Research Article

Undernutrition and Associated Factors among Lactating Women: Community-Based Cross-Sectional Study in Moyale District, Borena Zone, Southern Ethiopia

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Background. Undernutrition is one of the most widespread public health problems that affect both developed and developing countries. In Ethiopia, it is one of the factors leading to unacceptable high morbidity and mortality among women. However, little is documented on undernutrition among lactating women particularly in such a purely pastoral community. Therefore, this study was designed to assess prevalence of undernutrition and its associated factors among lactating women living in pastoral community of Moyale District, Borena Zone, Southern Ethiopia, 2018. *Methods.* A community-based cross-sectional study was conducted. Data were collected from a random sampled 545 lactating women using structured interviewer-administered questionnaire. Height and weight measurements of the study participants were also taken to compute body mass index. Data were entered in to Epi info version 7 and then exported to SPSS version 21 software for analysis. Descriptive statistics like frequency, mean, and percentage were computed to describe characteristics of the sample. Multivariable analysis was carried out, association between independent and dependent variables were measured using adjusted odds ratios, and its 95% confidence interval and *P* value below 0.05 were considered statistically significant. *Results.* This study showed that prevalence of undernutrition among lactating women was 17.7%. Dietary diversity (AOR = 2.49, 95% CI: 1.43–4.36), monthly income (AOR = 5.22, 95% CI: 1.40–19.40), extra meal taking (AOR = 2.76, 95% CI: 1.43–5.29, delivery place (AOR = 2.65, 95% CI: 1.24–5.65), and household food insecurity (AOR = 6.57, 95% CI: 3.50–12.34) were independent variables showing statistically significant association with undernutrition of lactating women. *Conclusion and recommendations.* The study revealed that magnitude of undernutrition among lactating women was high. Dietary diversity, monthly income, extra meal, delivery place, and household food insecurity were found to be predictor of undernutrition. Finally, we recommend that governmental and nongovernmental organizations should organize timely interventions targeting lactating women.

1. Introduction

Undernutrition refers to the outcome of insufficient food intake and/or poor absorption and/or poor biological use of nutrients consumed. It includes being underweight for one's age, too short for one's age (stunted), dangerously thin for one's height (wasted), and deficient in vitamins and minerals (micronutrient deficiencies) [1, 2]. It takes place when the body doesn't receive the nutritional support it requires [3].

There are many contributing factors to undernutrition including poverty, poor hygiene, lack of nutritional knowledge, no access to water supplies, poor housing, access and utilization of health services, and cultural practices and discriminatory social structure which often occur together, and these create an environment of poor nutrition and susceptibility to infectious diseases [4], vulnerability of lactating women is high due to considerable elevation of nutrient requirements during lactation than in any other stage of a woman's reproductive life due to physiological change, and it imposes high metabolic demand on the women to nourish their children with breast milk of good concentration of important nutrients [5, 6].

The energy cost of milk production in the first six months of exclusive breastfeeding increases women's daily energy needs by 30% or 1260 kJ/day above the pregnancy energy requirement, and this breast milk production has total energy value that requires average daily energy cost of breast feeding of approximately 2.9 MJ/day [7].

The energy, protein, and other nutrients in breast milk come from the women's diet or from her own body stores. When women do not get enough energy and nutrients in their diets, repeated, closely spaced cycles of pregnancy and lactation can reduce their energy and nutrient reserves leading to a process known as maternal depletion [8]. This will lead to health effects in the women rather than the infant leading to potential health effects unless extra meal with good quality is made available to lactating women [9, 10].

Currently, 815 million people (11% of global population) worldwide are living in hunger and are affected with all form of malnutrition due to different factors among which conflicts and climatic changes are the leading [11].

Globally, evidences show that about 13% of women are underweight and 33% are anemic of which at least half because of iron deficiency and this number is higher in economically poor countries varying from by 20–25% for underweight and 48%–57% for anemia. Low body mass index ($<18.5 \, kg/m^2$) and/or short stature (height $<145 \, cm$) are common in women in low-income countries, with the highest rates in southern and southeastern Asia, followed by sub-Saharan Africa, with "critical" rates ($\geq 40\%$) in Eritrea [12, 13]. Furthermore, in sub-Saharan Africa, data during 2000–2015 indicate that undernourishment prevails among 15–49 years of age in countries of the region ranging from lowest 3.2% in Swaziland to 37.3% in Eritrea where Ethiopia accounts 20% [14].

