Prevalence of Undernutrition and Its Associated Factors Among Lactating Women in the Shebedino District, Sidama Regional State, Ethiopia

Yonas Hechera¹ and Aregahegn Dona²

Abstract

Background: Ensuring the nutritional status of lactating women is crucial to prevent maternal morbidity and mortality in poor countries like Ethiopia. Hence, this study aimed to assess the prevalence of undernutrition and its associated factors among lactating women in Shebedino district, Sidama Regional State, Ethiopia.

Methods: A community-based cross-sectional study was conducted among randomly selected 612 lactating women from February to March 2020. Data were collected by using an interviewer-administered, structured, and pretested questionnaire. Also, physical measurements (weight, height, and body mass index) were measured by using standardized and calibrated instruments. Data entered into Epi data version 3.1 and exported to SPSS version 23 for further analysis. Descriptive statistics, bivariable, and multivariable logistic regression analysis were done. A P-value of \( \leq 0.05 \) was used to consider the statistical significance.

Result: The prevalence of undernutrition was 25.9% (95% CI: 22.5, 29.5). Having polygamous husband (AOR = 3.47, 95% CI: 1.13, 10.68), belonged to households with less than 5 members (AOR = 1.81, 95% CI: 1.16, 2.83), abortion history in the last 6 months (AOR = 3.09, 95% CI: 1.73, 5.51), poor household wealth status (AOR = 3.85, 95% CI: 1.89, 7.81), and medium wealth status (AOR = 2.07, 95% CI: 1.06, 4.03) were factors positively associated with undernutrition.

Conclusion: Undernutrition among lactating women was high in the study area. Attention should be given to the economic status of the women, family planning services, abortion prevention, and habits of marrying more than 1 wife (polygamy).

Keywords

nutritional status, lactation, cross-sectional study, questions

¹Sidama Regional State Health Bureau, Hawassa, Ethiopia
²Department of Social and Population Health, Yirgalem Hospital Medical College, Yirgalem, Ethiopia

Corresponding Author:
Aregahegn Dona, Department of Social and Population Health, Yirgalem Hospital Medical College, Yirgalem 184, Yirga, Ethiopia. Email: aregahegndona@gmail.com
What do we already know about this topic?
The malnutrition-related problem remains the challenging health problem in the world. Failure to compensate for the increased demand for nutritious foods during pregnancies and lactation would increase the health risk of the women.

How does your research contribute to the field?
There is a necessity for updated information regarding the nutritional status of the lactating women and factors contributing to it in the study setting.

What are your research’s implications towards theory, practice, or policy?
Evaluating the current nutritional status of lactating women as well as its correlates could play a big role in research, program designing, and initiating interventional activities.

Background
Malnutrition, in all its forms, is a persistent global public health challenge.1 According to global nutrition report, about a half of the women suffer from a significant burden of undernutrition in the world. Of these, 8.2% of lactating women are underweight in economically poor countries.2,3

Women in the reproductive age group are most vulnerable to malnutrition due to low dietary intakes, inequitable distribution of food within the household, improper food storage and preparation, dietary taboos, and infectious diseases.4

Lactating mothers from low-income settings are a nutritionally vulnerable group due to different socio-demographic factors and lack of nutritional knowledge which impacts their health.5,6 Additionally, women who do not get enough energy and nutrients in their diets are at risk of facing different health problems including malnutrition.7

Failure to compensate for the increased demand for nutritious foods during pregnancies and lactation would increase the health risk of mothers, resulting in high maternal mortality.8

Low body mass index (BMI) (<18.5 kg/m2) and/or short stature (height <145 cm) are common among women in low-income countries with the highest rates in southern and southeastern Asia, followed by sub-Saharan Africa.9,10

In Ethiopia, about 5 million people experience food shortages each year, and approximately 2.9 million people were receiving food assistance. It was also revealed that the dietary intake patterns are not adequate.4,9 As a result, lactating women are highly vulnerable to nutritional deficiencies.11,12

