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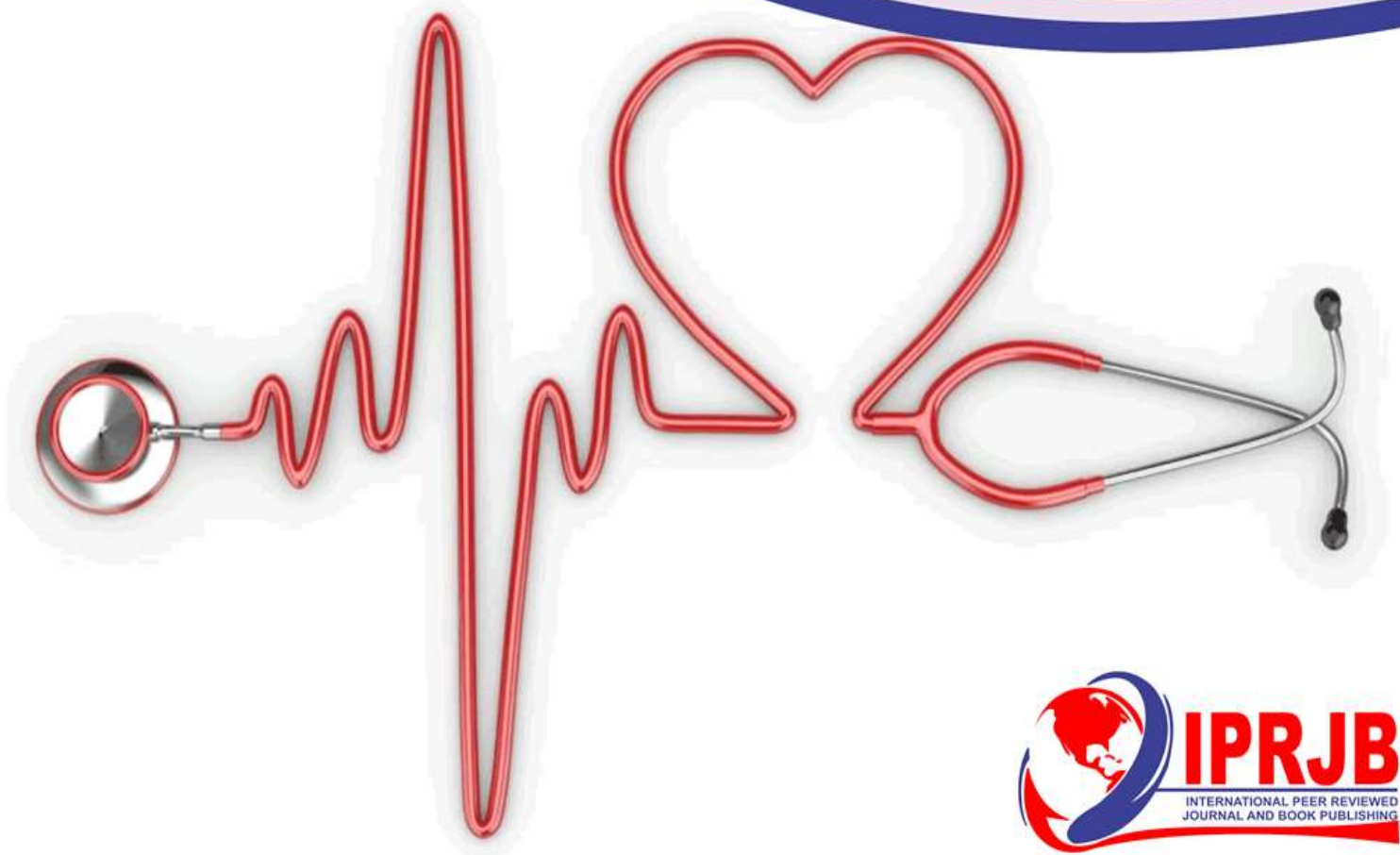
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# Malnutrition and Associated Factors among Lactating Women in Dale District, Sidama, Ethiopia

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## Abstract

**Purpose:** Proper diet and nutrition are necessary for the physical growth, mental development, performance, productivity, health, and well-being of an individual. Lactating women are among the most vulnerable groups of the population due to their increased nutritional requirements. This study aimed to assess the magnitude and associated factors of malnutrition among lactating women at public health facilities in Dale, Sidama Region, Ethiopia.

