Low Birth Weight and Nutritional Risk Factors Among Newborns in Fafan and Liban Zone, Somali Region, Ethiopia

Abstract

Background: *Birth weight is an important predictor of an infant's future health, and growth, It serves as a key indicator of various public health issues, including long-term maternal malnutrition and inadequate healthcare during pregnancy. In developing countries, a birth weight below 2,500 grams is a leading cause of infant and child mortality. While the determinants of low birth weight are not yet fully understood, this research is aimed to assess the prevalence low birth weight and the nutritional risk factors affecting newborns in the Fafan and Liban Zones of the Somali region in Ethiopia*

Methodology: *Institution-based cross section study design was conducted among 191 newborns delivered from March to May,2021 in Sheikh Hassan Yabare Referral hospital and Dolo Ado primary hospital, Consecutively, simple random sampling was employed to select study participants. Data were collected by interview using semi-structured and pretested questionnaire. Descriptive statistics were used for data description, and binary logistic regression was performed to explore the associations between independent and dependent variables.*

Result: *In this study, the prevalence of low birth weight was 25.1% percent. Iron folic acid supplementation during pregnancy[(AOR=0.23(0.11,0.50)],maternal under-nutrition (MUAC <22cm) [(AOR=3.17(1.22,8.25)] and Family Size ≥5 person[(AOR=2.74(1.13,6.62)] were found to be independent predictor of low birth weight.*

Conclusion: *Low birth weight is a critical public health challenge that demands urgent attention due to its connection to various risk factors. According to our findings iron and folic acid supplementation during pregnancy, maternal undernutrition, and larger family sizes (≥5 people) significantly contribute to low birth weight. To effectively tackle this issue, we must prioritize comprehensive family planning services, ensure increased access to antenatal care, and enhance household food security and dietary diversity. By implementing these measures, we can work towards healthier pregnancies and better outcomes for future generations.*

Keywords: *Birth weight, Fafan and liban Zone,Newborn, Low birth weight, Somali region*

1.1. Introduction

According WHO, "Low birthweight is a term used to describe babies who are born weighing less than 2,500 grams. 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. It also indicates past and present health status of the mother. LBW is considered as the single most important predictor of infant mortality, especially of deaths within the first months of life" [1]. "It is also a significant determinant of infant and childhood morbidity, particularly of neurodevelopment impairment such as mental retardation and learning disability" [2].

Low birth weight (LBW) imposes a significant burden on political, social, economic, and healthcare systems in both developing and developed countries. In response, the World Health Assembly has set a policy target to reduce LBW by 30% by the end of 2025. Various strategies have been implemented to address the issue of newborns with below-

normal birth weight, focusing on the care packages provided during the prenatal, antenatal, and postnatal periods. In Ethiopia, globally recommended approaches are being applied; however, a meta-analysis showed that the prevalence of LBW is 17.3%. This finding lacks national representativeness, as no data are available from the Benishangul Gumuz, Afar, Somali, and Gambella regions, Harari region and Dire Dawa city administration. [3,10] Therefore, it is important to identify low birth weight and nutritional risk factors among newborns in the Fafan and Liban Zones of the Somali region. This will help to develop feasible intervention strategies aimed at minimizing adverse reproductive outcomes.

2. Materials and Method

Study design, area and period

An institutional-based cross-sectional study was conducted from March to May,2021 among Newborns in Fafan and Liban Zone, Somali region, eastern Ethiopia.

Eligibility criteria: Birth weight of all selected sample were included. Newborns with multiple births, visible deformity, and preterm were excluded from the study because those conditions are known as risk factors for low birth weight.

Sample Size determination

The sample size was determined using a single population proportion formula. By the following assumptions: The level of confidence (α) is taken to be 95% (Z1-α /2=1.96); the margin of error (d) is taken to be 5% [0.05]. The proportion (p) of low birth weight was 13%, according Ethiopian demography health survey performed in Ethiopia (EDH, (2016). The final sample size was 191.

$$n_o = \frac{\left(Z\alpha_{/2}\right)^2 \times P(1-P)}{d^2} = \mathbf{191}$$

Sampling procedure

A Simple Random Sampling technique was imployed to select study participants. According to delivery reports from Sheikh Hassan Yabare Referral Hospital and Dolo Ado Hospital, a total of 900 women deliver each month. Consequently, 191 study participants were chosen through simple random sampling. Lottery method was used to select the initial participants. If a selected participant did not meet the inclusion criteria, the next participant on the list was included.

