Undernutrition and associated factors among pregnant women in Nekemte Town, Western Oromia, Ethiopia

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ABSTRACT

Background: Pregnant women in developing countries, including Ethiopia, are suffering from undernutrition because of their physiological requirements. However, little information is known about undernutrition and major influencing factors among pregnant women in the study area. Thus, this study was planned to assess undernutrition (mid-upper arm circumference) and its main associated factors among pregnant women in Nekemte town, Western Oromia, Ethiopia.

Methods: A community-based cross-sectional study was conducted in Nekemte town from June 8 to July 12, 2023. A simple random sampling method was used to select 579 study participants. Data were collected and analyzed using SPSS version 25. Logistic regression analyses were used to determine the degree of association between dependent and independent variables. Statistical significance was declared at a p-value < 0.05 with a 95% confidence interval (CI).

Results: Pregnant women who had mid-upper arm circumference less than 23 cm were 22.8%. Variables such as household food insecurity (AOR = 2.0; 95% CI, 1.2–3.2), poor dietary intake (AOR = 2.4; 95% CI, 1.5–3.8), poor wealth index (AOR = 4.6; 95% CI, 2.9–7.3), history of abortion (AOR = 2.6; 95% CI, 1.5–5.6), and family size > 5 (AOR = 2.6; 95% CI, 1.6–4.0) were significantly associated factors with undernutrition.

Conclusions: The prevalence of poor mid-upper arm circumference in this study was lower compared to previous studies reported from Ethiopia. The intervention that targets household food insecurity, poor dietary intake, poor economic status, history of abortion, and large family size are required to ensure the nutritional status of pregnant women.

Keywords: Undernutrition, Mid-upper arm circumference, Associated factors, Pregnant women

Citation: Aberra B, Yazew T, Shigign E. Undernutrition and associated factors among pregnant women in Nekemte Town, Western Oromia, Ethiopia. *HAJHBS*. 2025, 1(2): 16–25

Edited by Diriba Feyisa

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Submitted: Nov. 11, 2024 | Revised: Jan 31, 2025 | Published: August 17, 2025

BACKGROUND

Reproductive-age women are susceptible to undernutrition due to a lack of balanced food consumption (1). Undernutrition represents a worldwide public health concern affecting pregnant women, greatly heightening the likelihood of complications for both the mother and the fetus. These complications may include premature birth, stillbirth, maternal hemorrhage resulting from uterine atony, and various other pregnancy-related challenges (2). Developing countries bear a high burden of undernutrition among women and children. Despite widespread global economic expansion, pregnant women in sub-Saharan Africa (SSA) continue to experience a high prevalence of undernutrition (3). It varies across developing countries, ranging from 13 to 38 percent (4). However, the situation is worse in Africa, as 23 percent of pregnant women

suffer from undernutrition (5). In Ethiopia, it is also high, 38% (6).

The major factors contributing to undernutrition in pregnant women in Ethiopia include poor food quality and quantity, insufficient access to healthcare services, limited understanding of nutrition and breastfeeding practices, geographical remoteness, extreme poverty, and inadequate social protection (7). Besides, scarcity of food, drinking water, and hygiene are major contributing factors to it (8).

Moreover, undernutrition during pregnancy has been linked to various factors, including maternal illiteracy, low income, unplanned pregnancies, low diet intake, food insecurity, lack of latrines, lack of awareness regarding maternal nutrition education, and lack of malnutrition screening programs (9).

This study area lacks comprehensive data regarding the prevalence of undernutrition and its related factors among pregnant women. Although the National Nutrition Program, which emphasizes maternal and child nutrition, has been put into action in Ethiopia, undernutrition among pregnant women continues to pose a considerable public health issue. Therefore, it is essential to update the evidence concerning the nutritional status of pregnant women and the factors associated with it to create targeted interventions. Additionally, there exists a gap in the literature and a shortage of information pertaining to malnutrition in this study area. Therefore, this study aimed to determine the extent of undernutrition and related factors among pregnant women in Nekemte town, western Oromia, Ethiopia.