Hence, particularly for women, the high nutritional costs of pregnancy and lactation also contribute to their poor nutritional status.4 Furthermore, factors such as lack of control over resources, suboptimal dietary practices, lack of education, household food insecurity, and poor access to nutrition-related information are determinants that compromise the nutritional status of the women in Ethiopia.13,14

Overall, assessing the nutritional status of lactating women have many applications in research, policy development, program designing, initiating interventional activities, and evaluating it.15 Despite this, in Ethiopia, there is scanty of literature that show lactating women’s nutritional conditions in general and particularly in Sidama Regional state. Therefore, this study aimed to assess the prevalence of undernutrition and its associated factors among lactating women in Shebedino district, Sidama National Regional State, Ethiopia, 2020.

Methods and Materials

Study Area
This study was conducted in the Shebedino district which is located 27 km from Hawassa and 302 km from Addis Ababa, the capital of Sidama Regional state and Ethiopia, respectively. According to the Ethiopian Central Statistical Agency report, the total population of the district was 192,359. Among them, 51% are females. The district consists of 26 kebeles. It has a total of annually estimated 6656 (3.46%) lactating mothers. There are 6 health centers, 5 private clinics, and twenty-three health posts.16

Study Design, Period, and Population
A community-based cross-sectional study design was conducted from February to March 2020. The source population for this study was all lactating women in the Shebedino district. All lactating mothers in randomly selected kebeles who fulfilled the eligibility criteria were the study population. Those mothers who had up to 24 months of the child, and lived in the study area at least for 6 months were included. However, those mothers who were seriously ill and unable to be interviewed during the data collection period were excluded.

Sample Size Determination
For the first objective, the sample size was calculated by using single population proportion formula based on the following assumptions: prevalence of undernutrition among lactating mothers (P = 40.6%) taken from the previous study,23 10% of non-response rate, and design effect of 1.5, the final sample size was 612.

Sampling Procedures
From a total number of 26 kebeles (the smallest administrative unit in Ethiopia) found in the Shebedino district, 14 kebeles were selected by a lottery method. The lists of eligible
households were obtained from pregnant women registration book at health posts in the selected kebeles. Then, a calculated sample size was proportionally allocated based on the number of eligible mothers obtained from each kebele. Community health agents were assigned with data collectors to access the eligible households. Finally, the study participants were selected by simple random sampling technique.

Data Collection Tools and Procedures

Data were collected by using an interviewer-administered, pretested, and structured questionnaire. The questionnaire had different sections: socio-demographic characteristics of the respondents, items related to dietary practice assessment, and anthropometric measurements.

Minimum dietary diversity score was obtained by collecting 24-hours dietary recalls as consumed/not consumed from different food groups. The score was calculated by using 10 food groups as the summation of consumed food.

Anthropometric measurements (height, weight, and BMI) were measured by using standardized and calibrated instruments. Height was measured to the nearest .1 cm on a battery-powered digital scale (Seca770, Hanover Germany), and height was measured to the nearest .1 cm using a wooden height-measuring board with a sliding head bar following standard anthropometric techniques.

Data Analysis

After checking for its completeness and consistencies, data were entered into Epi Data version 3.1 and exported to the Statistical Package for Social Science (SPSS) version 23 software for further analysis. Descriptive analysis was done for each predictor variable. A cross-tabulation was performed to see the distribution of predictors with the outcome variable. Bivariable logistic regression analysis was done for each independent variable with the outcome variable. Variables with a $P$-value of $\leq .05$ were entered into multivariable logistic regression analysis.

The wealth index was constructed by using locally available tools related to ownership of selected household’s durable assets, domestic animals, and productive assets. Scores are derived by using principal component analysis. Wealth quintiles were compiled by assigning the household score to each usual household member, ranking by total score. The component with Eigenvalues greater than 1 was retained to construct the wealth index, and grouped into 3 socio-economic statuses as poor, medium, and rich.