Undernutrition constrains the ability of women to fill their potential to the fullest. Hunger and undernourished women are not able to take on physical work, are less able to attend school, and also has consequence of economic loss. Africa and Asia lose 11% of GDP every year due to poor nutrition while economic loss happens due to undernutrition [15]. In fact, it is not limited to only impacting the health and physical work capacity of the women but it is also one of reasons that put breast milk feeding children into the risk of inadequate feeding leading to stunting which is currently affecting about 155 million worldwide and 59 million in Africa [16].

In sub-Saharan Africa countries, there is a serious problem of maternal undernutrition caused by inadequate food intake, high energy expenditure, frequent reproductive cycle, and frequent infectious diseases like malaria and human immunodeficiency virus (HIV) resulting in unacceptably high morbidity and mortality rates as the region is highly exposed to natural and manmade disaster which led to socioeconomic problems [17, 18].

According to Ethiopia Nutrition Profile of 2014, household food insecurity, hunger, and undernutrition remain critical issues; the poor nutritional status of women and children has been a consistent problem in Ethiopia which causes about 27% of women of reproductive age to be undernourished, leaving their children predisposed to low

birth weight, short stature, lower resistance to infections, and higher risk of disease and death [19]. In addition, according to Ethiopian Demographic and Health Survey 2016 (EDHS, 2016), 22% of total women of reproductive age were undernourished based on their measure of BMI ($<18.5 \, kg/m^2$) and 8% were overweight/obese, and 29% pregnant and lactating women were anemic with hemoglobin level of less than 11 g/dl [20].

The Government of Ethiopia has made a firm commitment to address food insecurity and undernutrition, by launching the National Nutrition Program (NNP) which was revised and relaunched by the government in 2013 and Health Sector Development Plan IV (2010–2015) and other initiatives to combat undernutrition [19, 20].

Finally, even though growing number of studies reported the existence of maternal undernutrition and different associated factors in different parts of the country, very few studies in Ethiopia highlighted the issue of undernutrition among the lactating women of the pastoral community of Ethiopia [14, 15, 17–20]. Most of studies did not include the nutritional knowledge of lactating women as a factor affecting the nutritional status of lactating women. Up to our knowledge, there is no study conducted on this subject in this particular area. The purpose of this study is, therefore, to assess the prevalence of undernutrition and associated factors among lactating women in Moyale District pastoral community, Borena, southern Ethiopia.

2. Materials and Methods

2.1. Study Design and Period. A community-based cross-sectional study was employed to determine the prevalence and associated factors of undernutrition among lactating women from July 1 to July 30, 2018.

2.2. Setting and Participants. The study was carried out in the Oromia Regional State of Borena Zone, Moyale District. Moyale District is one of the 13 districts of Borena Zone, Oromia region, located at a distance of 775 km from Addis Ababa, the capital city of Ethiopia sharing international borders with Kenya to the south. Based on the 2007 Population and Housing Census projection, the total population is about 163,984 with a sex ratio of 1 : 1. All lactating women were considered as the source population, while selected (at least 6 months) lactating women in selected Kebeles were taken as study population during the study period.

2.3. Sample Size Determination. We estimated a sample size of 545 lactating women using single population proportion formula, assuming a 25.4% prevalence of malnutrition among lactating women from the study conducted in Samre, southeastern zone of Tigray, Ethiopia [21], with 0.05 margin of error with 95% confidence interval and using design effect of 2. Since the target population was <10,000, the finite correction formula was considered and 10% nonresponse rate was added to the total sample.