**Methodology:** Institution-based cross-sectional study was conducted among 400 randomly selected lactating mothers from March 20 to April 20, 2022. Astructured interviewer-administered questionnaire was used to collect the data. A logistic regression model was applied to analyze the data using SPSS version 25. An adjusted odds ratio with a 95% CI was used to determine factors associated with malnutrition, considering a p-value <0.05 to declare statistical significance.

**Results**: The magnitude of malnutrition among lactating women in this study was 30.1%. Early marriage [AOR = 2.46, 95% CI: 1.15–5.3], not consuming additional meals during lactation [AOR = 2.19, 95% CI: 1.0–4.72], not using contraceptives [AOR =3.41, 95% CI: 1.05–11.04], dietary diversity score below three [AOR = 3.64, 95% CI: 1.94-6.82], and food insecurity [AO = 7.86, 95% CI: 2.09–29.55] were significantly associated with malnutrition.

**Unique Contribution to Theory, Practice and Policy:** In the current study, malnutrition among lactating women was high. Attention should be given to early married, non-contraceptive users. In addition, it is crucial to ensure food security and consume additional diversified meals during lactation.

**Keywords:** *Malnutrition, Lactating Women, Health Facility, Associated Factors, Dale Woreda*

## INTRODUCTION

Nutrition is a vital component of human health throughout the lifespan. A well-balanced diet is required for the body's optimum functioning [1]. Proper diet and nutrition are necessary for life, physical growth, mental development, performance and productivity, health, and well-being. However, nutrition requirements vary with age, gender, and during physiological changes such as pregnancy [1].

Malnutrition is defined as deficiencies, excesses, or imbalances in a person's intake of energy and/or nutrients and its requirements. It is one of the world's most devastating public health issues, manifesting as both under-nutrition and overnutrtion [2]. It can be characterized by stunting and/or wasting. Wasting is defined as having a low weight-for-height ratio and usually indicates a recent weight loss; it is associated with morbidity and mortality in both adults and children [3].

Maternal malnutrition is defined as having a body mass index of $<18.5 Kg/m^2$ or a MUAC of $<$ 23cm. It is a widespread health issue that affects millions of women in developing countries. It is extremely common in low- and middle-income countries, resulting in significant increases in mortality and disease burden [3, 4].

According to Global Nutrition Reports, in 2016, 153.8 million women of reproductive age were affected by malnutrition globally [5]. Every year, more than 3.5 million women and children under the age of five die in developing countries as a result of the underlying cause of malnutrition [6]. In Ethiopia, a high proportion of reproductive-age women were affected by malnutrition. According to EDHS 2016, the level of malnutrition among the fertile age group was 22% [7].

Breastfeeding mothers require an extra 500 kcal per day beyond what is suggested for non-pregnant women [8]. Lactation puts women at extra risk of under-nutrition due to the utilization of their bodily reserves to maintain breastfeeding [8].

Maternal anthropometry is primarily used to assess malnutrition, which is measured by height and weight [9], and calculating the body mass index (BMI) by dividing weight in kilograms by height in meters squared (kg/m2), with a value less than 18.5 kg/m2 indicating underweight [9, 10]. According to the WHO, the BMI cutoffs are as follows: less than 16 kg/m2 severely underweight; 16–16.9 kg/m2 moderately underweight; 17.0–18.49 kg/m2 mildly underweight; 18.5–24.9 kg/m2 normal, 25–29.9 kg/m2 overweight; and greater than or equal kg/m2 to 30 obese [9]. Mid-upper arm circumference (MUAC) is another measurement that is used mainly to screen for underweight. MUAC is measured at the mid-point between the tips of the shoulder and elbow of the left arm using non-elastic, non-stretchable MUAC tapes. The cutoff point to say a child was malnourished was when the MUAC < 23 cm [2].

There is an increased demand for energy, protein, and essential micronutrients during pregnancy and lactation to maintain the mother's as well as the child's health and development [11, 12]. Adequate nutrition is critical for mothers' survival, health, and development [11]. Maternal malnutrition predisposes mothers to maternal complications, as well as children to fetal birth defects, low birth weight, limited physical and mental capacity, and fetal or newborn mortality [10].