To check multicollinearity effect, variance inflation factor less than 10 and tolerance test greater than .1 was considered. Adjusted odds ratio (AOR) with a 95% confidence interval (CI) was calculated. A $P$-value $\leq .05$ was used to consider statistically significant variables. Finally, the results were described by texts and tables.

All data collectors and supervisors were trained for 2 consecutive days on the general purpose of the survey and procedures. The tool was translated into local language (Sidaamu Afoo) and back to English by language experts to check its consistency. Instruments were calibrated before taking anthropometric measurements. A pretest was conducted on 5% of the sample outside of the study area. Collected data were checked for its completeness on daily manner, and all necessary modifications and measurements taken accordingly.

Variables

In this study, underweight was the primary outcome variable of interest, defined as body mass index (BMI) $< 18.5$ kg/m$^2$. In the final model (logistic regression analysis), we only considered underweight women and those with normal BMI and excluded those who were overweight and obese.

The independent variables were socio-demographic factors (age, marital status, occupational status, level of education, household’s wealth index, and family size), obstetric and health care related factors (antenatal care, place of delivery, history of abortion, and mode of delivery), anthropometric measurements (weight, height, and BMI), and environmental factors (source of drinking water, availability of latrine, and waste disposal system).

Operational Definitions

Undernutrition: According to this study, it is a nutritional status of lactating women (underweight) when BMI $< 18.5$ kg/m$^2$.

Body mass index (BMI): Calculated as weight in kilograms divided by square of the height in meter.

Results

Socio-Demographic Characteristics of the Study Participants

A total of 607 respondents participated, giving a response rate of 99.18%. The mean age of them was 27.7 ± 4.52 SD years. Most of the respondents (99.8%) were married. In terms of educational status, 186 (30.6%) had no formal education. The majority (92.4%) were unemployed by occupational status. 450 (74.1%) belonged to households with less than 5 members. In terms of the wealth status of the household, 279 (46.0%) were poor (Table 1).

Nutritional Status and Reproductive Related Characteristics of the Study Participants

Out of the study participants, 157 (25.9%, 95% CI: 22.5–29.5) were undernourished (BMI$<18.5$ kg/m$^2$). Out of this, 57 (36.3%) were mild, 62 (39.5%) were moderate, and 38 (24.2%) were severe form of undernutrition. Nearly half (49.9%) had children aged 12 months and above. The majority (95.2%) had ANC visits for their last pregnancy. About 558 (91.9%) delivered their child at the health facility. Above half (53.5%) were multi-gravida (Table 2).
Environmental and Health-Related Conditions

The majority (98.7%) of them reported that they use pipe water. Nearly three-fourths (74.0%) had cement/raw wood floors. Only 2.0% of them had a history of diarrhea in the past 2 weeks before this study (Table 3).

The Minimum Dietary Diversity Score of Lactating Mothers

The mean dietary diversity score of households was 3.4 (±1.70 SD). The majority (85.7%) had inadequate dietary diversity habits. Almost all (99.8%) reported that they had breakfast. The majority, 604 (99.5%), consumed foods from more than 4 food groups.

Factors Associated With Undernutrition

In bivariable logistic regression analysis, having polygamous husband, family size, household’s wealth status, availability of latrine, having an abortion in the last 6 months, having antenatal care (ANC) follow-up, place of delivery, and source of drinking water were factors associated with undernutrition among lactating mothers. In multivariable logistic regression analysis, having a polygamous husband, belonging to households with less than 5 members, having an abortion in the last 6 months, and being poor and medium by household wealth status were predictors significantly associated with undernutrition among lactating mothers.