2.4. Sampling Procedure. Fifteen Kebeles of Moyale District were clustered into 3 urbans and 12 rural kebeles, out of which 8 kebeles (2 urban and 6 rural) were selected by system random sampling with the lottery method, and the total sample size was proportionally allocated to each kebele. Using the Community Health Information System (CHIS) registration of households, lactating women were identified and sequential numbers were provided. The final study participants were identified using the systematic sampling method after the sampling interval in each kebele was determined by dividing the total number of households with lactating women by the allocated sample size. In case where more than one eligible respondent was found in the same selected household, only one respondent was chosen by the lottery method.

2.5. Data Collection. Data were collected through face-to-face interview of lactating women in selected households using structured questionnaires adapted from the different literatures of similar studies [22, 23]. The household food insecurity level was also measured with the Household Food Insecurity Access Scale (HFIAS), a tool which is validated in both urban and rural areas of Ethiopia to measure the household food security [24, 25].

The women's dietary intake pattern was measured by a qualitative recall of all foods consumed by each woman during the previous 24 hours, and thus certain food groups were aggregated to calculate individual (women's) dietary diversity score (IDDS/WDDS) [25].

Household monthly expenditure was indirectly measured by measuring the monthly household expenditure using the tool used by the FDRE Ministry of health to conduct household health service utilization and expenditure survey [26].

Nutritional knowledge of the women was assessed using the questionnaire containing 12 questions adapted from similar studies conducted previously [27, 28].

Anthropometric measurement (BMI) was taken from the study participants. For weight measurement, women were asked to remove their shoes and wear light cloths, and they were weighed on a calibrated portable digital scale and recorded the value to the nearest 0.1 kilogram. For height measurement, study participants were asked to stand erect with their shoulders leveled, hands at their sides, thighs and heels comfortably together, and the buttocks, scapulae, and head positioned in contact with the vertical backboard with a sliding head bar. Then, height values were recorded to the nearest 0.1 cm. Body mass index (BMI) of the study subjects was calculated.

Four data collectors and two supervisors who were not working in the actual study area were recruited for the data collection, and two days' training was provided to data collectors and supervisors. A pretest was conducted before the actual data collection in similar setting out of the selected kebeles, and intensive supervision was made by principal investigator and supervisors.

2.6. Data Management and Analysis. Quantitative data were entered and cleaned using Epi Info version 7.2.2 and exported to SPSS version 21.0 for analysis. Descriptive statistics of the collected data like frequency, percentage, mean, and standard deviation were done for most variables in the study using statistical measurements.

The Women Dietary Diversity Score (WDDS) was calculated, and the mean score was used to classify the adequacy of women nutrient intake [29].

The Household Food Insecurity Access Scale (HFIAS) measured the household food security, and then the households were categorized into four categories as secured, mildly insecured, moderately insecured, and severely food insecured households and then recoded to dichotomize into secured and unsecured [30]. The outcome variable was recoded to dichotomous outcomes: either they are undernourished or not. Lactating women with BMI<18.5 kg/m^2 will be coded as "1" and those with BMI ≥ 18.5 kg/m^2 was coded "0." Mid-upper arm circumference (MUAC) of the women was measured, and 21 cm MUAC value was used as the cutoff point. The independent bivariate logistic regression model was used to assess the possible association between predictors and outcome variables.

All covariates that are significant at P value < 0.2 in bivariate analysis was considered for further multivariate analysis to control for all possible confounders and to detect true predictors of undernutrition. Multivariate logistic regression was fitted by using the enter method technique to identify determinants of undernutrition. The odds ratio along with 95% confidence interval was used to assess the association between the outcome variable and independent variables using multivariable logistic regression. Adjusted odds ratio along with 95% confidence interval was used to declare the statistically significant variables at $P < 0.05$.

3. Results

3.1. Sociodemographic and Economic Characteristics of Lactating Women. A total of 532 lactating women aged 15–49 years participated, and the response rate was 97.6%. More than half of respondents, 316 (59.4%), were in the age group of 15–25, and the mean ± SD age was 25.8 ± 5.4 years. Concerning their residence, 346 (65%) of the respondents were from rural area. Majority 432 (81.2%) of the respondents were followers of the Muslim religion. Regarding their ethnicity, 382 (71.7%) of study participants were Oromo. Concerning marital status, 504 (94.7%) of the women were married and currently living with their husbands. Of the total study participants, 299 (56.2%) cannot read and write. One-hundred fifty 150 (28%) of the study participants were pastoralist, and 207 (38.9%) of them were unemployed. About 283 (53.2%) of the households had a family size greater than 4 (Table 1).

