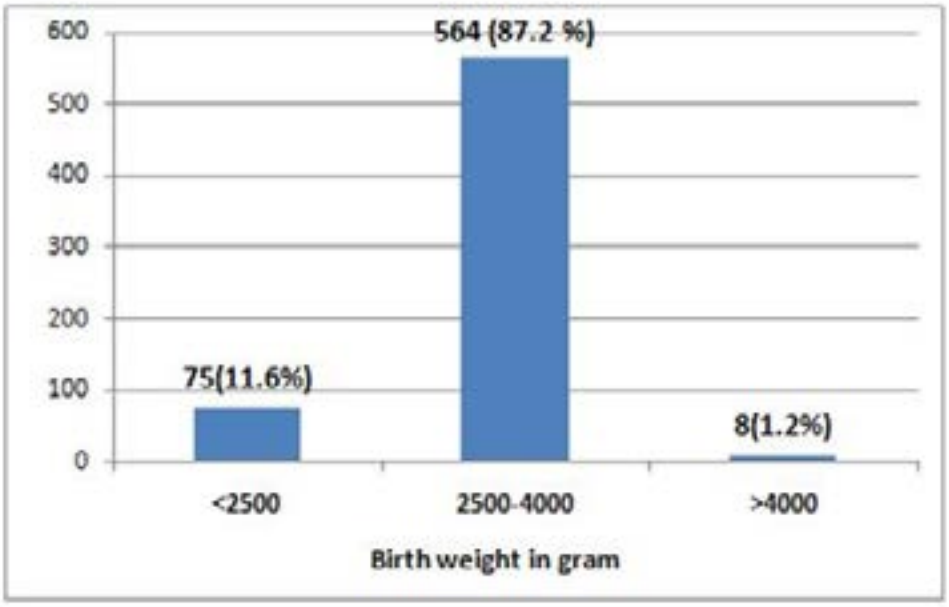

Figure 1. Birth Weight among neonates born at Felege Hiwot referral hospital, North West Ethiopia, 2015 (n=647).

Proportion of low birth weight by maternal and neonatal characterstics

The prevalence of low birth weight among male newborns was 53.3% and more than half (56%) of the low birth weight babies were term (>37 weeks of gestational age) (Table 4).

Table 4. Proportion of Low birth weight by child sex, maternal age, gestational week, maternal mid upper um circumference (MUAC) and pregnancy induced hypertension

Variables	Number	Percent
Sex of baby		
Male	40	53.3
Female	35	46.7
Maternal age (in years)		
< 20	16	21.3
20-34	45	60
35-49	14	18.7
Gestational week		
<37 weeks of gestation	33	44
≥37 weeks of gestation	42	56
MUAC (in CM)		
<23	56	74.7
23-25	13	17.3
>25	6	8
Pregnancy induced hypertension		
Yes	19	25.3
No	56	74.7

Factors associated with low birth weight

The bivariate analysis showed that pregnant mothers who were residing in a rural area, having Hgb level <11g/dl and body mass Index less than 18.5 kg/m^2 were factors associated for Low birth weight. However; after adjusting the potential confounders: Age of the mother (20-34 years) AOR 0.4 (95% CI: 0.19-0.93), low income (AOR= 2.6 (95%CI: 1.16-6.05)), gestational age <37weeks AOR=18. 2. (95%CI: 9.26-35.94), mid upper arm circumference (MUAC) < 23cm AOR 3.4 (95% CI: 1.38-8.60) and Pregnancy induced hypertension AOR=6.5 (95%CI: 3.06-14.00) were factors associated with low birth weight (Table 5).

Table 5: Factors associated with low birth weight among singleton neonates born at FelegeHiwot referral hospital(n=647)

Variables	Low birth weight		Crude Odds Ratio (COR)	Adjusted Odds Ratio (AOR)
	No	Yes		
Residence				
Rural	227	45	2.3(1.40-3.42)	1.3(0.71-2.50)
Urban	345	30	1	1
Age of mother				
<20	37	16	2.2.(0.954.91)	1.6(0.59--4.31)
20-34	465	45	0.5 (0.25 0.93)	0.4(0.19-0.93)*
35-49	70	14	1	1
Income (USD)				
<75	126	33	2.9 (1.50-5.91)	2.6(1.16-6.05)*
75-175	298	29	1.1 (0.55-2.19)	1.2(0.56-4.31)
≥175	148	13	1	1
Gestational week				
<37 weeks	28	33	15.3 (8.43-27.63	18.2(9.26-35.94)*
≥37 weeks	544	42	1	1
Hgb level				
<11 g/dl	28	10	2.9(1.38-6.43)	2.5(0.92-6.71)
>11 g/dl	544	65	1	1
Pre pregnancy BMI Kg/m^2				
<18.5Kg/m^2	122	29	2.65(1.04-6.75.)	2.5(0.9-4.92)
18.5-24.9 Kg/m^2	383	40	1.16 (0.5-2.82)	2.5(0.74-4.40)
> 25Kg/m^2	67	6	1	1
MUAC				
<23	294	56	3.3 (1.40-7..96)	3.4(1.38-8.60)*
23-25	173	13	1.3 (0.49-3.57)	2.1(0.71-6.37)
>25	105	6	1	1
PIH				
Yes	33	19	5.5(2.96-10.38)	6.5(3.06-14.00)*
No	539	56	1	**1**