METHODS

Study settings, design, and period

This research was carried out in Nekemte Town, which is the capital of the East Wollega Zone. Nekemte Town is situated 331 kilometers west of Addis Ababa and is classified into seven sub-administrative cities in the Oromia Regional State. According to the Nekemte Town administrative population profile, the total population of Nekemte Town is 142,150, consisting of 72,497 males, 69,653 females, and 4,933 pregnant women. The Oromia Regional Health Office of 2022 reported that the town has 29,615 residences, with an average household size of 4.8 people. Its healthcare infrastructure includes 2 hospitals, 2 health centers, two governmental clinics, and 13 private clinics.

A community-based cross-sectional study was carried out between June 8 and July 12, 2023, in the study area. The target population for this research consisted of all expectant mothers living in Nekemte Town. The study population comprised pregnant women within Nekemte Town. All eligible mothers who had resided in the town for a minimum of six months prior were incorporated into the research, whereas critically ill, unable to respond to the questionnaire, and pregnant women were excluded.

Sample size determination and sampling techniques

The sample size for this research was determined by employing a single population proportion, taking into account a 14.4% prevalence of undernutrition based on MUAC (<23 cm) among pregnant women, as reported in a prior study conducted in Gondor city of Ethiopia (10). This calculation included a margin of error of 3% and a confidence level of 95%. After accounting for a non-response rate of 10%, the final sample size calculated for this study amounted to 579. Out of a total of seven sub-cities, four were chosen through a simple random sampling method. Initially, a comprehensive list of households with pregnant women, sourced from the Kebele (village) Health Post family folder or registration book, was utilized as the sampling frame. To achieve the necessary sample size in each selected sub-city, the overall sample size was allocated proportionally to these sub-cities based on the total number of households present in each. Ultimately, to select individual sample units at the household level, a sampling

interval (k^{th}) was computed for all target groups within each village. Subsequently, every kth pregnant woman was selected from the four chosen villages using the family folder as the sampling frame.

Data collection tools and procedures

Data was gathered via in-person interviews utilizing structured, pre-tested questionnaires. Information regarding socio-demographic, socio-economic, socio-cultural aspects, household food insecurity, dietary diversity, as well as individual and behavioral factors was collected through validated English questions that were adapted from pertinent literature and translated into Afan Oromo, a local language.

The Household Food Insecurity Access Scale (HFIAS) was utilized to evaluate food insecurity. Each question was posed within four weeks (30 days), by the guidelines provided by the tool. Initially, respondents were asked an occurrence question to establish whether the specified condition had occurred at any point during the past four weeks (Yes or No). If the respondent replied "Yes," a frequency-of-occurrence question was then presented to determine if the condition occurred rarely (once or twice), sometimes (three to ten times), or frequently (more than ten times) within the four-week timeframe.

A method of 24-hour dietary recall was used to gather information regarding dietary intake. The dietary diversity score for each participant was determined by totaling the number of food groups (from a total of 14) that were consumed during the 24-hour reference period preceding the data collection (11). The 14 food groups were: 1) Cereals; 2) Vitamin A-rich vegetables and tubers; 3) White roots and tubers; 4) Vegetables with dark green leaves; 5) Other vegetables; 6) Vitamin A-rich fruits; 7) Other fruits; 8) Organ meat; 9) Flesh meat; 10) Eggs; 11) Fish; 12) Legumes, nuts, and seeds; 13) Milk and dairy-based items; and 14) Oils and fats.