Accordingly, increased odds of undernutrition was observed among lactating woman who had a polygamous husband (AOR = 3.46, 95% CI: 1.13, 10.68), had more than 5 family members (AOR = 1.81, 95% CI: 1.16, 2.83), had an abortion in the last 6 months (AOR = 3.09, 95% CI: 1.73, 5.51), were poor (AOR = 3.85, 95% CI: 1.89, 7.81), and medium (AOR = 2.07, 95% CI: 1.06, 4.03) by household wealth status when compared with their counterparts (Table 4).

Discussion

This study has attempted to identify the prevalence of undernutrition and its associated factors among lactating women. Accordingly, the prevalence of undernutrition was found to be 25.9% (95% CI: 22.5–29.5). This finding was consistent with the results of the previous studies done in the Womberma district (25.4%),4 Enderta district (25%),17 and Vietnam (23.7%).18

However, the result of this study was higher when compared with the findings of previous studies done in Arba Minch Zuria districts (17.4%),22 Nekemte town (20%),19 India (21.3%),20 Jammu (19.3%), and Kashmiri (10%) regions.21 The possible explanation for this difference might be the socio-demographic

| Table 1. Socio-Demographic Characteristics of Lactating Mothers at Shebedino District, Sidama Regional State, Ethiopia, 2020. |
|-----------------------------------------------|-----------------|-----------------|
| Variable                                      | Category        | Frequency       | Percentage |
| Age                                           | 19–24           | 101             | 16.6       |
|                                               | 25–29           | 341             | 56.2       |
|                                               | 30–34           | 116             | 19.1       |
|                                               | ≥35             | 49              | 8.1        |
| Marital status                                | Unmarried       | 1               | 0.2        |
|                                               | Married         | 606             | 99.8       |
| Had polygamous husband                        | No              | 576             | 94.9       |
|                                               | Yes             | 31              | 5.1        |
| Education status of lactating women           | No formal education | 186     | 30.6       |
|                                               | Primary school  | 357             | 58.8       |
|                                               | Secondary school| 46              | 7.6        |
|                                               | College and above | 18      | 3.0        |
| Occupational status of lactating women        | House wife      | 561             | 92.4       |
|                                               | Merchant        | 26              | 4.3        |
|                                               | Gov’t employee  | 12              | 2.0        |
|                                               | Private worker  | 8               | 1.3        |
| Occupational status of husband                | Farmer          | 524             | 86.5       |
|                                               | Merchant        | 53              | 8.7        |
|                                               | Gov’t employee  | 19              | 3.1        |
|                                               | Private worker  | 10              | 1.7        |
| Household’s wealth status                     | Poor            | 279             | 46.0       |
|                                               | Medium          | 219             | 36.1       |
|                                               | Rich            | 109             | 18.0       |
| Head of household                             | Male            | 601             | 99.0       |
|                                               | Female          | 6               | 1.0        |
| Number of family                              | ≤5              | 450             | 74.1       |
|                                               | >5              | 157             | 25.9       |
and cultural differences among study participants as well as the
difference in study period and settings.

The finding of this study was lower when compared with
previous results from the Dedo and Seqa-Chekorsa districts of
Jimma zone (40.6%)\textsuperscript{22} and Samre district (31%).\textsuperscript{23} This discrep-
ancy might be occurred due to the difference in the study setting and
period. Similarly, variation of socio-economic status and food eating
habits could contribute to dissimilarities in the findings.

The lactating women who had polygamous husband were
3.46 times more likely to be undernourished as compared
with those women who had monogamous husbands. This
finding is supported by similar study previously done in