3.2. Household Food Security Status. This study depicted that half of the study participants, 269 (50.6%), worried about their food despite 229 (43.0%) having no food type preference. In addition, this survey indicated that 139 (26.1%) of the lactating women consumed unwanted food and 99 (18.6) also experienced limited food amount. Results from this survey showed that 63 (11.8%) and 24 (4.5%) of the study participants experienced limited amount of food and meal

Table 1: Socioeconomic and demographic characteristics of lactating women ($N = 532$) in Moyale District, Borana, Southern Ethiopia, 2018.

Variables	Categories	Frequency	Percent (%)
	15–25	316	59.4
Age	26–35	192	36.1
	36–49	24	4.5
Residence	Urban	186	35.0
	Rural	346	65.0
	Orthodox	56	10.5
	Protestant	26	4.9
Religion	Muslim	432	81.2
	Wakefata	18	3.4
	Married	504	94.7
Marital status	Single	1	.2
	Divorced	16	3.0
	Widowed	11	2.1
	Illiterate	299	56.2
Educational level	Primary	167	31.4
	High school	42	7.9
	Diploma and above	24	4.5
	Illiterate	241	45.3
Educational status of husband	Primary	158	29.7
	High school	86	16.2
	Diploma	47	8.8
	Pastoralist	150	28.2
	Governmental	23	4.3
Occupation	Private business	54	10.2
	Trade	98	18.4
	Jobless	207	38.9
	Pastoralist	163	30.6
	Governmental	70	13.2
Occupation of husband	Private business	137	25.8
	Trade	128	24.1
	Jobless	34	6.4
	<1500	55	10.3
Family monthly income	1500–3000	263	49.4
	3000–4500	164	30.8
	>4500	50	9.4
Household food security level	Secured	284	53.4
	Insecured	248	46.6
	≤4	249	46.8
Family size	5–7	209	39.3
	>7	74	13.9

frequency, respectively. Table 2 summarizes the household food insecurity among lactating women in Moyale District.

Food insecurity level of households was assessed, and 277 (52%) the households were food secured, while 138 (25.9%), 94 (17.7%), and 36 (6.8%) fell into the category of mildly, moderately, and severely food-insecured households, respectively (Figure 1).

3.3. Health Care Utilization, Feeding Practice, and Environmental Characteristics of Lactating Women. With regards to family planning utilization, only 193 (36.3%) of the total respondents had a history of family planning method utilization before pregnancy of the current child. Four-hundred and one (75.4%) women got pregnant at the age below 19 years. Four-hundred ninety-five (93%) women had ANC follow up during pregnancy of the current child, of which only 324 (60.9%) had attended the fourth visit. Four-

hundred and twelve (77.4%)) of the study participants gave birth to the current child at the health institution. From the total women participated in this study, 376 (70.5%) responded that they had received postnatal care from skilled health professionals at the time they gave birth to the current child. Of the total women included in this study, 436 (44.4%) of them were breastfeeding children aged less than 6 months.

The mean dietary diversity score of lactating women was 4.6 ± 1.6, 296 (55.6%) of the respondents had a dietary diversity score of ≥ 4.6, while the rest 236 (44.4%) had a dietary diversity score less than mean 4.6. With regard to feeding practice of the respondents, 331 (62.2%) of them had not used additional/extra meal during the lactation period of the current child.