Local language-speaking, trained health extension workers administered the structured interview questionnaires to collect the data. After the in-person interview, the MUAC of the participants was assessed on the non-dominant arm at the midpoint between the shoulder and elbow tips, measured to the nearest 0.1 cm using non-stretchable MUAC tape. The principal investigator enlisted four trained health extension data collectors and two BSc. Nurse supervisors. The data collectors were tasked with measuring the MUAC of the participants and filling out the questionnaires. The supervisors supplied all essential data collection materials daily, reviewed the completed questionnaires for thoroughness and consistency, and addressed any issues that arose during the data collection process.

Data quality assurance

The questionnaire was translated from English into a local language, Afan Oromo, and subsequently pre-tested on 5% (twenty-nine) of the study sample size in a village distinct from the actual study locations to assess the validity of the data collection instruments. Following the pretest findings, essential adjustments were made to the questionnaire. The data collectors participated in a three-day training program on the questionnaire to guarantee a shared comprehension of the questions. The supervisors monitored the data collection process and reviewed the questionnaires daily for completeness.

Data processing and analysis

The data were verified for completeness, cleaned, and subsequently exported to the Statistical Package for the Social Sciences (SPSS), version 25, for further analysis. Descriptive statistics were performed to investigate the frequency distribution, central tendency, variability, and overall shape of the distribution of the variables. Bivariate and multivariable logistic regression analyses were employed to ascertain the extent of association between independent and dependent variables. The adjusted odds ratio (AOR) and 95% confidence interval (CI) were utilized to evaluate the strength of the association, and

statistical significance was established at a p-value < 0.05.

RESULTS

Socio-demographic characteristics of pregnant women

About 579 study subjects participated in this study, with a response rate of 97.9%. The mean age with a standard deviation (SD) was 27.3 ± 3.7 years. Nearly half (47.6%) of the participants were in the age group of 25–34 years. A total of 244 (43%) participants had primary education, and 238 (42%) attended secondary education. Furthermore, 539 (95.1%) participants reported being ever married, 278 (49%) housewives, and 136 (24%) government employees. A total of 179 (31.6%) participants lived in households with more than five members, and 227 (40%) were categorized under poor economic status (Table 1).

Table 1: Socio-demographic characteristics

Variables	Category	Frequency (n)	Percent (%)
Age of women (in years)	18-24	216	38.1
	25-34	270	47.6
	≥35	81	14.3
Marital status	Married	539	95.1
	Single	13	2.3
	Divorced	5	0.9
	Separated	10	1.8
Mother education	Non-formal	85	15.0
	Primary	244	43
	Secondary and above	238	42.0
Husband education	Non-formal	27	4.7
	Primary	226	39.9
	Secondary and above	314	55.4
Mother occupation	House wife	278	49.0
	Student	25	4.4
	Government	136	24.0
	Merchant	128	22.6
Family size	≤5	388	68.4
	>5	179	31.6
Wealthy index	Poor	227	40.0
	Medium	114	20.1
	Rich	226	39.9

Nutritional and health-related information

Table 2 below shows that the majority (83.1%) of the participants were multigravida, while 96 (16.9%) were primigravida. About 59 (10.4%) participants were in the first trimester, and 218 (38.5%) in the third trimester of gestational age. About 61 (10.8%) participants had a history of abortion, and 116 (20.5%) participants had an unplanned pregnancy.

Table 2: Nutritional and health-related information of the study participants

Variables	Categories	Frequency (n)	Percent (%)
Number of pregnancies	1	96	16.9
	2-3	395	69.7
	≥4	76	13.4
Gestational age	1st trimester	59	10.4
	2nd trimester	290	51.1
	3rd trimester	218	38.5

History of abortion	No	506	89.2
	Yes	61	10.8
Planned pregnancy	Planned	451	79.5
	Unplanned	116	20.5%
Sickness during pregnancy	No	470	82.9
	Yes	97	17.1
Latrine availability	Yes	439	77.4
	No	128	22.6

Household food security

Table 3 depicts the household distribution of the participants. In the month preceding data collection, 362 households (63.8%) reported concerns about having insufficient food. Forty-five households (7.9%) ate foods they did not prefer. Thirty-eight (6.7%) pregnant women ate foods they did not desire, and 46 (4.6%) consumed smaller meals. Twelve households (2.1%) reported eating fewer meals, and 17 (2.9%) had no food of any kind in their homes. Sixteen (2.8%) pregnant women went to sleep hungry, and 261 (46.1%) were from food-insecure households.