Variables of the Study

Dependent variables: Birth weight

Independent Variables

Socio-demographic variables: (Infant's sex, marital status, maternal age, the weight of the mother, maternal education, religion, ethnicity, maternal occupation..

Obstetric factors: (gestational age, parity, Antenatal Care (ANC) visit, anemia, history of abortion, gravidity.

Nutritional factors: maternal MUAC, nutrition counselling during pregnancy, and prenatal iron supplementation

Data collection Procedure

The data were collected by interviewing the mothers, observing medical records and measuring the anthropometry of the mothers and the newborns using Semi-structured and pretested questionnaires. The interview and anthropometric measurements were conducted by 8 trained midwives working in delivery rooms of the two public hospitals and 2 supervisors.

The socio-demographic, obstetric, and nutritional factors of the questionnaire were obtained from the maternal interviews, and document review. Newborn's birth weight was measured within 1–2 hours after birth by using balanced seca scale. The scale measures starting from 50 grams (g) (lowest) to 20 kilograms (highest) and rounded to the nearest 50 g. The scale interval was 50 g. Mothers who fulfill the inclusion criteria were interviewed face to face within a day after delivery. MUAC of mothers was measured by MUAC tape and rounded to the nearest 0.1cm. Mother were classified as undernourished if their MUAC was less than 22 cm (WHO 2011).

Data analysis

Data was entered and analyzed SPSS (version 25). Multivariable logistic regression was used to measure the association between birth weight and independent variables with 95% confidence interval. Finally, Statistical significance was declared at p-value < 0.05.

2. Result

Socio-demographic characteristic of the respondent

In this study 191 of new baby/mother pairs s were included yielding 100% response rate. The mean age of the mother was 27.91(±4.6) and more than two third of the respondents 158(82.7%) were found within the age 20-34. The majority of the participants 156(81.7%%) were Somali followed by Oromo 22(11.7%). Ninety nine percent of the mothers were married and sixty percent of the respondents were urban residence. Regarding maternal educational status, 61(31.9%) of the respondents were unable to read and write and closed-two third of the participants were housewives(65.4%). A summary of Socio-demographic characteristics of the present study participants is indicated in table 1

Table:1: Socio-demographic characteristics **of women delivered in Sheikh Hassan Yabare Referral hospital and Dolo Ado primary hospital**

Variable	Categories	Frequency	Percentage
Age of the Mother	<19	8	4.2%
	20-34	158	82.7%
	34-39	25	13.1%
Religion	Muslim	169	88.5 %
	Orthodox	20	10.5%
	Protestant	2	1%
Ethnicity	Somali	156	81.7%
	Oromo	22	11.5%
	Amhara	6	3.1%
	Tigray	2	1%
	Others	5	2.6%

Residence	Urban Rural	115 76	60.2% 39.8%
Marital Status	Married Single	190 1	99.5% 0.5%
Maternal educational status	Illiterate Primary-Secondary Education Diploma Degree Master	61 3 101 25 1	31.9% 1.6% 52.9% 13.1% 0.5%
Maternal occupation	House- wife Trade Professional Private-worker Students Un-employed	125 30 20 5 3 3	65.4% 15.7% 10% 2.6% 1.6% 1.6%
Family Size	≤ 5 people ≥ people	128 63	67% 33%

Prevalence of low birth weight among new born babies in Sheikh HassanYabare Referral hospital and Dolo Ado Primary hospital,

As shown by in Figure 1. Out of the 191 participants, 48 (25.1%) were classified as having low birth weight (≤2500 grams). This indicates that approximately one-fourth of the participants experienced adverse pregnancy outcomes, highlighting the need for immediate interventio