Assessing the level of malnutrition and its associated factors is an important tool for designing an effective prevention program based on evidence. To our knowledge, no previous research on malnutrition among lactating women in the study area has been conducted. Therefore, the

study was aimed at assessing the prevalence of malnutrition and its associated factors among lactating women in Dale Woreda.

## Methods and Materials

### Study Setting and Period

The study was conducted at Dale woreda, which is one of the administrative woreda of Sidama national regional state, 311km from Addis Ababa and 40km from Hawassa. Dale woreda is bordered from South by Aleta Wendo and Cucko, on the west by Lokka Abaya, North by shebedino and East by Wensho. Yirgalem is major town of the woreda and the Woreda has 36 kebele. According to woreda health office, estimated population of woreda in 2014 Ethiopian Fiscal Year was 254,658 people, among them 51% was female population. Total estimated women belonging to the reproductive age group are 49912, from which 16384 are lactating women. According to the woreda health office report, the woreda has 10 public health centers, 2 missionary health center and 2 private clinics and 36 health posts. The study was conducted from March 20 to April 20, 2022.

### Study Design

Institution based cross-sectional study was conducted to assess the magnitude of malnutrition and associated factor among lactating mothers.

### Sampling Technique and Sample Size

Lactating mothers who had less than 24 months of child visited public health facilities in the woreda were included in the study. All public health facilities in Dale woreda were considered as strata. Systematic sampling was used to select study participants, and sample size was allocated to each stratum by proportional allocation. The sample size was estimated based on single population proportion formula. Assuming, confidence level of 95%, margin of error to be 5% and prevalence of malnutrition among lactating women 40.6% [13]. It yields sample size of 363, by adding non response rate of 10%, total sample was 400.

### Data Collection Tools and Techniques

The structured questionnaire, which was adapted from different literatures [13-15] and anthropometric measurements were used to assess the nutritional status of study participants. The questionnaire was developed in English first, and then translated to the local language, and then back to English to maintain its consistency. A structured questionnaire was designed, which contains questions on socio-demographic, reproductive, dietary, environmental, and food insecurity questions, used to collect the data. An adult weighing scale was used for weight measurement, and a portable height meter with a moveable head piece was used for the height measurement of the study participants. In addition, a tape meter that can be rolled was used to measure the MUAC of the mother. Data was collected using electronic data collection Kobo collect tools. Face-to-face interviews were used to collect data on the variables associated with the nutritional status of lactating women. Data were collected by eight B.Sc. nurse professionals who work in Dale woreda at different units other than MCH. To minimize bias and ensure the high quality of the information, training was given to data collectors and supervisors. Before data collection, 5% of sample was pretested at Yirgalem town, and corrections were done. The collected data were checked daily for completeness and consistency.

## Main Study Outcome Variable

The main study outcome variable in this study was malnutrition among lactating mothers. It was explained as a categorical variable with two possible values: presence ("yes") or absence ("no") of the malnutrition.

## Data Analysis

The data was checked for completeness, coded and analyzed by importing into Statistical Package for Social Science (SPSS) version 25. Frequency with percentage was used to report categorical variables, while mean with a standard deviation was used to report quantitative variables. Binary logistic regression was conducted to identify candidate variables for the adjusted model, with a p-value of $\leq 0.25$. Logistic regression was applied to assess the associated factors for maternal malnutrition. Multicollinearity was assessed using the variance inflation factor (VIF), and model fitness was checked by the Hosmer-Lemeshow goodness of fit test. An adjusted odds ratio (AOR) with a 95% confidence interval was used to identify factors significantly associated with the outcome variable.

## RESULTS

## Socio-Economic Characteristics of Participants

In this study, we included a sample of 400 lactating mothers from the woreda, with a response rate of 97.7%. The mean age of the participants was ($28.7 \pm 5.3$SD) years. More than three-fourths (79%) of the participants were from rural areas. The median monthly income of participants was 400 Ethiopian birr. Similarly, the median monthly income of participant's husbands was 1,000 Ethiopian Birr. Regarding occupation, 77% and 13% of participants were housewives and merchants, respectively. About 99% of respondents are married. Regarding the religions of the respondents, 74% were Protestants, and 18.2% were Orthodox religion followers. Regarding the occupation of husbands, more than half (53.5%) were farmers, and 17.4% were government employers. About 45.6% and 38.3% of participant`s husbands attend primary and secondary education, respectively. The Sidama ethnic group made up 87.7% of the total participants, while the Amhara ethnic group made up 6.4%.