Table 3: Household food insecurity status of pregnant women

Variable	Category	Frequency (n)	Percent (%)
Worry about food	Yes	362	63.8
	No	205	36.2
	Rarely	306	53.9
	Some times	36	6.4
	Often	20	3.5
Did not eat the preferred food	Yes	45	7.9
	No	522	92.1
	Rarely	20	3.5
	Some times	15	2.6
	Often	10	1.8
Eat a few kinds	Yes	45	7.6
	No	524	92.4
	Rarely	10	1.7
	Some times	7	1.0
	Often	28	4.9
Eat, don't want	Yes	38	6.7
	No	529	91.5
	Rarely	5	0.9
	Some times	5	0.9
	Often	28	4.9
Eat a smaller meal	Yes	26	4.6
	No	541	95.4
	Rarely	10	1.8
	Some times	5	0.9
	Often	11	1.9
Eat fewer meals	Yes	12	2.1
	No	555	97.9
	Rarely	5	0.9
	Some times	5	0.9
	Often	2	0.3
No kind of meal	Yes	17	2.9
	No	550	97.1
	Rarely	13	2.2
	Some times	4	0.7
	Often		
Go to sleep	Yes	16	2.8
	No	551	97.2
	Rarely	12	2.1

	Some times Often	4	0.7
The whole day and night without eating	Yes No Rarely Some times Often	6 561 6	1.1 98.9 1.1
Household food security status	Foo security Food insecurity	306 261	53.9 46.1

Dietary diversity score

In this study, all the study participants consumed cereals. About 435 (76.7%) of the participants consumed vitamin-rich vegetables. Legumes, nuts, and seeds were eaten by 479 (84.5%) of the pregnant women. Table 4 below depicts that approximately 253 (44.6%) of the participants had a poor dietary diversity score.

Prevalence of poor MUAC among the study participants

The results of this study indicated that 129 (22.8%) of the pregnant women were undernourished (MUAC < 23cm), with a mean mid-upper arm circumference (MUAC) of 25.78 ± 1.98 cm (SD).

Table 4: Food groups consumed by pregnant women

Food groups	Category	Frequency (n)	Percent (%)
Cereals	Yes No	567	100.0
Vitamin-rich vegetable	Yes No	435 132	76.7 23.3
White tubers and roots	Yes No	411 156	72.5 27.5
Dark green leafy vegetable	Ye No	366 201	64.6 35.4
Other vegetables*	Yes No	504 63	88.9 11.1
Vitamin A-rich fruit	Yes No	311 256	54.9 45.1
Other fruits*	Yes No	208 359	36.7 63.3
Organ meat	Yes No	18 549	3.2 96.8
Flesh meat	Yes No	104 463	18.3 81.3
Eggs	Yes No	304 263	53.6 46.4
Fish	Yes No	567	100.0
Legumes, nuts, and seeds	Yes No	479 88	84.5 15.5
Milk and milk products	Yes No	319 218	56.3 43.7
Oils and fats	Yes No	567	100
Dietary diversity score	Poor DDS	253	44.6

	Good DDS	314	55.4

Factors associated with poor MUAC

History of abortion (AOR = 2.5; 95% CI (1.3–4.8)), wealth index (AOR = 1.9, 95% CI (1.1–3.1)), household food insecurity (AOR = 2.0, 95% CI (1.2–3.2)), dietary diversity score (AOR = 2.8, 95% CI (1.4–3.4)), and family size > 5 (AOR = 4.6, 95% CI (2.9–7.3)) showed significantly associated with pregnancy (Table 5).