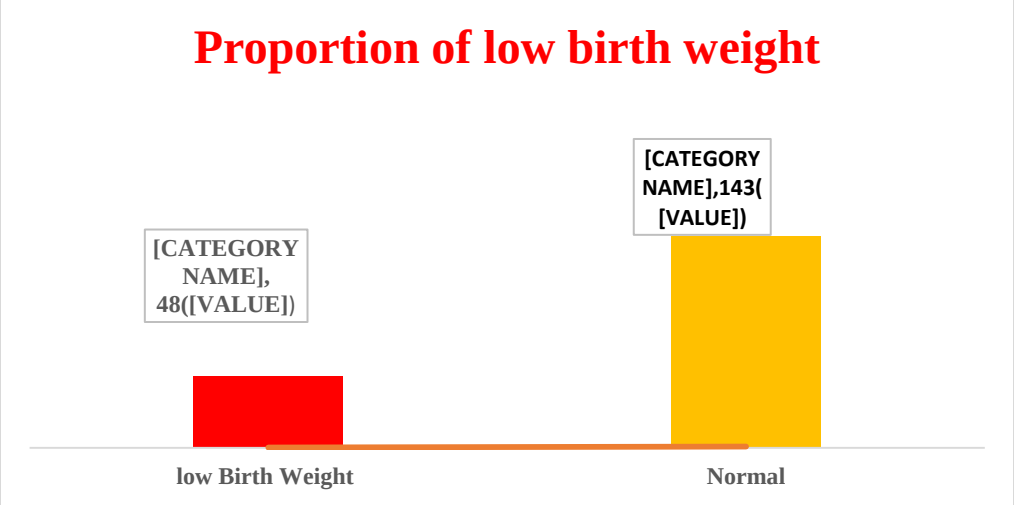

Figure. 1 Birth weight of newborns delivered in Sheikh HassanYabare Referral hospital and Dolo Ado primary hospital.

Maternal nutrition

As illustrated by Table 2: Only thirty-two (16.7%) of the mothers reported taking additional food during pregnancy and two-thirds of the mothers (125(65.4%) had received nutritional counselling. Approximately two-thirds of the mothers(62.8%) had received iron and folic acid supplements, while, one-third (30.4%) of the mother were found to

have anemia (Hb<11g/dl) A summary of the maternal nutritional status of the present study participants are indicated in table 2.

Table:2. Maternal Nutrition

Variable	Categories	Frequency	Percentage
Maternal MUAC	Under-nourished	38	19.9%
Maternal Hemoglobin	Anaemic	58	30.4%
Additional food during pregnancy	Yes	32	16.7%
Nutritional Counseling	Yes	125	65.4%
Iron and Folic Acid Supplementation	Yes	120	62.8%
Nutritional problem during pregnancy	Nausea and Vomit	90	47.1%
	Poor Appetite	48	25.1%
	Heartburn	41	21.5%
	Constipation	12	6.3%

Food type consumed during current pregnancy

Twenty-five percent (n=49) of respondents reported consuming animal proteins daily, while nearly two-thirds 125 (65.4%) consumed plant proteins daily. Approximately, two-third of the participants 117((61.3%) ate fruits three times a week, and 120(62.8%) consumed dark green vegetables daily. Additionally, 174(91%) reported eating cereal daily, whereas one-third 66(34.6%) consumed milk and dairy products.

Table: 3. Food type consumed during current pregnancy

Variable	Categories	Frequency	Percentage
Animal Protein	Daily	49	25.7%
	Theric week	106	55.5%
	Twice a week	9	4.7%
	Once a week	15	7.9%
	Once a month	12	6.3%
Plant Protein	Daily	125	65.4%
	Theric week	38	19.9%
	Twice a week	12	6.3%
	Once a week	12	6.3%
	Once a month	4	2.1%
Fruit	Daily	51	26.7%
	Theric week	117	61.3%
	Twice a week	9	4.7%
	Once a week	7	3.7%
	Once a month	7	7.7%
Vegetable	Daily	120	62.8%
	Theric week	51	26.7%
	Twice a week	8	4.2%
	Once a week	7	3.7%
	Once a month	5	2.6%

Cereals	Daily	174	91.1%
	Theric week	17	8.9%
Milk and milk product	Daily	66	34.6%
	Theric week	120	62.8%
	Twice a week	3	1.6%
	Once a week	2	1%
Oil	Daily	179	100%

Obstetrical characteristics of women delivered in Sheikh Hassan Yabare Referral hospital and Dolo Ado primary hospital

Out of 191 mothers surveyed, 34 (17.8%) were pregnant for the first time (primigravid), and 45 (23.6%) had given birth for the first time (primiparous). Additionally, 30 (15.7%) of the respondents reported having experienced a previous abortion. The majority of mothers, 165 (86.9%), attended antenatal care (ANC) during their pregnancy. However, a significant number of participants, 175 (91.6%), reported never using family planning methods. A summary of maternal obstetric characteristic of the present study participants is indicated in table 4.