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\begin{tabular}{|l|l|l|l|}
\hline
\textbf{Variable} & \textbf{Category} & \textbf{Frequencies} & \textbf{Percentage} \\
\hline
Age of breastfeeding child & <12 months & 304 & 50.1 \\
& ≥12 months & 303 & 49.9 \\
Breast feeding twins & No & 586 & 96.5 \\
& Yes & 21 & 3.5 \\
Had antenatal care follow-up & No & 29 & 4.8 \\
& Yes & 578 & 95.2 \\
Place of delivery & Health facility & 558 & 91.9 \\
& Home & 49 & 8.1 \\
Number of pregnancy & One & 139 & 22.9 \\
& Two & 144 & 23.7 \\
& >2 & 324 & 53.4 \\
Number of live children & One & 144 & 23.7 \\
& Two & 147 & 24.2 \\
& >2 & 316 & 52.1 \\
Mode of delivery & Vaginal delivery & 587 & 96.7 \\
& Cesarean delivery & 20 & 3.3 \\
Had PNC visit & No & 82 & 13.5 \\
& Yes & 525 & 86.5 \\
Had abortion in the last 6 month & No & 470 & 77.3 \\
& Yes & 137 & 22.7 \\
Body mass index & <18.5 kg/m\textsuperscript{2} & 157 & 25.9 \\
& ≥18.5 kg/m\textsuperscript{2} & 450 & 74.1 \\
\hline
\end{tabular}
\caption{Table 2. Nutritional and Obstetric/Health Service Related Characteristics of Lactating Mothers at Shebedino District, Sidama Regional State, Ethiopia, 2020.}
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\begin{tabular}{|l|l|l|l|}
\hline
\textbf{Variable} & \textbf{Category} & \textbf{Frequency} & \textbf{Percentage} \\
\hline
Source of drinking water & Pipe & 503 & 82.9 \\
& Protected well/spring & 104 & 17.1 \\
Cement/raw wood floor & No & 158 & 26.0 \\
& Yes & 449 & 74.0 \\
Latrine available & No & 37 & 6.1 \\
& Yes & 570 & 93.9 \\
Ownership of the latrine & Private & 480 & 84.2 \\
& Communal/shared & 90 & 15.8 \\
Refuse disposing site & Open field & 27 & 4.4 \\
& Pit-hole & 265 & 43.7 \\
& Burning & 228 & 37.5 \\
& Garbage can & 63 & 10.4 \\
& Others & 24 & 4.0 \\
Type of water collection container & Pot & 11 & 1.8 \\
& Jerry can & bucket & 596 & 98.2 \\
Had diarrhea in the last 2 weeks & No & 595 & 98.0 \\
& Yes & 12 & 2.0 \\
Had cough in the past 2 weeks & No & 599 & 98.7 \\
& Yes & 8 & 1.3 \\
\hline
\end{tabular}
\caption{Table 3. Environmental and Health-Related Conditions of Lactating Mothers at Shebedino District, Sidama Regional State, Ethiopia, 2020.}
\end{table}
Kenya. A more likely explanation might be most women are economically dependent on their husbands and cannot afford the cost of well-nourished and dietary diversity unless they get support from their husbands. In addition, the husband could be so busy to contribute equally to his wives. So, these factors might bring a shortage of nutritious foods for lactating mothers that cause undernutrition.

The finding of this study also revealed that the lactating women who belonged to households with less than 5 members were 1.81 times more likely to be undernourished when compared with those who had less than 5 family members. This result was consistent with the study conducted in India, Bangladesh, and Ethiopia.

A possible reason for this might be lactating women with low-income status could not afford varieties of foods with high nutritious value. As a result, these might contribute to a household’s food insecurity and lead to malnutrition.

This study also showed that lactating women who had history of abortion in last 6 months was 3.09 times more likely to be undernourished when compared with those not had an abortion. This study result was supported by previous study conducted in Bahir Dar. A probable explanation for this might be that lactating women who had an abortion history could be exposed to anemia and different infections that lead to undernutrition. As a result, their chance of being malnourished could be high.