Table 5: Logistic regression analysis of factors associated with the nutritional status of pregnant women

Variables	Category	Poor MUAC		COR (95% CI)	AOR (95% CI)
		Yes	No		
Age of first pregnancy	18-24	39(18.1%)	177(81.9%)	1	1
	25-34	66(24.4%)	204(75.6%)	1.4(0.9–2.2)	1.16(0.70–1.9)
	≥35	24(29.6%)	57(70.4%)	1.9(1.1–3.4)	1.4(20.8–2.7)
History of abortion	Yes	22(36%)	39(64%)	2.1(1.2–3.6)	2.5(1.3–4.8) *
	No	107(21.2%)	399(78.8%)	1	1
Wealth index	Poor	76(33.4%)	151(66.6%)	2.7(1.7–4.3)	1.9(1.1–3.1) *
	Medium	18(15.8%)	96(84.2%)	1.0(0.5–1.9)	0.81(0.41–1.6)
	Rich	35(15.5%)	191(84.5%)	1	1
Pregnant status	Unplanned	19(16.4%)	97(83.6%)	0.6(0.3–1.3)	0.91(0.49–1.7)
	Planned	110(24.4%)	341(75.6%)	1	1
Family size	>5	79(44.1%)	100(55.9%)	5.3(3.5–8.1)	4.6(2.9–7.3) *
	≤5	50(12.8%)	338(87.2%)	1	1
Household food security	Insecure	72(33.3%)	144(66.7%)	2.5(1.7–3.8)	2.0(1.2–3.2) *
	Secure	57(16.3%)	294(83.7%)	1	1
DDS	poor DDS	80(31.6%)	173(68.4%)	2.5(1.6–3.7)	2.8(1.4–3.4) *
	good DDS	49(15.6%)	265(84.4%)	1	1
Latrine possession	No	40 (31.2%)	88(68.8%)	1.7(1.2–2.7)	1.6(0.98–2.8)
	Yes	89 (20.2%)	350 (79.8%)	1	1
Birth intervals	≤3	105(21.1%)	304(78.9%)	1.92(0.18–3.1)	1.6(0.93-2.74)
	>3	24(27.2%)	134(72.8%)	1	1
Knowledge	No	60(27.1%)	161(72.9%)	1.4(1.0–2.2)	1.5(0.93–2.3)
	Yes	69(19.9%)	277(80.1%)	1	1

**; p value less than 0.05, AOR-Adjusted odds ratio, COR-Crude odds ratio, DDS- Dietary Diversity Score, CI-Confidence interval*

DISCUSSION

In this study, the prevalence of undernutrition (MUAC<23 cm) was 22.8%. Key contributing factors identified included food insecurity, inadequate dietary diversity scores, low wealth index, history of abortion, and larger family size.

The present study's finding is higher compared to studies reported from other parts of Ethiopia, such as Gondar Town (14.4%) (10), East Shewa Zone (13.9%) (12), Diredawa town (18.2%) (13), and Wando Genet District (9%) (14). These discrepancies might stem from variations in socioeconomic characteristics, cultural beliefs, and the periods in which the studies were conducted. Furthermore, it is also higher than reports from Kenya (19.3%) (15), Nepal (7%) (16), and the Ashanti region of Ghana (10%) (17). This variation could be attributed to differences in the MUAC cutoff value used between Ethiopia and other countries. However, the results of this study are consistent with findings from studies reported from Gedeo Zone (21%) (18), Dessei Town (19.5%) (19), and Alamata General Hospital in the Northern region of Ethiopia (22.3%) (20).

Nevertheless, the current study finding is lower than findings from the Shashemane District (34%) [21], Kacha Birra District (52.6%) (22),

Gambella Town (28.6%) (23), Eastern Ethiopia (43.8%) (24), and Goro Dola District (41.2%) (25). A possible explanation for these differences could be variations in the urban or rural nature of the study subjects and the study settings.