Table 4: Obstetrical characteristics of women delivered in Sheikh Hassan Yabare Referral hospital and Dolo Ado primary hospital

Variable	Categories	Frequency	Percentage
Gravidity	Prime-gravida	34	17.8%
	2-5 pregnant	131	68.8%
	six times become pregnant and more	23	13.6%
Parity	Prime-parity	45	23.6%
	Multi-parity	125	65.4%
	Grand-Multiparity	21	11%
Gestational age	<36 week	30	15.7%
	37-40week	158	82.7%
	>40week	3	1.6%
Previous pregnancy interval	<2year	173	90.6%
	≥2 year	18	9.4%
History of abortion	Yes	30	15.7%
ANC Follow-up	Yes	166	86.9%
Time of 1st ANC visit	1st trimester	102	53.4%
	2nd trimester	86	45%
	3rd trimester	3	1.6%
Family planning practice	Never used	175	91.6%
	Traditional method	3	1.6%
	Modern Method	13	6.8%

Factors associated with low birth weight among women delivered in Sheikh Hassan Yabare Referral hospital and Dolo Ado primary hospital.

Binary logistic regression was done to identify the effect of independent variable on dependent variable (birth weight). During binary logistic regression analysis sex of the neonate, age of the mothers, residence, family size,

nutritional counseling service during pregnancy, iron folic acid supplementation, anti-nontonal care visit, under-nutrition, and anemia(hemoglobin) were included. Iron folic acid supplementation during pregnancy [(COR=4.23(1.99, 9.02)], under-nutrition [(COR)0.31(0.12,0.81)], and Family Size ≥5 person [(COR=0.36(0.15,0.87)])] had statistically significant association with lower birth weight.

Multivariate logistic regression analysis iron folic acid supplementation during pregnancy[(AOR=0.23(0.11,0.50)], maternal under-nutrition[(AOR=3.17(1.22,8.25)] and Family Size ≥5 people [(AOR=2.74(1.13,6.62)] were found to be independent predictor of low birth weight.

Iron folic acid supplementation during o pregnancy was significantly associated with low birth weight: mothers who took iron folic supplementation were 23 times less likely to delivery low birth weight neonate when we compere to their counterpart[(AOR=0.23(0.11,0.50)].

Under-nutrition was significantly associated with low birth weight: under-nutrition mothers were 3.17 times more likely to have low birth weight neonate when we compare to their counterpart[(AOR=3.17(1.22,8.25)].

Family size was significant associated with low birth weight: mother from family size ≥5 people was approximately three time more likely to have low birth weight neonate when we compare to those come from family size less than five people [(AOR=2.74(1.13,6.62)].

Table:5: Factors associated with low birth weight among women delivered in Sheikh Hassan Yabare Referral hospital and Dolo Ado primary hospital.

Variables	Responses	COR(95% CI)	AOR(95% CI)
Sex of the neonate	**Male**	**1.40(0.67,2.94)**	**0.69(0.33,1.46)**
	Female	**I**	**I**
Age	**<19**	**1.44(0.24,8.33)**	**0.69(0.12,4.01)**
	20-49	**I**	**1.87(0.53,6.56)**
Residence	**Urban**	**1.0(0.48,2.09)**	**0.99(0.47,2.06)**
	Rural	**1**	**I**
Nutritional counselling	**Yes**	**0.54(0.23,1.26)**	**1.82(0.79,4.19)**
	No	**I**	**I**
Iron folic acid supplementation provision	**Yes**	**4.23(1.99, 9.02)**	**0.23(0.11,0.50) ***
	NO	**I**	**I**
Under-nutrition (MUAC)	**Yes**	**0.31(0.12,0.81)**	**3.17(1.22,8.25) ***
	No	**I**	**I**
Anemia	**Yes**	**0.98(0.46,2.10)**	**1.01(0.47,2.17)**
	No	**I**	
Family Size	**≤ 5 people**	**0.36(0.15,0.87)**	**2.74(1.13,6.62) ***
	≥ people	**I**	**I**
ANC visit	**Yes**	**0.67(0.21,2.12)**	**1.47(0.47,4.62)**
	No	**I**	**I**

Discussion

Somali region, Ethiopia low birth weight is still remaining significant cause of morbidity and mortality among neonates and neonatal mortality rate increased from 27 deaths per 1,000 births in 2005 to 41 deaths per 1,000 births in 2016(7)**.** Our study set out to establish the prevalence and risk factor for low birth weight among mothers delivered in Sheikh Hassan Yabare Referral hospital and Dolo Ado primary hospital.

The prevalence of low birth weight was 25.1% percent. Iron folic acid supplementation during pregnancy[(AOR=0.23(0.11,0.50)], under-nutrition (MUAC <22cm)[(AOR=3.17(1.22,8.25)] and Family Size ≥5 person[(AOR=2.74(1.13,6.62)] were found to be independent predictor of low birth weight.