Regarding age at first marriage, 20.5% of participants were married before turning 18 years old. About 10.8% of the participants became pregnant for the first time before 18 years of age. 270 (69%) of the total participants had five or fewer children, while 137 (35.4%) had two or more children under the age of five. The current child of participants was 8 months old on average (SD 6 months), and about half (51.4%) of the current child's sex was male.

Regarding possession, 71.4% of the respondents had livestock and 92.6% owned farming land. About half (50%) of the participants had television and or radio and 63.9% get their food from own production. (Table 1)

**Table 1: Socio-Demographic Characteristics of Participants in Dale Woreda Wereda, Sidama Region Ethiopia, 2022**

| Variables | Response | Frequency | Percentages |
|---|---|---|---|
| Residence | Rural | 309 | 79.2 |
| | Urban | 81 | 20.8 |
| Ethnicity | Sidama | 343 | 87.7 |
| | Amhara | 25 | 6.4 |
| | Oromo | 9 | 2.3 |
| | Wolayta | 5 | 1.3 |
| | Other*(abc) | 9 | 2.3 |
| Occupation | Housewife | 301 | 81.4 |
| | Merchant | 51 | 13.8 |
| | Farmers | 14 | 3.8 |
| | Other*(ab) | 4 | 1 |
| Marital status | Married | 386 | 98.7 |
| | Widowed | 4 | 1 |
| | Divorced | 1 | 0.3 |
| Religions | Protestant | 291 | 74.4 |
| | Orthodox | 71 | 18.2 |
| | Muslim | 29 | 7.4 |
| Husband occupation | Farmer | 208 | 53.3 |
| | Merchant | 100 | 25.6 |
| | Gov't employee | 68 | 17.4 |
| | Pastoralist | 14 | 3.6 |
| Sex of current child | Male | 201 | 51.8 |
| | Female | 187 | 48.2 |
| Have Livestock | Yes | 279 | 71.5 |
| | No | 111 | 28.5 |
| Have Television and/or Radio | Yes | 197 | 50.6 |
| | No | 192 | 49.4 |
| Have Farming land | Yes | 362 | 92.8 |
| | No | 28 | 7.2 |
| Source of food for household | Own production | 250 | 64.1 |
| | Purchasing | 140 | 35.9 |

Other ethnicity= (a=Kambata, b=Gurage , c=Tigre), *Occupation (a=government employers, b= daily laborer)

**Reproductive Characteristics of Lactating Mother**

Approximately, 94.5% of participant mothers received ANC during their current pregnancy, with 38.4% receiving four or more visits and 24% receiving two or fewer visits. 83.1% of participants gave birth at a health facility. From the total participants, 68.3% had 3 or fewer children, and the median birth interval between the current and preceding child was 33 months. Regarding postnatal care follow-up, 70.1% of participants had postnatal care follow-up, and 91.8% were contraceptive users.

Of the total participants, nearly half (50.6%) breastfed their child eight or fewer times, and above two-thirds (81.1%) received counselling on nutrition. Of those who received

counselling, 70.1% and 3.8% obtained information from health professionals and the media, respectively. In total, 64.2% of participants fed additional meals from the pre-lactation period, and 46.5% of participants consumed food four or more times per day. (Table 2)

**Table 2: Reproductive Health Related Characteristic of Lactating Mother in Dale Woreda Wereda, Sidama Region, Ethiopia, 2022**

| Variable | Response | Frequency | Percentage |
|---|---|---|---|
| Antenatal care during last pregnancy | Yes | 369 | 94.6 |
| | No | 21 | 5.4 |
| ANC frequency | One | 5 | 1.4 |
| | Two | 86 | 23.3 |
| | Three | 128 | 34.7 |
| | Four and above | 150 | 40.6 |
| Place of Birth for last child | Home | 64 | 16.5 |
| | Health facility | 325 | 83.5 |
| Number of children | <=3 | 267 | 68.6 |
| | >=3 | 122 | 31.4 |
| Postnatal care for current child | Yes | 274 | 70.1 |
| | No | 117 | 29.9 |
| Using of family planning currently | Yes | 359 | 92.8 |
| | No | 28 | 7.2 |
| Number of breastfeed per/day | <8times | 198 | 51.2 |
| | ≥8times | 189 | 48.8 |
| Get nutritional counseling | Yes | 317 | 81.7 |
| | No | 71 | 18.3 |
| Source of nutritional Counseling | Health professional | 274 | 86.7 |
| | Media | 15 | 4.7 |
| | Peer | 27 | 8.6 |