**Limitations of the Study**

Impossibility of assessing causal effects of the predictors on outcome variable due to a cross-sectional nature of the study design applied. Some of the responses might suffer from recall bias, but this was minimized by reminding them about

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**Table 4.** Bivariable and Multivariable Logistic Regression Analysis for Factors Associated with Undernutrition among Lactating Women at Shebedino District, Sidama Regional State, Ethiopia, 2020.

| Variables                        | Undernourished |         |         |         |         |
|----------------------------------|----------------|---------|---------|---------|---------|
|                                  | Yes            | No      | COR (95% CI) | AOR (95% CI) |
| Had polygamous husband           |                |         |         |         |         |
| No                               | 134            | 442     | 1       | 1       |
| Yes                              | 23             | 8       | 9.48 (4.14, 21.69) | 3.46 (1.13, 10.68)* |
| Family size                      |                |         |         |         |         |
| ≤5                               | 93             | 358     | 1       | 1       |
| >5                               | 64             | 92      | 2.67 (1.80, 3.95) | 1.81 (1.16, 2.83) |
| Household’s wealth status        |                |         |         |         |         |
| Rich                             | 19             | 91      | 1       | 1       |
| Medium                           | 51             | 168     | 1.43 (.80, 2.58) | 2.07 (1.06, 4.03)* |
| Poor                             | 87             | 191     | 2.15 (1.23, 3.74) | 3.84 (1.89, 7.80)** |
| Latrine available                |                |         |         |         |         |
| No                               | 17             | 20      | 3.45 (1.14, 10.44) | 1.67 (0.47, 5.93) |
| Yes                              | 150            | 420     | 1       | 1       |
| Had abortion in last 6 months    |                |         |         |         |         |
| No                               | 101            | 369     | 1       | 1       |
| Yes                              | 57             | 80      | 2.59 (1.73, 3.89) | 3.08 (1.73, 5.51)** |
| Had antenatal care follow-up     |                |         |         |         |         |
| No                               | 15             | 14      | 3.29 (1.55, 6.98) | 1.70 (0.67, 4.38) |
| Yes                              | 142            | 436     | 1       | 1       |
| Place of child delivery          |                |         |         |         |         |
| Health facility                  | 137            | 421     | 1       | 1       |
| Home                             | 20             | 29      | 2.12 (1.16, 3.86) | 2.01 (0.99, 4.045) |
| Source of drinking water         |                |         |         |         |         |
| Pipe                             | 183            | 320     | 1       | 1       |
| Well/spring                      | 64             | 40      | 1.79 (1.21, 2.68) | 1.80 (0.98, 3.30) |

*Statistically significant at P < .05.
**Statistically significant at P < .001.
the events. An anthropometric measurement fault would occur; however, it was minimized by training the data collectors and calibrating the instrument.

**Conclusion**

This study revealed that more than one-fourth of the study participants were undernourished. Having a polygamous husband, belonging to households with less than 5 members, having an abortion in the last 6 months, and being poor and medium by household wealth status were predictors significantly associated with undernutrition among them. Giving due attention to family planning services to minimize family size and prevent abortion and improving the economic status of the women are necessary. Also, educating communities on the consequences of marrying more than one wife (polygamy) is crucial to decrease this problem.

**Appendix**

**Abbreviations**

- ANC: Antenatal Care
- BMI: Body Mass Index
- AOR: Adjusted Odds Ratio
- COR: Crude Odds Ratio
- SPSS: Statistical Package for Social Science Students

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**Authors’ Contributions**

YH made considerable contributions to conception and design, data analysis and interpretation of the result. AD contributed in design, data analysis, interpreting the results, preparing and revising the document. Both authors revised and gave the final approval of the version to be published.

**Declaration of Conflicting Interests**

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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**Ethics Approval**

Ethical Clearance Was Obtained from the Institutional Review Board of Hawassa University College of Medicine and Health Sciences (Ref. No: IRB/097/12). Official Support Was Obtained from the Shebedino District Health Office.

**Informed Consent**

Informed written consent was taken from the study participants prior to study initiation. Study subjects found with nutrition problems were linked to the service at nearby the health facility.