We found a low-birth-weight prevalence rate of 25.1%, This figure is significantly higher than the national average reported in the Ethiopian Demographic Health Survey (2016), which is 13%. In addition, it higher than the prevalence 17.4% from Gondar[{4}] and 14.6% from a mixed study in Tigray[{5}] Our findings also higher than the LBW prevalence rates of 6.3% and 12.3% reported in studies conducted in Benin City, Nigeria, and at Olkalou District Hospital in Central Region, Kenya, respectively.[{6,7}] The variations in prevalence rates could be attributed to differences in study design, population characteristics, and geographic factors, which may influence health service utilization and the nutritional status of mothers during pregnancy. However, our findings is lower than the 32% documented in a facility-based study at Negest Elene Mohammed Memorial General Hospital in Hosanna Town, SNNPR, Ethiopia, in 2016. This discrepancy may be due to differences in sample size and socio-economic factors.

"Low birth weight observed in this study was approximately consistent with studies conducted in Bahir Dar Felege Hiwote Referral which was 25.5% [8] and 25.5% from a cross sectional Study done on the prevalence and factors associated with low birth weight among Teenage Mothers in New Mulago Hospital in Uganda"[13]

Increased family size may adversely affect the nutritional status of every member of the household, including mother, because it may be associated with decreased per capita human inputs. In other words, the allocation of food per house hold is likely to decrease with the increase in the number of family size, which, in turn, may adversely affect the nutritional status of the mother. In line with this, the current study revealed that respondents from family size ≥5 people were approximately three time more likely to have low birth weight neonate when we compare to those come from family size less than five people [(AOR=2.74(1.13,6.62)].

"Maternal nutritional status prior to and during pregnancy is an important factor, especially as demand for macronutrients and micronutrients increase. Iron requirements, e.g., increase by about 8-fold by the third trimester to support the development of the maternal-placental-fetal unit during pregnancy[14]. necessitating supplementation during pregnancy. In line with this, our study reveals mothers who took iron folic supplementation were 77% times more likely to delivery normal birth weight neonate when we compere to their counterpart[(AOR=0.23(0.11,0.50)].

Poor nutrition is a known cause of low birth weight, especially in developing countries. According to Kramer reported that maternal nutritional factors both before and during pregnancy account for 50% of cases of LBW in many developing countries" [15]. In line with this, our study reveals maternal under-nutrition was significantly associated with low birth weight: under-nourished mothers were three times more likely to have low birth weight neonate when we compare to their counterpart[(AOR=3.17(1.22,8.25)].

Poor nutrition is a well-known cause of low birth weight (LBW), particularly in developing countries. According to Kramer maternal that maternal nutritional factors, both before and during pregnancy, account for 50% of LBW cases in many developing nations. Consistent with this, our study found that maternal undernutrition was significantly associated with low birth weight: undernourished mothers were three times more likely to have low birth weight neonates compared to their counterparts (AOR=3.17, 95% CI: 1.22–8.25).

Conclusion

Low birth weight is a critical public health challenge that demands urgent attention due to its connection to various risk factors. According to our findings iron and folic acid supplementation during pregnancy, maternal undernutrition, and larger family sizes (≥5 people) significantly contribute to low birth weight. To effectively tackle this issue, we must prioritize comprehensive family planning services, ensure increased access to antenatal care, and enhance household food security and dietary diversity. By implementing these measures, we can work towards healthier pregnancies and better outcomes for future generations. In this study, Iron folic acid supplementation during pregnancy[(AOR=0.23(0.11,0.50)] and Family Size ≥5 person[(AOR=2.74(1.13,6.62)] was significantly associated with the low birth weight among newborns; this was not much revealed by other studies.

Limitation

This study was Institutional based, and therefore it may not be as good as population-based studies to generalize the results in the population

Ethical Approval and Consent:

Ethical clearance for the research was obtained from the research, publication and technology transfer directorate director of Jigjig University. Written informed consent and or assent were obtained from each study participant after they were included in this study. The assent was taken from the mother and signed on the consent form after detail explanation of the procedure and the research. The purpose of the study was explained to study participants before giving consent. Confidentiality was maintained at all levels of the study. Participants were informed about the weight status of the neonate. All mothers who deliver low birth weight neonate were given appropriate nutrition counselling

Disclaimer (Artificial intelligence)

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