Pregnant women with a history of abortion were 2.5 times more likely to be undernourished. This finding aligns with evidence from rural areas of Southern Ethiopia (26). A possible justification for this association is that bleeding and the stress during an abortion could negatively impact a woman's health, including her nutritional status.

Additionally, pregnant women from poor households had 1.9 times higher odds of undernutrition. These findings align with reports from the East Shewa Zone (12) and the Gedeo Zone (18). This difference likely arises due to the economic status of the household. Moreover, a higher risk of undernutrition was observed among pregnant women in larger families compared to those who live in smaller families. This is consistent with studies conducted in Gondar (27) and the Gedeo Zone (18). This suggests that mothers with short intervals between births and their current pregnancy may not have sufficient time to replenish essential macro- and micronutrients. In addition, higher parity can necessitate women prioritizing childcare over their own health and nutritional well-being, especially when household resources are limited.

Besides, pregnant women in food-insecure households were 2.0 times more likely to be undernourished compared to those in food-secured households. Similar findings were reported from previous studies conducted in Gambella, Bench-Shako, Gumay District, and Nigeria (7, 23, 28, 29). This association likely exists because family food shortages typically lead to inadequate daily nutritional intake, a poor socioeconomic situation, and compromised dietary intake, ultimately contributing to undernutrition in women.

Moreover, pregnant women with low dietary diversity scores had approximately 2.8 times higher odds of being undernourished compared to those with high dietary diversity scores. This finding is consistent with studies reported from Ethiopia, Diredawa Town, Dessei Town, and the Kacha Birra District (22, 24, 30). This could be attributed to the fact that women with low dietary diversity may not be consuming a balanced diet, which is essential for maintaining immunity and performing metabolic functions. Furthermore, a diversified diet typically reflects better dietary quality and contributes to improved daily nutrient and energy intake.

As with any study, the present study has limitations. Its study design and small sample size could limit the ability to establish cause-and-effect relationships between the independent and outcome factors. Moreover, the potential for recall bias during interviews might affect the accuracy of the information collected regarding the food used in the past.

Conclusion

The current study's finding among pregnant women in the study area was lower than reported in several previous studies from Ethiopia. Variables like household food insecurity, poor dietary diversity, a low wealth index, a history of abortion, and large family size were independently associated with undernutrition. It is important to promote behavioral change communication activities at all levels to emphasize the significance of a balanced diet. Implementing policies and programs that enhance food security, promote dietary diversity, support family planning, and improve economic conditions can help mitigate the impact of these factors.

List of abbreviations

ANC-Antenatal Care, DDS-Dietary Diversity Score, FANTA-Food and Nutrition Technical Assistance, HFIAS-Household Food Insecurity Assessment Scale, IDDS-Individual Dietary Diversity Score, MUAC-Mid Upper Arm Circumference, NNS-National Nutritional Strategy, SPSS-Statistical Package for Social Sciences.

Declarations

Ethical consideration

Ethical clearance was obtained from Salale University Institution Research Ethical Review Committee (SlU-IRERC) with approval number Ref No SLU-IRB-04-2023. The research was carried out according to the Declaration of Helsinki, which pertains to medical research involving human subjects. Informed consent in writing was secured from every participant after a comprehensive explanation of the study's aims and methods. The privacy of the participants was preserved by refraining from gathering data on variables that might disclose their identity and by limiting access to the data.

Consent for publication: Not applicable

Availability of data and materials: The dataset utilized in this research can be obtained from the corresponding author upon a reasonable request.

Authors' contributions

BA conceived the study, conducted the analysis, and drafted the manuscript. TY and ES reviewed the manuscript critically and approved the submission. All authors approved the submission of the manuscript.

Acknowledgments

This study was funded by the Oromia Health Bureau, Ethiopia. All data collectors, supervisors, and participants for their tolerance and commitment during data collection were appreciated by the authors.

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