**Data Availability**

The finding of this study is generated from the data collected and analyzed based on stated methods and materials. The original data supporting this finding are available from the corresponding author on reasonable request.

**ORCID iD**

Aregahegn Dona https://orcid.org/0000-0001-5418-6662

**References**

1. Global Nutrition Policy Review 2016-2017: Country Progress in Creating Enabling Policy Environments for Promoting Healthy Diets and Nutrition. Geneva, Switzerland: World Health Organization; 2018 Contract No. Licence: CC BY-NC-SA 3.0 IGO.
2. Sserwanja Q, Kawuki J, Mutisya LM, et al. Underweight and associated factors among lactating women in Uganda: Evidence from the Uganda demographic health survey 2016. *Health Sci Rep*. 2021;4:e356. doi:10.1002/hsr2.356.
3. Global Nutrition Report. The state of global nutrition. 2021. https://globalnutritionreport.org/reports/2021-global-nutrition-report (Accessed 10 January 2022).
4. Sileshi B, Getachew MK, Muluken T. Factors associated with underweight among lactating women in Womberma woreda, Northwest Ethiopia; A cross-sectional study. *BMC Nutrition*. 2017;3(46):1-7.
5. Daniels L, Gibson RS, Diana A, Haszard JJ, Rahmannia S. Micronutrient intakes of lactating mothers and their association with breast milk concentrations and micronutrient adequacy of exclusively breastfed Indonesian infants. *Am J Clin Nutr*. 2019;110(2):391-400.
6. Tian HM, Wu YX, Lin YQ, Chen XY, Yu M. Dietary patterns affect maternal macronutrient intake levels and the fatty acid profile of breast milk in lactating Chinese mothers. *Nutrition*. 2019;58:83-88.
7. Narvaez-Caicedo C, Moreano G, Sandoval BA, Jara-Palacios MA. Zinc deficiency among lactating mothers from a peri-urban community of the ecuadorian andean region: An initial approach to the need of zinc supplementation. *Nutrients*. 2018;10(7).
8. Röhner F, Woodruff BA, Aaron OJ, Yakes EA, Lebanon MA. Infant and young child feeding practices in urban Philippines and their associations with stunting, anemia, and deficiencies of iron and vitamin A. *Food Nutr Bull*. 2013;34(2 suppl 1):S17-S34.
9. Gagebo DD, Kerbo AA, Thangavel T. Undernutrition and associated factors among adolescent girls in Damot Sore District, Southern Ethiopia. *Journal of nutrition and metabolism*. 2020;2020:5083140.

10. Zemed Z, Tariku B, Kote M, Estifanos W. Undernutrition and associated factors among HIV-positive adult patients enrolled in antiretroviral therapy (ART) clinics in the Arba Minch area, southern Ethiopia. *Hivo/AIDS*. 2019;11:147-154.

11. Zufan BD, Melkitu F, Zegeye A, Tadesse AA, Kindie FM. Maternal characteristics and nutritional status among 6–59 months of children in Ethiopia: Further analysis of demographic and health survey. *BMC Pediatrics*. 2019;19:83.

12. Debancho WW, Gizaw AT, Ababulgu FA. Lactating mothers’ perception toward diarrheal disease in Bench-Maji Zone, Southwest Ethiopia: Mixed study design. *The Pan Afr Med J*. 2018;31:176.

13. Hadiya HT, Samson G, Addisoalem M, Susan W. Prevalence and factors associated with undernutrition among exclusively breastfeeding women in Arba Minch Zuria District, Southern Ethiopia: A cross-sectional community-based study. *Ethiop J Health Sci*. 2018;29(1):913.

14. Fekadu Y, Mesfin A, Haile D, Stoecker BJ. Factors associated with nutritional status of infants and young children in Somali Region, Ethiopia: a cross-sectional study. *BMC Public Health*. 2015;15(1):846.

