

Determinants of Low Birth Weight among Mothers Who Gave Birth in Debremarkos Referral Hospital, Debremarkos Town, East Gojam, Amhara Region, Ethiopia

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Abstract

Background: World Health Organization defines low birth weight as weight at birth of less than 2500 g. Low birth weight could be the result of either preterm birth or restricted intrauterine growth. Globally, out of 139 million live births, about 20 million of them are low birth weight and nearly 95.6% of them are in developing countries. Ethiopia, having an infant mortality rate of 59/1000 live births, has limited data on low birth weight estimates as most deliveries take place at home. According to Ethiopian Demographic and Health Survey, 2011, only 5% of children were weighed at birth. The aim of this study was to assess determinants of low birth weight in Debremarkos referral hospital.

Methods: Facility based case control study was undertaken from June to November 2015. The total sample size was 287 (191 controls and 96 cases). Data was collected through interview using structured questioner, actual measurements and review of clinical records. After checking for completeness and accuracy, data was entered in to Epi-info version 7 and was analyzed by SPSS version 20. Variables with P-value <0.2 in bivariate analysis were entered to multivariate analysis and variables with p-value <0.05, 95% CI were considered statistically significant.

Results: Cases and controls were similar in almost all socio demographic characteristics. About 79.2% of cases and 93.2% of controls had ante natal care at least once. However, majority of cases (73.7%) had ANC visit of three or less, whereas more than half of controls (59.6%) had four or more. Parity (AOR=4.93, 95% CI, 2.55-9.52), three or less ANC visits (AOR=3.81, 95% CI, 1.82-7.99), anemia (AOR=3.91, 95% CI, 1.73-8.87), hypertensive disorders (AOR=6.13, 95% CI, 2.69-13.98) and frequency of meals per day (AOR=2.61, 95% CI, 1.26-5.38) were found significantly associated with low birth weight.

Conclusions: Parity, three or less ante natal care visits, anemia, hypertensive disorders of pregnancy and frequency of meals per day were found significantly associated with low birth weight. Emphasis should be given to ante natal service utilization, prevention of anemia, early detection and management of hypertensive disorders and feeding practice of pregnant women.

Keywords: Determinants; Low birth weight; Case control; Debremarkos; Ethiopia

Introduction

World Health Organization (WHO) defines low birth weight (LBW) as weight at birth of less than 2500 g. LBW could be the result of either preterm birth or restricted intrauterine growth [1]. Globally, out of 139 million live births about 20 million of them are low birth weight and nearly 95.6% of them are in developing countries [2]. LBW contributes substantially to neonatal, infant and childhood mortality and morbidity [3]. Globally neonatal mortality is 20 times higher among LBW babies compared to their counter parts [4]. Evidences also reveal that LBW babies are likely to have disabilities such as poor schooling, hospitalization, poor language development and intellectual impairments [1,5].

Evidences reveal magnitude of LBW to be significantly different across the world. It is highest in South Asia (31%) and lowest in East Asia (7%). In sub-Saharan Africa and Middle East/North Africa it is reported to be 14% and 15% respectively [6].

Ethiopia, having an infant mortality rate of 59/1000 live births, has limited data on LBW estimates as most deliveries take place at home. According to Ethiopian Demographic and Health Survey, 2011, only 5% of children were weighed at birth [1,5]. Better understanding of LBW causes is essential for designing cost effective intervention strategies aimed at reducing LBW rates. This study is therefore aimed at assessing determinants of low birth weight in the study area which might be helpful to design preventive strategies.

Methods

This study was conducted in Debreworkos referral hospital, East Gojam zone, Northern Ethiopia, located 300 km northwest of Addis Ababa. The town is divided into 7 kebeles with estimated total population estimated of 62,469. The town has one referral Hospital, three health centers, three private clinics and one family guidance association (FGA) [7]. The referral hospital catchment population is estimated to be 5 million. The study was conducted from June to November 2015.

Facility based unmatched case-control study design was utilized. Source population was all women who gave live birth in the study facility while study population was all mothers who gave birth to live single ton baby during the data collection period [8-10]. All mothers who gave birth to live singleton baby during the study period were included whereas mothers with: preterm baby, unknown last normal menstrual period (LNMP) and/or have no early ultrasound examination or early urine test, gave birth a baby with serious visible congenital anomalies and macrosomic newborns (baby weighing ≥ 4000 g were excluded from the study [11-13]. Sample size was calculated using Epi Info version 7 with the assumption of P1=14.4% (proportion of controls with no ANC follow up), P2=29.8% (proportion of cases with no ANC follow up), 95% CI, Power of 80%, and case to control ratio of 1:2 (Table 1). The sample size obtained considering the above assumptions was 273 (91 for cases and 182 for controls). Adding 5% non-response rate, the total sample size was 287; which is 96 cases and 191 controls. Cases were operational defined as mothers who gave birth to term live singleton baby weighing less than 2500 g whereas controls were mothers who gave birth to term live singleton baby weighing ≥ 2500 g and < 4000 g. Additional food during pregnancy was defined as intake of at least two additional meals per day during the pregnancy [14,15].

