Journal of Midwifery & Reproductive Health

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Predictors of Low Birth Weight among Newborns Delivered At a Referral Hospital in Hadiya Zone, Southern Ethiopia

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ARTICLE INFO

Article type:
Original article

Article History:
Received: 01-Dec-2020
Accepted: 30-May-2021

Key words:
Low Birth Weight
Predictors
Ethiopia

ABSTRACT

Background & aim: In developing countries, such as Ethiopia, neonatal morbidity and mortality, which is usually associated with low birth weight, are still high. Therefore, the aim of this study was to determine the extent and predictors of low birth weight among newborns delivered at a referral hospital in Hadiya Zone, Southern Ethiopia.

Methods: A hospital-based cross-sectional study was conducted from 1st to 28th April, 2019. A structured questionnaire and chart review were used to collect data. A systematic sampling technique was used to recruit 363 study participants. The relationship of independent variables with the dependent variable was determined using bivariate and multivariable logistic regression analyses. The odds ratios were calculated with their 95% confidence intervals, and statistical significance was accepted at a *p*-value of < 0.05. SPSS software (version 23) was used to enter and analyze the data.

Results: The prevalence of low birth weight was found to be 12.7%. The predictors of low birth weight comprised of not receiving antenatal care visit (AOR =7.6; 95 % CI: 1.23-6.24), preterm delivery (AOR=4.99, 95% CI: 2.22-11.18), anemia (AOR =4.99; 95% CI: 2.22-11.18) and smoking of cigarette (AOR=5.85; 95% CI: 1.18-28.92).

Conclusion: This study revealed that a significant proportion of newborns are delivered with low birth weight. Consumption of iron-rich foods and abstinence from smoking should be encouraged to help prevent low birth weight. Additionally, increasing the uptake of antenatal care visits and prompt diagnosis and treatment of obstetric complications such as preterm delivery are important.

▶ *Please cite this paper as*:
Girma Hailu A, Alemu Anshebo A, Halil HM, Abdo RA. Predictors of Low Birth Weight among Newborns Delivered At a Referral Hospital in Hadiya Zone, Southern Ethiopia. Journal of Midwifery and Reproductive Health. 2021; 9(4): 2999-3006. DOI: 10.22038/jmrh.2021.53939.1660

Introduction

Low birth weight (LBW) is described by the World Health Organization (WHO) as a weight at birth of fewer than 2,500 grams, regardless of gestational age. Being born with LBW is still a major public health problem (1). It is also the most important factor regarding the survival and development of newborns. Furthermore, the vast majority of LBW births have taken place in low- and middle-income countries. According to the WHO, 26 million LBW neonates are born each year, with almost all of them born in developing countries. LBW was found in 7% of developed countries and 16.5% of developing countries (2). Nonetheless, the recorded prevalence in developing countries is still skewed and distorted because more than half of the newborns were not born in a health facility or weighed at birth (1, 2). According to the 2016 Ethiopian demographic health survey study, the prevalence of LBW was 13% across the country (3). However, in various parts of Ethiopia, it ranged from 6.3% to 32%. Due to different study populations, locations, designs, and sociocultural contexts, there is substantial variation in the prevalence of LBW across the world (4-8). Neonatal morbidity and mortality,

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slow cognitive growth, and an increased risk of chronic diseases later in life are all risks of LBW (9). Neonatal mortality is 29 per 1000 live births in Ethiopia (10). In general, the infant's health is impacted by the mother's health. As a result, the predisposing factors for LBW may be avoided by introducing preventive measures during pregnancy and the postpartum period, such as improved diet and increased use of antenatal and postnatal care services (11).

Poor maternal nutritional status, weight before pregnancy, parity, a history of adverse birth outcomes, anemia, educational status, lack of Antenatal care (ANC), and socioeconomic status have all been identified as risk factors for LBW (12,13). The Ethiopian government is aiming to reduce neonatal mortality to 10 per 1000 live births by the year 2035. As a result, the underlying causes must be investigated in order to develop effective strategies for reducing maternal and child health issues (14-16). The extent and contributing factors of LBW have yet to be adequately considered in Ethiopia, especially in the study region. As a result, further research into LBW is needed in order to develop prevention and management strategies. Therefore, this study is aimed to assess the magnitude and predictors of LBW among newborns delivered at a referral hospital in Hadiya Zone.