**Food Security**

Of the total participants, 72.4% worry that they didn't have enough food to eat and were not able to eat the kind of food they prefer at different levels. About 24.4% of participants get adequate access to variety food, while the remaining 75.6% eat a limited variety of foods at different levels. Nearly half (50.8%) and 17.5% eat smaller meals than they feel they need. More than half (51.5%) of participants eat smaller meals each day, and 58% lack any foods to eat at different levels. Above one third, 29.5% and 34% of participants sleep hungry and go day and night without eating any foods, respectively. From the total number of participants, the magnitude of food insecurity was 84.2%. (Table 3).

**Table 3: Food Security Level of Lactating Mothers in Dale Woreda, Ethiopia 2022**

| Variable | Responses | Frequency | Percentages |
|---|---|---|---|
| Worry that not have enough food | No | 108 | 27.6 |
| | Rarely | 158 | 46.5 |
| | Sometimes | 76 | 19.4 |
| | Often | 25 | 6.4 |
| Not able to eat kind of food preferred | No | 108 | 27.6 |
| | Rarely | 195 | 49.9 |
| | Sometimes | 71 | 18.2 |
| | Often | 17 | 4.3 |
| Eat limited variety of Foods due lack of resource | No | 94 | 24.2 |
| | Rarely | 203 | 52.2 |
| | Sometimes | 76 | 19.5 |
| | Often | 16 | 4.2 |
| Eat some foods that you really didn't want | No | 108 | 27.8 |
| | Rarely | 197 | 50.8 |
| | Sometimes | 68 | 17.5 |
| | Often | 15 | 3.9 |
| Eat smaller meal than needed | No | 118 | 30.3 |
| | Rarely | 203 | 52.2 |
| | Sometimes | 62 | 16 |
| | Often | 6 | 1.5 |
| Eat fewer meal in a day b/c lack enough food | No | 193 | 49.5 |
| | Rarely | 145 | 37.2 |
| | Sometimes | 47 | 12.1 |
| | Often | 5 | 1.3 |
| Lack of any food to eat | No | 162 | 41.9 |
| | Rarely | 172 | 44.4 |
| | Sometimes | 52 | 13.4 |
| | Often | 1 | .3 |
| Sleep at night hungry | No | 257 | 66.2 |
| | Rarely | 110 | 28.4 |
| | Sometimes | 19 | 4.9 |
| | Often | 2 | .5 |
| Go a whole day and night with out eating anything | No | 275 | 70.9 |
| | Rarely | 94 | 24.9 |
| | Sometimes | 19 | 4.6 |

## Dietary Intake

More than half (55.4%) of the participants consumed starchy staples, 44.6% consumed green leafy vegetables, 37.6% ate vitamin A rich fruits, and 35% consumed legumes, seeds, and nuts. The median dietary diversity score for participants was estimated by summing up each group's food consumption score. The mean dietary diversity score was 3.4. (Table 4)

**Table 4: Recall Dietary Diversity Score of Lactating Mothers in Dale Woreda, Ethiopia 2022**

| Variables | Responses | Frequency | Percentages |
|---|---|---|---|
| Cereals, roots and tuber | Yes | 214 | 55.4 |
|  | No | 172 | 44.6 |
| Green leafy vegetable | Yes | 173 | 44.6 |
|  | No | 215 | 55.4 |
| Other vitamin A rich fruits and vegetables | Yes | 146 | 37.6 |
|  | No | 242 | 62.3 |
| Other fruits and vegetables | Yes | 146 | 37.7 |
|  | No | 241` | 62.3 |
| Organ meats | Yes | 79 | 20.5 |
|  | No | 307 | 79.5 |
| Meat and or fish | Yes | 98 | 25.3 |
|  | No | 290 | 74.7 |
| Egg | Yes | 111 | 28.7 |
|  | No | 276 | 71.3 |
| Legumes, nuts and seeds | Yes | 135 | 35.0 |
|  | No | 251 | 65.0 |
| Milk and milk products | Yes | 230 | 59.3 |
|  | No | 158 | 40.7 |

**Environmental Health Related Characteristic of Respondents in Dale Woreda**

Of the total participants, 96.4% had latrines, and of those, 60.3% were pit latrines. Regarding the source of drinking water, 33% and 56.5% of participants get drinking water from a pipe and a protected spring, respectively. In terms of disease status, 27.1% of participants had diseases in the month preceding the survey. (Table 5).