Variable	Case n (%)=96	Control (%)=191	n
Age			
<19	15 (15.6%)	8 (4.2%)	
20-29	68 (70.9%)	151 (79%)	
≥ 30	13 (13.5%)	32 (16.8%)	
Occupation			
Housewife	76 (79.2%)	140 (73.3%)	
Merchant	1 (1%)	18 (9.4%)	
Government employee	12 (12.5%)	33 (17.3%)	
Others	7 (3.1%)	0 (0.0%)	
Marital status			
Married	78 (81.25%)	177 (92.7%)	
Separated	8 (8.33%)	14 (7.3)	
Widowed	6 (6.25%)	0 (0.0%)	
Single	4 (4.12%)	0 (0.0%)	
Residence			
Urban	42 (43.8%)	95 (49.7%)	

Rural	54 (56.2%)	96 (50.3%)
Religion		
Orthodox	75 (78.1%)	156 (81.7%)
Muslim	16 (16.7%)	29 (15.2%)
Protestant	5 (5.2%)	6 (3.1%)
Ethnicity		
Amhara	96 (100%)	190 (99.5%)
Tigray	0 (0%)	1 (0.5%)
Educational status		
Cannot read and write	53 (55.2%)	97 (50.8%)
01-Aug	19 (19.8%)	21 (11.0)
09-Dec	12 (12.5%)	36 (18.8%)
Diploma and above	12 (12.5%)	37 (19.4%)
Family size		
≤ 3	49 (51.0%)	82 (42.9%)
04-Jun	28 (29.2%)	98 (51.3%)
≥ 7	19 (19.8%)	11 (5.8%)
Family monthly income		
≤ 600	43 (44.8%)	61 (31.9%)
700-1500	34 (35.4%)	47 (24.6%)
1600-2500	15 (15.6%)	44 (23%)
≥ 2600	4 (4.2%)	39 (20.4%)

Table 1: Socio demographic characteristics of study participants in Debreworkos Referral hospital, East Gojam, Amhara region, Ethiopia, 2015.

All term singleton low birth weight babies born during the study period were taken as cases and the next two consecutive term singleton normal birth weight newborns were taken as controls. Data was collected through interview using structured questionnaire, reviewing maternal records/carts and actual measurement of some variables. Data collection tool prepared in English was translated in to local language Amharic for data collection and back to English for analysis. Three diploma and one BSc midwives were involved to collect data [16-19]. Data was collected in the immediate post natal period. Height of mothers was measured with height scale in centimeter while the mother is in standing position and bare feet, and was recorded nearest to 0.1 cm. Gestational age was calculated using last normal menstrual period and review of maternal record of early ultrasound examination or urine test.

Weight of babies was measured using neonate scale beam balance machine and babies were weighed naked and weight was recorded to the nearest of 100 g. Weighing machine was checked and zeroed before weighing each baby. Weight of baby was taken within 1-2 h post-delivery. Collected data was reviewed and checked for completeness and consistency on daily basis [20-23]. Training on data collection,

interviewing approach and measurement of height of mother and weight of baby was given to all data collectors and supervisor. Pre-test was done on 5% of the total sample size in Finote selam hospital before actual data collection was started and necessary corrections were made accordingly.

After data was checked for completeness and consistency, it was entered in to computer using Epi info version 7 and then exported in

to SPSS version 20. Further cleaning and recoding was done before analysis. Descriptive statistics like frequencies, cross tabulation, proportion, Mean and standard deviation were computed. Bivariate analysis using binary logistic regression was done to see association between dependent and independent variables (Table 2).