Concerning toilet availability and utilization, 441 (82.9%) of the household had own toilet, of which 343 (64.5%) were able to use it properly. With regards to respondents' source of drinking water, 166 (31.2%) were using

TABLE 2: Household food insecurity assesses scale questions and response of lactating women ($N = 532$) in Moyale District, Borana, Southern Ethiopia, 2018.

| Question of occurrence	Yes	No	Frequency of occurrence N (%)			
	N (%)	N (%)	0	1	2	3
Worry about food	269 (50.6)	263 (49.4)	263 (49.4)	105 (19.7)	68 (12.8)	96 (18.1)
No preference of food type	229 (43.0)	306 (57.5)	306 (57.5)	93 (17.4)	70 (13.2)	66 (12.4)
Limit food type	178 (33.5)	354 (66.5)	354 (66.5)	88 (16.5)	60 (11.3)	30 (5.6)
Feeding unwanted food	139 (26.1)	393 (73.9)	393 (73.9)	71 (13.3)	49 (9.2)	19 (3.6)
Limit food amount	99 (18.6)	433 (81.4)	433 (81.4)	58 (10.9)	28 (5.3)	13 (2.4)
Limit meal frequency	63 (11.8)	469 (88.2)	469 (88.2)	31 (5.8)	25 (4.7)	7 (1.3)
No food in the house	24 (4.5)	508 (95.5)	508 (95.5)	18 (3.4)	6 (1.1)	0
Hanger at night	11 (2.1)	521 (97.9)	521 (97.9)	7 (1.3)	3 (0.6)	1 (0.2)
Hanger at day and night	7 (1.3)	525 (98.7)	525 (98.7)	6 (1.1)	1 (0.2)	0
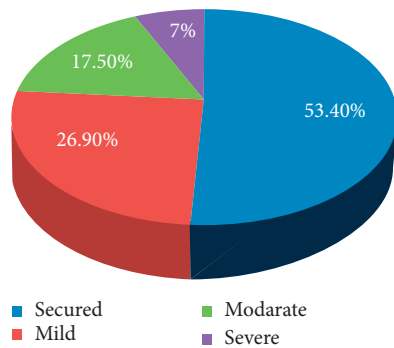
FIGURE 1: Household food security level of lactating women ($N = 532$) in Moyale District, Borana, Southern Ethiopia, 2018.

from unimproved sources (from unprotected source). Table 3 summarizes healthcare utilization, feeding practices, and environmental characteristics of lactating women.

3.4. Nutritional Knowledge Score of Lactating Women. With regards to knowledge of the lactating women, a proportion of below 34%, 34%–66%, and above 67% was determined as poor, medium, and good nutritional knowledge, respectively [30]. Accordingly, 342 (64.2%), 157 (29.5%), and 33 (6.2%) of lactating women who participated in the study were found to have poor, medium, and good nutritional knowledge, respectively (Table 4).

3.5. Nutritional Status of Lactating Women. Of the total lactating women participated in the study, 94 (17.7%), 362 (68%), and 112 (21%) of them were underweight (<18.5 kg/ht^2), have normal body weight (BMI = 18.5 to 24.99 kg/ht^2), and overweight (BMI>25 kg/ht^2), respectively. Hence, magnitude of BMI-based undernutrition among lactating women in the study area was 17% (BMI = 17.7%, 95% CI: 14.2–20.9). Based on MUAC as a measurement of nutritional status, 16% of lactating women had undernutrition with MUAC less than 21 cm (MUAC = 16%, 95% CI: 13.1, 19.4) (Figure 2).

3.6. Level of Malnutrition among Lactating Women. On bivariate analysis the covariates, age of women, educational status of women, educational status of corresponding husband, feeding additional/extra meal, place of residence, dietary diversity score (DDS), household food insecurity of the women, household monthly income, age of the current child, delivery place, postnatal care, and water source for the household were associated with undernutrition among lactating women at a P value below 0.2. However, in multiple logistic regression, use of additional/extra meal, delivery place, family monthly income, dietary diversity score, and household food insecurity level were the variables that showed statistically significant association with undernutrition among lactating women. Accordingly, lactating women who did not take extra/additional meal during their lactation period were 2.66 times more likely to have undernutrition compared with their counterparts (AOR = 2.66, 95% CI: 1.43–5.29).

Lactating women who have gave delivery at home for the current child were 2.65 times more likely to have undernutrition compared with who gave delivery at their home (AOR = 2.66, 95% CI: 1.24–5.65). On the other hand, lactating women whose household monthly income was less than 1500 Ethiopian birr were 5.22 times more likely to have undernutrition compared with those who had greater than 4500 Ethiopian birr monthly income (AOR = 5.222, 95% CI: 1.40–19.40).