Materials and Methods

This hospital-based cross-sectional study was conducted from April 1st to April 28th, 2019 at the Wachemo University Nigist Eleni Mohamed Memorial Referral Hospital, Southern Ethiopia. The Wachemo University Research and Community Service Office provided ethical approval, with the reference number and date of the letter WURCSO/724/2019 and 26/02/2019, respectively. This hospital is a referral hospital found in the Hossana town, capital of Hadiya Zone. Hosanna town is located 230 kilometers from Addis Ababa, the capital city of Ethiopia and 194 kilo meters from Hawassa. The hospital serves more than three million people residing in urban and rural parts of south west Ethiopia. The source populations encompassed all women with their index newborns delivered at Wachemo University Nigist Eleni Mohammed Memorial Referral Hospital during the study period and the study populations included sampled women with their index newborns delivered at Wachemo University Nigist Eleni Mohammed Memorial Referral Hospital during the study period. The inclusion criterion was sampled women with their newborns delivered at study hospital during the study period, while, women who had newborns with a congenital anomaly and seriously ill were excluded from this study.

The sample size of 363 was calculated using a single population proportion formula by considering of 17.4% prevalence of LBW taken from a previous study conducted at Gondar (10), with a 95% confidence interval, margin of error of 4%, and 5% non-response rate. By considering the average numbers of clients who delivered daily during the data collection period which was estimated based on the previous daily client flow of the units was found by referring client registration book for a month (n=585) earlier to the real data collection period. The systematic random sampling method was used to enroll the respondents with the k-value of two. Thus, the first respondent was selected every second intervals by using the lottery method on the initial day of data collection period.

Data was collected using a structured questionnaire and chart review, which was used to retrieve necessary information that could not be achieved by the interview. Four BSc and two MSc holder midwives collected and supervised the data. The questionnaire was prepared in English after reviewing of different literature and adapted to suit and relate to the study objective and the area's context (4-8). The questionnaire was created to collect data on sociodemographic, obstetric, dietary, and behav ioral characteristics.

To ensure data accuracy, the questionnaire was first translated into the local language (Hadiyissa) and then back translated into English by experts to ensure uniformity. The questionnaire was then pretested on 17 people in the Hossana health center prior to the study period, and appropriate changes were made based on the discrepancies found in the questionnaire. The instruments understand ability, clarity, and organization were tested after the pretest. The reliability test yielded a Cronbach's alpha value of 0.86. The tool's

validity was verified through the application of valid criteria (content validity). In addition, the data collectors and supervisors received two days of training on the questionnaire's material. Similarly, during the pretest and real data collection periods, the supervisors and nvestigators closely supervised the data collection process every day. In addition, the supervisor obtained and signed the completed questionnaire after inspecting it for missing items and logicality.

In this study, LBW was defined as a newborn weighing less than 2500 grams at birth (1). The birth weight was measured within an hour after delivery.

Data were entered and analyzed using SPSS software (version 23). Initially, bivariate logistic regression was performed for the selection of candidate variables into the multivariable logistic regression. In binary logistic regression, the variables with a *p*-value < 0.25 were transferred to the multivariable logistic regression model. It was conducted to determine the independent associated factors of the outcome variable and control possible confounders. An odds ratio was accepted at a 95% CI, and a *p*-value < 0.05 was stated as statistically significant. The fitness of the model was approved by Hosmer Lemeshow statistic test which has a p-value of 0.87.

The Wachemo University Research and Community Service Office provided ethical approval, with the reference number and date of the letter WURCSO/724/2019 and 26/02/2019, respectively. Then, from the study hospital's authority, a letter of permission was sent. The study's intent, procedures, potential risks, and benefits were all explained to the participants. Written informed consent was obtained. Participants under the age of 18 were required to obtain parental or legal guardian consent. The names of the participants were not included in the questionnaire to maintain confidentiality. Participants were also assured that refusing to consent or withdrawing from the study would not affect or jeopardize their ability to receive treatment.

Results

Socio demographic characteristics

The mean age of the respondents was 27.7 (standard deviation ± 4.6) years and 164 (45.2%) of them falls between age group of 25-29 years.

Table 1. Socio-demographic characteristics of respondents at Wachemo University Nigist Eleni Mohammed Memorial referral hospital, Southern Ethiopia, April 2019

Variables	Frequency (%)
Age in years	
15-19	12(3.3)
20-34	316(87.1)
≥35	35(9.6)
Marital status	
Married	329(90.6)
Unmarried	34(9.4)
Residence	
Urban	237(65.3)
Rural	126(34.7)
Religion	
Protestant	219(60.3)
Orthodox	55(15.2)
Muslim	38(10.5)
Catholic	51(14.0)
Ethnicity	
Hadiya	277(76.3)
Gurage	20(5.5)
Kambata	46(12.7)
Silte	20(5.5)
Occupation	
House wife	165(45.5)
Gov't employee	119(32.7)
Private employee	79(21.8)
Mothers educational status	
No formal Education	139(38.3)
Primary education	88(24.2)
Secondary education	39(10.7)
College and Above	97(26.7)
Family monthly income in ETB	
<2000	76(20.9)
2000-4000	124(34.2)
≥4000	163(44.9)

ETB: Ethiopian birr

Two hundred thirty seven (65.3%) of the respondents were resided in urban areas, 329(90.6%) were married, 267(73.6%) were Hadiya in ethnics, 165 (45.5%) were housewives and 219 (60.3%) were Muslims. Regarding to educational status, 103(28.4%) of the respondents had no formal education and 163 (44.9%) have earned an average monthly income of ≥ 4000 Ethiopian Birr (ETB) (Table1).