**Table 5: Environmental health and   nutritional status related characteristics of lactating women in Dale woreda, Ethiopia, 2022.**

| Variable | Responses | Frequency | Percentages |
|---|---|---|---|
| Source of water | Pipe | 128 | 33.0% |
|  | Protected spring | 221 | 57% |
|  | Unprotected | 39 | 10.0% |
| Having latrine | Yes | 374 | 96.4% |
|  | No | 14 | 3.6% |
| Types of latrine | Pit | 225 | 60.0% |
|  | Improved | 148 | 39.7% |
| History of having disease in previous month | Yes | 106 | 27.1% |
|  | No | 281 | 71.9% |
| BMI | $<18.5kg/m^2$ | 116 | 30.1% |
|  | $15.5\text{-}25kg/m^2$ | 255 | 66.2% |
|  | $>25kg/m^2$ | 14 | 3.6% |
| MUAC | $\leq23cm$ | 158 | 40.7% |
|  | $>23cm$ | 230 | 59.3% |

**Prevalence of Malnutrition**

Regarding nutritional status, 30.1% with a 95% CI [25.46, 34.65] are underweight, 66.2% are normal and 3.6% are overweight.
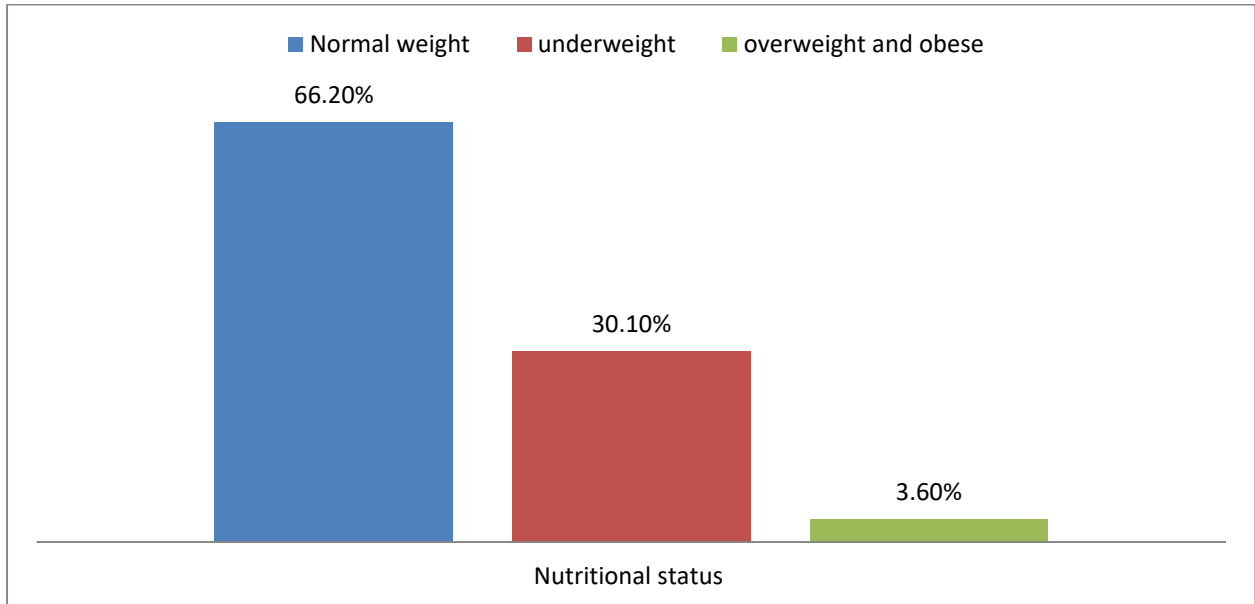