In addition, lactating women whose household dietary diversity was less than the mean score were 2.49 times more likely to have undernutrition compared with those who had greater than or equal to mean score dietary diversity (AOR = 2.495, 95% CI: 1.43–4.36).

Finally, lactating women who were from food insecured household were 6.57 times more likely to have undernutrition compared with their counterpart (AOR = 6.57, 95% CI: 3.50–12.34. Table 5 shows the factors associated with malnutrition among lactating women.

4. Discussion

Women are generally vulnerable to undernutrition during lactation where the food and nutrient requirements are more during that period [20, 21, 31, 32]. Thus, this study identified the overall prevalence of undernutrition and associated factors in the study area among lactating women. Accordingly, the prevalence of undernutrition among lactating women in Moyale District was 17.7%. This

TABLE 3: Maternal healthcare and feeding practice of lactating women ($N = 532$) in Moyale District, Borana, Southern Ethiopia, 2018.

Variables	Category	Frequency	Percent (%)
ANC	No	37	7
	Yes	495	93
Parity	≤2	252	47.4
	2–4	152	28.6
	5–6	84	16.4
	>6	41	7.7
Family planning utilization	No	339	63.7
	Yes	193	36.3
Birth interval	First child	106	19.9
	<2	158	29.7
	≥2	268	50.4
Delivery place	Health institution	412	77.4
	Home	120	22.6
Age of child	<6	236	44.4
	6–12	183	34.4
	>12	113	21.2
	Total	532	99.6
Dietary diversity score	≥4.6	296	55.6
	<4.6	236	44.4
Diarrheal history of respondents	No	505	94.9
	Yes	27	5.1
Toilette availability	No	91	17.1
	Yes	441	82.9
Water source	Unimproved	166	31.2
	Improved	366	68.8
	Total	532	100.0
Proper toilet utilization	No	189	35.5
	Yes	343	64.5
Frequency of ANC	≤3	208	39.1
	≥4	324	60.9
Age at first pregnancy	<19	401	75.4
	>=19	131	24.6
Family size	1–4	249	46.8
	5–7	209	39.3
	>7	74	13.9
Have nutritional information	Yes	328	61.7
	No	204	38.3
Additional meal	No	331	62.2
	Yes	201	37.8

finding was similar to the prevalence of undernutrition among lactating women of the low land of Raya and Alamata Districts and community-based study conducted in Adama District reported as 17.5% and 19.5%, respectively [33, 34] but lower than the study conducted in West Shao, Nekemte Referral Hospital and Womberma District of Northwest Ethiopia which were noted as 21.5%, 20%, and 25.4%, respectively [35–37]. This discrepancy might be due the attention given by the Federal Ministry of Health to maternal health and nutrition, engagement of NGO in the issues of nutrition in the study area and study design, and inclusion of both urban and rural settings in the current study population.

On the contrary, the result of this study was higher than the findings of studies conducted among lactating women in Offa woreda of Wolayita Zone and Indonesia which recorded 15.8% and 9%, respectively [38, 39]. This might be due to difference in the study areas and socioeconomic factor difference in Ethiopia and Indonesia.

MUAC was also used to assess the nutritional status of the lactating women. Consequently, the prevalence of undernutrition obtained from this study was 16% (MUAC < 21 cm). This was very similar with the finding of the study conducted in Vietnam on lactating women which revealed the prevalence of undernutrition to be 15% [40] and slightly lower than result obtained from Rayitu District of Ethiopia (24%) [41].