15. WHO. *Levels and Trends in Child malnutrition: UNICEF/WHO/World Bank Group Joint Child Malnutrition Estimates*. New York, Geneva and Washington (DC): United Nations Children’s Fund, World Health Organization and the World Bank Group; 2018. Global and Regional Aggregates Are for the Year 2015.

16. Central Statistical Agency. *Ethiopia Demographic and Health Survey; Final Draft Report*. Addis Ababa, Ethiopia. EPHI; 2016.

17. Teka B, Assefa H, Hailelassie K. Prevalence and determinant factors of exclusive breastfeeding practices among mothers in Enderta woreda, Tigray, North Ethiopia: A cross-sectional study. *Int Breastfeed J*. 2015;10(1):2.

18. Nakamori M, Ninh NX, Isomura H, Yoshiike N, Hien VT. Nutritional status of lactating mothers and their breast milk concentration of iron, zinc and copper in rural Vietnam. *J Nutr Sci Vitaminol*. 2009;55(4):338-345.

19. Gejo NG, Welearegay HG, Mekango DE, Woldemichael ES. Exclusive breastfeeding and associated factors among HIV positive mothers in Northern Ethiopia. *PLoS One*. 2019;14(1):e0210782.

20. Randhawa A, Chaudhary N, Gill BS, Singh A, Garg V, Balgir RS. A population-based cross-sectional study to determine the practices of breastfeeding among the lactating mothers of Patiala city. *J Fam Med Prim Care*. 2019;8(10):3207-3213.

21. Khan Y, Khan A. A study on factors influencing the nutritional status of lactating women in Jammu, Kashmir and Ladakh regions. *Inter J Advancements Res Technol*. 2012;1(4):65-74.

22. Mihirotu A, Alemanyehu A, Abebe GM. Factors associated with malnutrition among lactating women in subsistence farming households from Dedo and Seqa-Chekorsa Districts, Jimma Zone. *Develop Countr Stud*. 2015;5(21):1-9.

23. Kiday H, Afework M, Meron G. Feeding practices, nutritional status and associated factors of lactating women in Samre Woreda, South Eastern Zone of Tigray, Ethiopia. *Nutr J*. 2013;12(28):1-11.

24. Okada J, Otieno G, Kinuthia J, Kohler P, John-Stewart G. Higher likelihood of 6-months exclusive breastfeeding among HIV infected than uninfected mothers: A household survey in Kenya. *Int Breastfeed J*. 2018;13:51.

25. Argaw A, Wondafrash M, Bouckaert KP, Kolsteren P, Lachat C. Effects of n-3 long-chain PUFA supplementation to lactating mothers and their breastfed children on child growth and morbidity: A 2 x 2 factorial randomized controlled trial in rural Ethiopia. *Am J Clin Nutr*. 2018;107(3):454-464.

26. Chhanani S, Waingankar A, Shah More N, Pantvaidya S, Fernandez A, Jayaraman A. Participation of pregnant women in a community-based nutrition program in Mumbai’s informal settlements: Effect on exclusive breastfeeding practices. *PLoS One*. 2018;13(4):e0195619.

27. Nguyen PH, Kim SS, Sanghvi T, Mahmud Z, Tran L M. Integrating nutrition interventions into an existing maternal, neonatal, and child health program increased maternal dietary diversity, micronutrient intake, and exclusive breastfeeding practices in Bangladesh: Results of a cluster-randomized program evaluation. *J Nutr*. 2017;147(12):2326-2337.

28. Derso T, Tariku A, Biks GA, Wassie MM. Stunting, wasting and associated factors among children aged 6-24 months in Dabat health and demographic surveillance system site: A community based cross-sectional study in Ethiopia. *BMC Pediatrics*. 2017;17(1):96.

29. Feleke BE, Feleke TE. Pregnant mothers are more anemic than lactating mothers, a comparative cross-sectional study, Bahir Dar, Ethiopia. *BMC hematology*. 2018;18:2.