Table 2. Obstetric characteristics of respondents at Wachemo University Nigist Eleni Mohammed Memorial referral hospital, Southern Ethiopia, April 2019

Variables	Frequency (%)
Parity	
Primiparous	44(12.1)
Multiparous	270(74.4)
Grand multiparous	49(13.5)
Birth spacing in months	
<24	236(65)
≥24	127(35)
ANC follow up for current pregnancy	
Yes	339(93.4)
No	24(6.6)
Number of ANC Visits	
<4	199(58.7)
≥4	140(41.3)
Supplementation of iron	
Yes	207(58.8)
No	145(41.2)
Duration of iron supplementation in month	
<3	196(97)
≥3	11(3)
Pregnancy induced hypertension	
Yes	45(12.4)
No	318(87.6)
Drink alcohol	
Yes	17(4.7)
No	346(95.3)
Smoke cigarette	
Yes	6(98.3)
No	357(1.7)
History of anemia	
No	295(81.3)
Yes	68(18.7)
Nutritional counseling	
Yes	315(86.8)
No	48(13.2)
History of still birth	
Yes	16(4.4)
No	347(95.6)

Obstetric characteristics

Two hundred seventy (74.4%) of the participants were multiparous, 16(4.4) had a history of still birth and 236(65%) gave birth with in birth interval of < 24 months. Three hundred thirty nine (93.4%) of the participants had ANC visit and 203(55.9%) of them were supplemented iron tablets.

Forty five (12.4%) of the respondents had history of pregnancy induced hypertension, 68(18.7%) had history of anemia, 43(11.8%) had hemoglobin level <11g/dl, 48(13.2%) did not obtain nutritional counseling (Table 2).

Prevalence of LBW and anthropometric measurement

The prevalence of LBW was observed to be 46(12.7%).

Table 3. Prevalence of LBW and anthropometric measurements of the study participants at Wachemo University Nigist Eleni Mohammed referral hospital, Southern Ethiopia, April 2019

Variables	Frequency (%)
Weight of the women in kilogram	
< 50	107(29.5)
≥ 50	256(70.5)
Height of the women in centimeter	
< 150	18(5)
≥ 150	345(95)
Women's BMI in kg/m²	
<18.5	56(15.4)
≥18.5	307(84.6)
Women's MUAC in centimeter	
<23	154(42.2)
≥23	209(57.8)
Gestational age in weeks	
<37	75(20.7)
≥37	288(79.3)
Birth weight of newborns in gram	
<2500	46(12.7)
≥2500	317(87.3)
Hemoglobin level in g/dl	
<11	43(11.8)
≥11	320(88.2)
Apgar score	
<7	20(5.5)
≥7	343(94.5)
Sex of newborn	
Female	155(42.7)
Male	208(57.3)

The mean weight of the neonates was 2.99 kilograms with a standard deviation of 0.55. One

hundred fifty five (42.7%) of the neonates were females, 288 (79.3%) were born at gestational age of ≥37 weeks and 343(94.3%) had an Apgar score of ≥7. Additionally, 56 (15.4%) of the participants had body mass index (BMI) of <18.5kg/m^2, 9(2.5%) had a history of smoking cigarette and 17(4.7%) had drunk alcohol (Table 3).

Predictors of low birth weight

The outcome of multivariate logistic regression analysis indicated that, not receiving ANC follow up, preterm delivery, anemia and history of smoking cigarette were predictors of LBW.

The risk of having LBW baby was 7.6 times higher among mothers who didn't attend ANC visit in their current pregnancy as compared to mothers who attended ANC visit (AOR =7.6; 95 % CI: 1.23-6.24).