Food insecurity affects the intake of adequate quantity and quality of diet that in turn contributes to maternal undernutrition. This study identified the household food insecurity was a strong predictor of nutritional status of lactating women. Women who were from food-insecured household were about 6.57 times more likely to be undernourished than those from food-secured houses, and a significant association was observed between the household food security level and BMI of lactating women. But, a finding from a similar study conducted in Ambo District showed that there was no statistically significant association

TABLE 4: Nutritional knowledge score of lactating women ($N = 532$) in Moyale District, Borana, Southern Ethiopia, 2018.

| Series of questions		Correctly answered	
		Yes (N (%))	No (N (%))
Have information on nutrition		328 (61.7)	204 (38.3)
	Health facility	109 (20.6)	
Source of information	Health EW	191 (35.8)	
	School	22 (4.1)	
	Media	6 (1.1)	
Listed main food staff		213 (40)	319 (60)
Know use of protein		86 (16.2)	446 (83.8)
Listed source of protein		55 (10.3)	477 (89.7)
Know use of carbohydrate		39 (7.3)	493 (92.7)
Know the source of carbohydrate		41 (7.7)	491 (92.7)
Listed some vitamins and mineral foods		75 (14.1)	457 (85.9)
Know use of vitamins and minerals		59 (11.1)	473 (88.9)
Know that lactating women need extra meal		440 (82.7)	92 (17.3)
Know frequency of extra meal needed during lactation		390 (73.3)	142 (26.7)
Have encouragement from family member to have additional meal		415 (78)	117 (22)
Nutritional knowledge score of respondents			
0–33% (poor)		342	64.2
34–66 (medium)		157	29.5
67–100% (good)		33	6.2
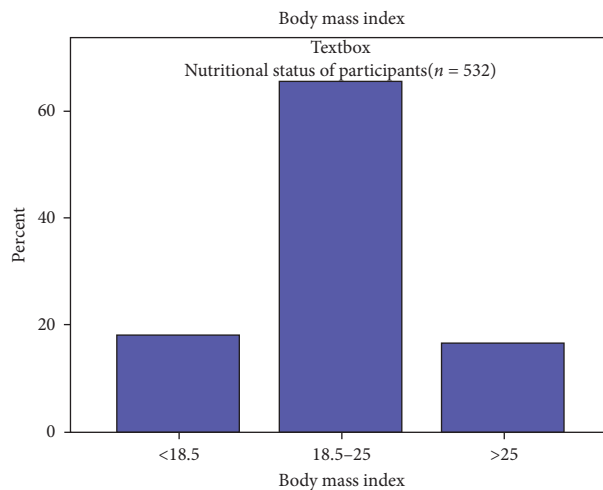
FIGURE 2: Nutritional status of lactating women ($N = 532$) using BMI in Moyale District, Borana, Southern Ethiopia, 2018.

between the household food security level and maternal undernutrition [35]. This discrepancy might be due to the presence of frequent drought in Moyale District which leads to food insecurity as compared with Ambo District.

During lactation, an additional meal/extra meal is recommended to ensure adequacy for lactating women. In the present study, extra meal consumption characteristic of lactating women was also significantly associated with undernutrition. Accordingly, lactating women who have not taken extra meal in addition to the usual meal she normally takes in house with family members were 2.66 times more prone to undernutrition than those who took extra meal during the lactation period. This finding was in agreement with the study conducted in the low land of Raya and Almata [33]. Furthermore, a systematic review made on maternal feeding practice and its outcome in developing countries

also reported that undernutrition among women of reproductive age in developing countries including Ethiopia is due poor dietary intake below national or international recommendation [42].

Dietary diversity is a proxy indicator of maternal nutrient adequacy. Lactating women who had DDS less than mean DDS were about 3.49 times more likely to be undernourished than lactating women whose DDS was above mean DDS calculated in this study. This was supported by the finding obtained from the study conducted in Dedo and Seka Chekorsa Districts of Jima Zone of Ethiopia [22].

Maternal health service utilization characteristics of the women have consequences on health and nutritional statuses of women. In the current study, the delivery place of the women for the current child was found to be significantly associated with undernutrition. Lactating women who gave

TABLE 5: Association between undernutrition and independent variables among lactating women in Moyale District, Borana, Southern Ethiopia, 2018.