*Figure 1: Nutritional Status of Lactating Mothers in Dale Woreda, Sidama Ethiopia, 2022*

**Factor Associated With Malnutrition among Lactating Women in Dale Woreda**

In the multivariate logistic regression, age at first marriage, eating additional meals during lactation period, using family planning, dietary diversity and food insecurity were significantly associated with maternal malnutrition among lactating women. (Table 6)

**Table 6: Factor Associated With Malnutrition among Lactating Women in Dale Woreda, 2022**

| Variable | Responses | Under nutrition | | COR | AOR | p-value |
|---|---|---|---|---|---|---|
| | | Yes | No | | | |
| Place of delivery | Home | 29 | 34 | 2.30(1.3, 4.0) | | |
| | Health facility | 87 | 235 | 1 | | |
| Family planning use | Yes | 103 | 252 | 1 | 1 | |
| | No | 13 | 15 | 2.12(.98, 4.61) | 3.41(1.05,11.04)* | 0.040 |
| Having latrine | Yes | 107 | 264 | 1 | | |
| | No | 8 | 6 | 3.29(1.12, 9.7) | | |
| Age at first marriage | ≤18 years | 71 | 153 | 1.25(.73, 2.15) | 2.46(1.15, 5.3) * | 0.045 |
| | >18 years | 36 | 110 | 1 | 1 | |
| Source of drinking water | Pipe water | 30 | 97 | 1 | | |
| | Protected spring | 71 | 148 | 1.55(0.94, 2.55) | | |
| | Unprotected spring | 14 | 25 | 1.81(0.83, 3.92 | | |
| Avoid eating any food | Yes | 34 | 45 | 2.07(1.24,3.46) | | |
| | No | 82 | 225 | 1 | | |
| Eating additional meals | Yes | 35 | 100 | 1 | 1 | |
| | No | 79 | 169 | 1.34(.87, 2.13) | 2.19(1.07,4.72)* | 0.04 |
| Numbers of meals | ≤3 | 71 | 132 | 1 | | |
| | >3 | 44 | 13 6 | 0.61(0.39, 0.94) | | |
| Average birth interval | ≤ 24month | 30 | 58 | | | |
| | >24 month | 75 | 165 | 0.88(.52, 1.47) | | |
| PNC follow up | Yes | 201 | 69 | 1 | | |
| | No | 69 | 47 | 1.98( 1.25, 3.15) | | |
| ANC follow ups | Ye | 105 | 260 | 1 | | |
| | No | 11 | 10 | 2.72(1.123,6.60) | | |
| Dietary diversity score | ≤3 food group | 74 | 111 | 2.62(1.65, 4.14) | 3.64(1.94,6.82)* | .0001 |
| | >3 food group | 39 | 153 | 1 | 1 | |
| Food security | secured | 4 | 57 | 1 | 1 | |
| | insecure | 110 | 211 | 7.43(2.63, 21.01) | 7.86(2.1,29.55)* | .002 |

**Discussion**

In this study, we identified both the magnitude and factors associated with malnutrition among lactating mothers in Dale, Sidama, Ethiopia. The findings of this study showed that the magnitude of malnutrition among lactating mothers was high. Compared to other similar study findings reported from Afar, Ethiopia (33%) [16], Miesso, Ethiopia (30.3%) [17], Tigray, Ethiopia, (33.2%) [18], and Wombera, Ethiopia (25.4%) [19], the prevalence of malnutrition identified in this study was nearly the same. However, this finding is lower when compared to findings from Jimma, Ethiopia (40.6%) [20] and Uganda [49.45%] [21]; while the prevalence

in this study was higher compared to the findings reported from Nekemte, Ethiopia (20%) [22], Gamo Gofa, Ethiopia (17.7%) [23], Adama, Ethiopia, (19.5%) [24], and Kambata Tambaro, Ethiopia (21.2%) [25]. The possible discrepancy might be due to socio-economic differences in the study population. Furthermore, during the period of data collection, there was religious fasting, which might have had an effect on the nutritional status of lactating women.

In this study, using family planning was significantly associated with the nutritional status of lactating mothers. Family planning users have a lower risk of malnutrition. The odds of having malnutrition were 3.4 times higher in non-users of contraceptives. This finding is comparable with a study conducted in the Arsi zone of the Oromia region, which showed that the use of modern contraceptives is associated with a lower risk of malnutrition [26]. A possible reason might be that using contraceptives could limit the number of children, which might lead to a better way of life. Furthermore, hormonal contraceptives have a weight-gain effect [26, 27].