Variables		Birth weight		COR (95% CI)	AOR (95% CI)
		Case (n=96)	Control (n=191)		
Family income	≤1500	77	120	2.40 (1.34-4.29)	
	>1500	19	71	1	
Parity	Primi	49	58	2.39 (1.44-3.96)	4.93 (2.55-9.52)
	Multi	47	133	1	1
Pregnancy intended	Yes	74	167	1	
	No	22	24	2.07 (1.09-3.92)	
ANC status	≤3 times	76	85	4.74 (2.68-8.37)	3.81 (1.82-7.99)
	≥4 times	20	106	1	1
Anemia (hemoglobin level)	<11 mg/dl	26	17	3.80 (1.94-7.44)	3.91 (1.73-8.87)
	≥11 mg/dl	70	174	1	1
Iron and folic acid supplementation	Yes	74	175	1	
	No	22	16	3.25 (1.62-6.54)	
Disease condition during pregnancy	No	57	153	1	1
	Hypertensive disorders	29	16	4.87 (2.46-9.62)	6.13 (2.69-13.98)
	Others	10	22	1.22 (0.54-2.73)	
Number of meal per day	≤3 times	65	72	3.47 (2.06-5.82)	2.61 (1.26-5.38)
	≥4 times	31	119	1	1

Table 2: Bivariate and multivariate logistic regression analysis of variables in relation to LBW among cases and controls in Debreworkos Referral Hospital, East Gojam, Amhara region, Ethiopia, 2015.

All variables with P-value <0.2 in bivariate analysis were entered into multivariate logistic regression model. Association between dependent and explanatory variables was assessed using AOR, 95% CI. Variables with P-value <0.05 were considered statistically significant.

Ethical clearance was obtained from University of Gondar Institutional Research Ethics Review Committee. Formal letter was submitted to all the concerned bodies in the study area to obtain their co-operation in facilitating the study. Data collectors explained the objective, benefit and risks of the study to the study participants to get informed consent prior to data collection. Respondents were told they have the right to refuse or decline from the study at any time if they wish so. Study participants were also explained for the attainment of confidentiality and the information they give will not contain their name or any identifiers and would not be used for any purpose other than the study.

Result

A total of 287 mothers were included in this study (191 controls and 96 cases). There was no non response rate. The mean age and standard deviation of study participants' among cases was 24.57 ± 5.02 while that of controls was 25.39 ± 4.87. Majority of cases and controls (70.9%, 79%) respectively fall to the same age group (20-29). Almost all (99.5%) were Amhara and majority were house wife, married, orthodox and illiterate in both cases and controls. About half of cases (51%) had family size of three or less while equal magnitude of controls had four or more family size. Majority of cases (80.2%) had an income of less than or equal to 1500 Ethiopian birr whereas only about 56.5% controls belong to the same income level.

About 51% of cases were primi parous and 70.6% of controls were multi parous. About 79.2% of cases and 93.2% of controls had ante natal care at least once. However, majority of cases (73.7%) had ANC

visit of three or less, whereas more than half of controls (59.6%) had four or more. Less than half (46.7%) of the cases had first visit at first trimester unlike to controls where majority (71.3%) had first visit at first trimester.

Among cases who had ante natal record of first trimester weight (52.1%), about two third (64%) of them had weight of 50.5 kg and above, while this was also true for majority (88.7%) of the controls. The mean and standard deviation of weight gain during pregnancy for cases and controls was 4.59 ± 1.26 , and 6.2366 ± 1.41 respectively. BMI was calculated for nearly half (47.9%) of cases and more than two third (69.6%) of controls. Majority of both cases (82%) and controls (93.2%) fall to normal range. The proportion of underweight was higher among cases (18%) than controls (3%). About 77.1%, 87.4% pregnancies among cases and controls respectively were intended. Proportion of disease condition during pregnancy among cases was about twice higher than controls (40.6%, 19.9%) respectively. Hypertensive disorders of pregnancy accounts for 71.8% of the diseases among cases.

About 70.75% of controls had additional food intake and 62.3% of them greater than four time a day meal. However, 60.4% of cases had no additional food intake and about two third of them (67.7%) had three times or less a day meal.

The mean birth weight of babies among cases and controls was 2171.9 ± 136.7 and 3082.1990 ± 2221.8999 g respectively. Female sex was dominant in both cases and controls (71.9%, 61.3%) respectively.

Family monthly income, parity, pregnancy intention, ANC service utilization, anemia, iron and folic acid supplementation, hypertensive disorders of pregnancy and frequency of meal per day were found to be associated with low birth weight in binary logistic analysis.

All variables with P-value <0.2 , 95% CI, in bivariate analysis were entered in to multivariate analysis. Parity, Anemia, ANC service utilization, hypertensive disorders of pregnancy and Frequency of meals per day were found to have statistically significant association with low birth weight (P-value <0.05 , 95% CI).

Primigavida mothers were about five times more likely to give low LBW than multi parous mothers (AOR=4.93, 95% CI, 2.55-9.52). Although majority of both cases and controls had normal hemoglobin level, the proportion of Hgb <11 mg/dl was higher among cases than controls. Women with Hgb <11 mg/dl were about three times more likely to give LBW baby than their counter parts (AOR=3.91, 95% CI, 1.73-8.87).