1= Reference category, MUAC= Mid upper arm circumference, PIH=pregnancy induced hypertension, *Statistically significant at p<0.05

Discussion

The prevalence of low birth weight was 11.6% in the current study, which is in line with Ethiopian demographic and health survey reports of 2011 in Amhara region 11.2%, though EDHS used maternal self-reports to measure lower birth weight leading to biased estimate[10]. Similar findings were also obtained in Iran 11.1%[11] and Tamilnadu 11.67%[12]. However; this finding is lower than in a study done in Gondar, Ethiopia 17.4 % [3,13] and Northern India 32.3%[14]. The possible reason for this difference might be due to time variation and /or difference in the nutritional status of the mother. Moreover, mothers with multiple pregnancies were included in those studies which may overestimate the prevalence.

The current prevalence is higher than study done in Axum, Ethiopia 9.9%[4], Brazil 7.6%[15] and, Western Algeria 5.53%[16]. The possible explanation for observed difference may be time difference, difference in geographic

area, accessed to adequate nutrient before and after conception, health service utilizations, quality of health service, dietary counseling for pregnant mothers and study design difference between our study and others.

In this study, mothers whose age was between 20 to 34 years old had less risk to have low birth weight as compared to age 35 years. Those mothers with the age range of 20-34 years had 60% less risk of giving birth to a low weight baby as compared to those whose age was 35 years and above (AOR= 0.4 (95%CI:0.19-0.93). This finding is supported by the studies done in Ghana and Qatar[17,18]. This may be due to the fact that mothers with old age have depletion of nutrition by previous birth.
In this study, lowest monthly income was significantly associated with low birth weight . Mothers who had monthly income less than 70 USD were three times (AOR=2. 6 (95% CI=1. 16-6.05) more likely to have a low birth weight baby than those who had greater than 175 USD. This finding is supported by the studies in Nepal, Japan and India[19-22]. This is due to the fact that in order to reduce low birth weight two extra meals are required in addition to the basic three meals. However, mothers with low monthly income may not get adequate nutrition. For example, in this study, 9% of the rural mothers did not have access to more than two meals per day, leading to the maternal under nutrition and in turn low birth weight. Gestational age less than 37 weeks was significantly associated with low birth weight in this study. Those who gave birth before 37 weeks gestational age (per term) were 18 times more likely to have a low birth weight baby as compared to those mothers who gave birth at 37 weeks gestation or more (AOR=18. 2. 95%CI=9.26-35.94). Similar findings were observed in Tamilnadu, Gondar and Iran[11-13].

Maternal nutrition was also associated with low birth weight in this study. Mothers with MUAC less than 23 cm were more than three times more likely to have a low birth weight baby than mothers whose MUAC was more than 25 cm (AOR 3.4(95% CI: 1.38-8.60). Studies conducted in Africa and Asia support this finding[6,23].
Furthermore, pregnancy induced hypertension was another factor associated with low birth weight in the current study. Mothers who had pregnancy induced hypertension were six times more likely to have low birth weight baby than those who did not (AOR= 6.5(95%CI=3.06-14.00). This finding is consistent with the study done in Ethiopia, Western Maharashtra, Indian and china[11,13, 20,22].
This study has some limitations. First, the cross-sectional nature of the study does not confirm definitive cause and effect relationship. In addition, reports for some of the questions were history or encounters which are prone to recall bias. Finally, Although we have collected a wide range of factors associated with LBW in developing countries, we did not have data on other factors possibly associated with LBW such as maternal pregnancy diabetes, maternal psychopathology, and other genetic and environmental factors.

Conclusion

The prevalence of low birth weight was in line with WHO estimate of low birth weight for sub-Saharan Africa. Age of the mothers, income, pre-term, mid upper arm circumference less than 23 cm and pregnancy induced hypertension were factors associated with low birth weight. It is recommended to encourage the mother to give birth between the age range of 20 to 34 years, to prevent low birth weight. Nutritional counseling of pregnant mothers to have adequate weight gain (1.5kg /month in the last two trimesters) during pregnancy is also recommended. Furthermore, early detection and management of pregnancy induce hypertension is not compulsory.

Competing interests

The authors declare that they have no competing interests.

Authors' contribution

TA originated and wrote the proposal, participated in data collection, analyzed the data and drafted the paper. BAD revised subsequent drafts of the manuscript and approved the proposal. BAD wrote the manuscript. All authors read and approved the final version of the manuscript.

Acknowledgement

We would like to pass our gratitude to the Bahir Dar University for the approval of ethical clearance and technical support. We are very grateful for respondents all who participated in this study.

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