In the current study, early marriage was a significant predictor of malnutrition among lactating women. The odds of under-nutrition was 2.5 times higher among mothers who were married before the age of 18 years compared to those who were married at 18 years of age or older. The finding is consistent with a study conducted in Ethiopia that showed early marriage was associated with a higher risk of under-nutrition [28]. These might be due to the fact that women are accountable for their kids, spouses, and the entire family; hence, there may be inequitable food distribution within the household since they prioritize their children and spouses, making them-selves prone to under-nutrition.

This study's findings show that consuming extra (additional) meals during the lactation period was related to a lower risk of malnutrition. The odds of under-nutrition were twice as high among those who didn't eat additional meals during the lactation period. This finding was in line with the results of a study conducted in Moyale, Ethiopia, which showed that eating an additional or extra meal was associated with under-nutrition among lactating women [29]. The possible mechanism for these might be that extra meals might provide additional calories for mothers, which further prevents stored energy depletion as lactation needs extra calories of energy.

According to the United Nations Committee on World Food Security, food insecurity (FI) was described as the limited or uncertain availability of nutritionally adequate and safe foods, as well as the limited or uncertain ability to obtain adequate foods through socially acceptable means [48]. Global epidemiological data shows the level of food insecurity is strongly related to under-nutrition [48]. Regarding this, our study suggests that there is a strong and significant association between food insecurity and maternal under-nutrition. The odds of malnutrition were 7.86 times higher among the food unsecured group compared to the food-secured group. This finding was consistent with studies conducted in different parts of Ethiopia [24, 29, 30]. The possible justification could be that lactating mothers are extremely vulnerable to both macro and micronutrient deficiencies due to the increased nutritional requirements when there is food insecurity.

The household dietary diversity score (HDDS) is intended to reflect a household's economic ability to access a variety of foods in a snapshot form, whereas individual dietary diversity scores aim to reflect nutrient adequacy. Increasing individual dietary diversity scores is related to increased nutrient adequacy of the diet, according to studies in different age groups [31]. This finding indicates that eating non-diversified foods (dietary diversity score <4) is related to an increased risk of malnutrition. The odds of under-nutrition were 3.64 times higher among

those who had a dietary diversity score of less than 4 as compared to those who scored 4 and above in this study.  The finding was in line with a study conducted in the Afar region, which indicated malnutrition was associated with those who didn't meet the minimum criteria of dietary diversity [31]. This is because of a higher score is an indicator of increased economic access to a varied diet for household members.

## Limitations of the Study

Since the study was institution-based and confined to specific group of women, generalizing the finding is limited. This study also shared the limitations of cross-sectional studies, primarily the difficulty of determining temporal relationships between exposure and outcome variables. Furthermore, food consumption patterns may fluctuate seasonally, thus the results of dietary variety score and meal frequency are limited to the specific season of the year in which the study was conducted.

## Conclusion

The magnitude of malnutrition among lactating women was high in the study area. Early marriage, eating additional meals during lactation, contraceptive use, dietary diversity score and food insecurity were factors significantly associated with the malnutrition. Therefore, creating and raising awareness among lactating women about early marriage, eating additional meals during lactation, contraceptive use, and dietary diversity and ensuring food security by the households and government are very important to minimize the problem.

## Acknowledgements

## Authors` Contributions

SG conceived the idea, designed it, conducted formal analysis, and wrote the manuscript. FB, EL, AA, and TB involved in the design, analysis, and interpretation of data, drafting, and revising the manuscript. All the authors have read and approved the final manuscript.

## Ethical Considerations

An ethical approval was obtained from the institutional review board (IRB) of Hawassa University College of Medicine and Health Sciences, School of Public Health. During data collection, informed consent was obtained from study subjects by thoroughly explaining the purpose of the study to them. The confidentiality of the information was assured by excluding the names of participants from the identification part of the questionnaires. All methods were carried out in accordance with relevant ethical guidelines and regulations.

## Competing Interests

The authors declare that they have no competing interests

## Funding

## Data Availability

The original datasets generated and/or analyzed during the current study are available upon reasonable request from the corresponding author.

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