Table 4. Predictors of low birth weight at Wachemo University Nigist Eleni Mohammed Memorial referral hospital, Southern Ethiopia, April 2019

Variables	LBW		COR (95% CI)	AOR (95% CI)
	Yes	No		
Residence				
Rural	20	55	3.12((2.12,6.23)*	1.5(0.72-4.87)
Urban	30	258	Reference	Reference
Gestational age				
<37(preterm)	22	53	4.57(2.39,8.74)*	4.1(2.0-8.39)**
≥37(term)	24	264	Reference	Reference
ANC visit				
No	12	12	8.97(1.46,6.56)*	7.6(1.23-6.24)**
Yes	34	305	Reference	Reference
Anemia				
Yes	16	27	5.73(2.78,11.81)*	4.99(2.22-11.18)**
No	30	290	Reference	Reference
Smoking cigarette				
Yes	4	5	6.11(1.54,23.0)*	5.85(1.18-28.92)**
No(ref.)	42	312	Reference	Reference
Birth spacing in months				
<24	22	53	2.73(1.39,3.41)*	2.5(0.4-2.89)
≥24	38	250	Reference	Reference

*p- value <0.25, **p-value <0.05, COR: Crude odds ratio AOR: Adjusted odds ratio

Similarly, mothers who had anemia during pregnancy had nearly 5 times as high odds of having LBW babies as compared to those who had no anemia (AOR=4.99; 95% CI: 2.22-11.18).

In addition, the odds of being LBW in babies born as being preterm was 4 times higher when compared to babies born at term (AOR=4.1; 95% CI: 2.0-8.39).

Moreover, mothers who had history of smoking cigarette were 5.85 times more likely to deliver LBW baby as compared to those women who had no history of smoking cigarette (AOR=5.85; 95% CI:1.18- 28.92) (Table 4).

Discussion

According to research, birth weight is a good overall indicator of complex public health risks. As a result, it is often used to demonstrate long-term maternal malnutrition, ill health, and inadequate prenatal care (3).

In this study, we have explored the magnitude and predictors of low birth weight among neonates delivered at Wachemo University Nigist Eleni Mohammed Memorial Referral Hospital. In the current study, the magnitude of LBW was observed to be 12.7%.This rate is comparable to the prevalence recorded in studies conducted in Ethiopia and Kenya, where rates of 13% and 12.3%, respectively, were found (2, 17). This result, however, was higher than previous studies conducted in Brazil and Iran, which found rates of 7.6 % and 8.8 %, respectively (18, 19).The observed disparity may be due to better LBW prevention strategies used by mothers in the abovementioned countries. Furthermore, this

difference may be a sign of the failure of national policies for maternal and newborn health care. In comparison to the previous statement, the rate reported in this study was lower than the rates reported in Gondar and Jimma, which were 17.4% and 22.5 %, respectively (10, 20). The explanation for this may be due to the introduction of different healthcare programs and differences in the sample population's characteristics, such as the nutritional status of mothers during pregnancy.

In this study, preterm delivery had a significant association with LBW. This result is consistent with research conducted in Jimma and Malaysia, respectively (20, 21). Many organs and structures of the human fetus develop after 37 weeks of gestation, according to scientific evidence. As a result, neonates born before 37 weeks are both physically small and physiologically immature, putting them at a higher risk of being delivered as LBW than babies born after 37 weeks.

This study also revealed that women who have not attended ANC visits had increased odds of delivering LBW babies. This finding is consistent with the result of the studies conducted in Axum, Nepal, and Indonesia (21-24). The explanation for this may be that ANC visits are very important for both newborns and mothers because they provide opportunities for early detection and intervention of fetomaternal issues, as well as allowing the mother to promote her wellbeing through therapy. Another belief may be that mothers who had an ANC visit received nutritional therapy to enhance their dietary diversity, allowing the mother and her fetus to have a healthier pregnancy.

Moreover, our study showed that anemia had a significant association with LBW. This result is consistent with research conducted in Ethiopia and Nigeria (25, 26).This may be clarified by reducing nutrients and oxygen to the fetus during pregnancy, resulting in intrauterine growth restriction and LBW.

Furthermore, the current study indicated smoking cigarette had a significant association with LBW. This result is consistent with the findings of studies conducted in India and Tanzania (27, 28). The explanation for this may be that smoking increases the risk of carbon monoxide combining with hemoglobin, forming carboxyhaemoglobin, which reduces oxygen transfer to the placenta and fetus.

The enrolment of research participants using the probability sampling process, which were used to ensure the study's representativeness, was the study's power. In addition, various techniques were used to maintain data quality. The current research, on the other hand, was restricted to health facilities and relied on data from a cross-sectional study design. Furthermore, this research excludes women who gave birth at home.

Conclusion

In conclusion, this study revealed that a significant proportion of newborns are delivered as being LBW. Not receiving ANC service, preterm delivery, anemia and smoking cigarette were predictors of LBW. Consumption of iron-rich foods and abstinence from smoking should be encouraged to help prevent low birth weight. Additionally, increasing the uptake of antenatal care visits and prompt diagnosis and treatment of obstetric complications such as preterm delivery are important. Furthermore, the results of the current study can be used as secondary data in future research in a similar field. Further community based research is needed to better understand the scope of LBW and its contributing factors.

Acknowledgements

We would like to express our gratitude to the data collectors, managers, Wachemo University, and the study facility's workers.

Conflicts of interest

Authors declared no conflicts of interest.

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