Variables	Category	Undernutrition (BMI < 18.5 kg/h^2) Yes	No	COR (95%CI)	AOR (95%CI)	P value
Residence	Urban	19	166	1 (0.001)	1	
	Rural	75	271	2.433 (1.41–4.17)		
Age of breastfeeding child	<6	27	208	1 (0.001)		
	6–12	47	136	1.66 (0.88–3.10)		
	12–24	20	94	0.622 (0.343–1.12)		
Postnatal care received	Yes	27	129	1		
	No	67	309	1.03 (0.630–1.69)		
Extra/additional meal used	Yes	77	254	1	1	
	No	17	184	3.26 (1.87–5.705)	2.76 (1.43–5.29)*	0.002
Delivery place	Health institution	14	106	1	1	
	At home	80	332	1.830 (0.996–3.363)	2.65 (1.24–5.65)*	0.012
Water source of the household	Improved	55	311	0.58 (0.37–0.92)		
	Unimproved	39	127	1 (0.19)	1	
Family monthly income	>4500	4	46	1		
	3000–45000	18	146	2.32 (1.24–4.34)		
	1500–3000	52	211	4.60 (2.205–9.61)		
	<1500	20	35	6.57 (2.06–20.96)	5.222 (1.40–19.4)*	0.014
Educational level of women	Illiterate	57	242	1		
	Primary	27	140			
	High school	9	33			
	Diploma and above	1	23	0.16 (0.019–1.35)		
Educational level of husband	Illiterate	54	184	1		
	Primary	21	137			
	High school	15	71			
	Diploma and above	3	43	0.333 ((0.90–1.21)		
Age of respondent	15–25	67	249	1		
	16–35	24	168	1.87 (1.129–3.105)		
	36–49	3	21	1.88 (0.545–6.505)		
Dietary diversity score	≥mean score	29	267	1	1	
	<mean score	65	171	3.49 (2.16–5.62)	2.495 (1.43–4.36)*	0.001
Household food security level	Secured	15	262	1	1	
	Unsecured	79	176	7.81 (4.36–14.00)	6.57 (3.501–12.34)*	0.001

*Statistically significant at P value < 0.05v.

birth at home were 2.56 times more likely to be underweight when compared with women who deliver at a health institution. Other study conducted in Womberma District, northern Ethiopia, also reported that there was a significant association between the delivery place of women and their nutritional status [37].

5. Conclusion

Prevalence of undernutrition among lactating women was found to be a severe public health problem. Thus, this study depicted that the prevalence of undernutrition among lactating women in Moyale District of Borena Zone was 17.7%. Use of additional/extra meal, delivery place, family monthly income, dietary diversity score, and household food insecurity level were important determinants factors of undernutrition among lactating women in the study area. In the meantime, we recommend Moyale District Health Office and Borena Zonal Health Department should enhance comprehensive health education and counseling of lactating women to improve their nutritional intake, institutional delivery, and dietary diversity during the lactating period. Furthermore, Zonal Agricultural Sector and Job Creation Department need to work on household food security and empower them for income-generating activities.

Data Availability

The data used to support the findings of this research are included within the article. The data can be obtained upon request from the corresponding author upon request (imu.ashe@gmail.com).

Ethical Approval

Ethical clearance was obtained from the Institutional Review Board (IRB) of Arsi University College of Health Sciences. The letter of permission to conduct the study was obtained from Borana Zone, Moyale District, and all selected kebeles. Before data collection, the participants were informed about the purpose of the study and their right to refuse participation and discontinue the interview/measurement. The interviewers discussed the issue of confidentiality and obtained the verbal consent from all selected women before the actual data collection. In addition, any identification information including the name of the participants was not written in the questionnaire. Undernourished infants and young children were linked to local nutritional programs in the area.

Conflicts of Interest

The authors declare that there are no conflicts of interest.

Authors' Contributions

Hailu Bekele Regassa involved in the proposal writing, designing, recruitment and training of supervisors and data collectors, and analysis and writeup of the paper. Gebi Husein Jima contributed to the conception and designing of the project proposal and methodology, led the study and design of questionnaires and supervised and involved in the analysis stage of the project, final approval of the research, and preparation of the manuscript. Ashenafi Habtamu Regesu contributed to the conception, designing of the project proposal, and methodology and involved in the analysis stage of the project and preparation of the manuscript. All the three authors read and approved the final manuscript.

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