Proportion of hypertensive disorders of pregnancy was also about four times higher in cases than controls [24-29]. Mothers who have hypertensive disorder during pregnancy were about six times more likely to give LBW baby than those who have no the disease (AOR=6.13, 95% CI, 2.69-13.98). The proportion of cases and controls that had ANC service utilization of three or less was 79.2% and 44.5% respectively. Mothers who had three or less visit were about five times more likely to give LBW than who had four and above visits (AOR=3.81, 95% CI,1.82-7.99).

Frequency of meals per day was also found to be significantly associated with LBW [30-33]. Mothers who had three or less times a day meal were about two and half times more likely to deliver LBW baby than those who had four and above meals per day (AOR=2.61, 95% CI, 1.26-5.38).

Discussion

The results of this study revealed that parity, hypertensive disorders of pregnancy, anemia (Hemoglobin <11 mg/dl), ante natal service utilization and frequency of meals per day were independently and significantly associated with LBW.

In this study, mothers who have had three or less ANC visits were about four times more likely to give LBW than those who had four and above visits. Similar finding was found in a study conducted in Axum, Tigray, Northern Ethiopia where mothers who had four and above ANC visits were 71% less likely to give LBW [7]. Facility based case control study done in India also revealed mothers who had ANC visit of three or less to be forty times more likely to give LBW than those who have greater than three visits [8]. Other studies done in University of Gondar referral hospital [9], kersa Demographic Health Research Center [6], Nigeria [10], Sudan [11] and India [12] also revealed ANC visits to be significant risk factors for low LBW. This may be due to the fact that ANC visits of the pregnant mother are very important to reduce adverse pregnancy outcomes including LBW as they provide chances for monitoring the fetal wellbeing and allow timely intervention by improving the health condition of the mother and preventing complications through early detection and treatment of complications [34-38].

Anemia during pregnancy was also found to have significant association with LBW, making anemic mothers about four times more likely to give LBW than their counter parts. This is supported by study done in Nigeria [10] where the proportion of LBW among mothers with anemia and without anemia was 60.5% and 39.5% respectively. Similar case control study conducted in India, karanka district hospital revealed anemic mothers to be about three times more likely to give LBW [13]. Other case control studies done in Sudan [11] and India [12] also conclude similarly. This might be due to the fact that babies born from anemic mothers get less oxygen and nutrients through the placenta.

A study conducted in Gondar town revealed pregnancy induced hypertensive disorders to be a significant risk factor for LBW [14]. Likewise, in this study, mothers with pregnancy induced hypertensive disorders were about six times more likely to give LBW than those who have no the disorder [39-44]. This finding is consistent with case control study conducted in India where mothers with pregnancy induced hypertensive disorders were about three times more likely to give LBW than their counterparts [12]. Matched case control study done in Malaysia also revealed mothers with hypertensive disorders to be about four times more likely to give LBW [15]. Retrospective study in west Algeria also revealed babies born from hypertensive mothers to be at higher risk of LBW (8.12%) than mothers with other disease [16].

Another study on risk factors among full term neonates in south India also reported similar finding [45]. This may be due to the fact that oxygen and nutrient supply through placenta is compromised as a result of the disorders.

This study also revealed primigavida mothers to be about five times more likely to give LBW baby than multi parous mothers. This is consistent with study done in Nigeria and Veintiane where primi parous mothers were about two times more likely to give LBW than multi parous mothers [46,47]. Case control study done in Malaysia also revealed primi gravida mothers to be three times more likely to have LBW baby [15]. This might be related to no prior experience to pregnancy events which might have positive or negative impact to birth weight. This study also showed mothers who had three or less

meals per day were about two and half times more likely to give LBW than those who had four and above. This is against the WHO recommendation of frequency of meals per day for pregnant women which states at least two snacks between meals [2]. This might be due to limited food availability or poor awareness on the need for extra food during pregnancy.

Conclusion and Recommendation

Parity, Anemia, Hypertensive disorders during pregnancy, Ante natal service utilization and frequency of meal per day were found to be independently and significantly associated with low birth weight. We would like to recommend zonal and regional health offices to design programs which can improve ANC utilization, anemia prevention, and feeding practice of all pregnant women.

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Authors' Contribution

TG and KG designed and developed the proposal. They also supervised the data collection, analyzed the data and drafted the manuscript. EA and MG assisted the whole process from proposal development. They also reviewed and commented the manuscript. All authors read and approved the final manuscript.

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