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Research article

Undernutrition and its associated factors among pregnant women at the public hospitals of Bench-Sheko and Kaffa zone, southwest Ethiopia

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ABSTRACT

Background: Undernutrition in pregnant women, expressed as low mid-upper arm circumference, is responsible for maternal mortality and morbidity, adverse birth outcomes, subsequent childhood malnutrition, and mortality. As a result, the purpose of this study was to determine the prevalence of maternal undernutrition and associated factors during pregnancy in public hospitals in the Bench-Sheko and Kaffa zones of southwest Ethiopia.

Methods: A facility-based cross-sectional study design was employed among 566 women who received antenatal care from March–May 2021 at the public hospitals of the Bench-Sheko and Kaffa zones, Southwest Ethiopia. A systematic random sampling technique was used to select the research unit. Undernutrition was measured by mid-upper arm circumference. The data were entered into Epi- Data version 3.1 and then exported to Statistical Package for Social Science (SPSS) version 21 software for analysis. Multivariate logistic regression models were constructed using variables with a P-value <0.25 in bivariate logistic regression analysis. Finally, in multivariate logistic regression analysis, the variable with a (P-value < 0.05) is considered statistically significant.

Results: A total of 566 pregnant women participated in our study with a response rate of 98.3%. The overall prevalence of undernutrition among pregnant women was 42.4% (95% CI: 38.3, 46.5). In multivariate logistic regression, the age of mothers between 16-24 years old (AOR = 3.9, 95% CI: 1.60, 9.70), household food insecurity (AOR = 1.81, 95% CI: 1.04, 3.15), and poor dietary knowledge (AOR = 3.25, 95% CI: 1.94, 5.47) were the factors significantly associated with undernutrition among pregnant women.

Conclusion: According to this study finding, the prevalence of undernutrition was very much high in the study area, which was significantly associated with the age groups of 16–24 years older women, poor dietary knowledge, and household food insecurity. Therefore, the strategies and programs targeted towards reducing and preventing undernutrition among pregnant mothers should be made at all levels to improve their nutritional status, and also health information, nutrition counseling, and food assistant should be provided.

1. Introduction

Women of reproductive age are vulnerable to undernutrition [1]. Poor nutritional status in pregnant women, expressed as low mid-upper arm circumference (MUA), is responsible for maternal mortality and morbidity and adverse birth outcomes [2, 3]. Furthermore, it is a risk factor for under-five malnutrition [4, 5, 6]. Maternal malnutrition is a risk factor for intrauterine growth restriction (IUGR), which occurs frequently and is a serious complication of pregnancy. Newborns who have IUGR are at high risk for perinatal morbidities as well as physical and mental impairments in later life [7, 8]. Malnourished mothers have a higher risk of giving low birth weight babies vulnerable to disease and death. Low birth weight newborns are also at risk of mortality during a pediatric period and develop the non-communicable disease in later life [2, 9]. In addition it will again affect the economic development of family, society and continue the cycle of undernutrition [2, 10].

Maternal iron deficiency anemia and short height are also risk factors for maternal mortality during delivery, for at least 20% of maternal mortality. Mothers who have shorter height are at risk of having caesarian delivery and cephalopelvic disproportion [11]. In most developing countries, it is responsible for having small babies, reduced organ size in babies, obstetric complications, maternal and newborn morbidity, and subsequent childhood malnutrition and mortality [12].

Maternal undernutrition during pregnancy in all Africa regions remains highly prevalent, which was 20.2% [13]. In Ethiopia, it was highly remaining prevalent [3], around 29.07% of pregnant women were

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undernourished, of which 30.4%, 30.4%, 33.9%, and 38% were in Amhara, Oromia, South Nation, Nationality, and People Region (SNNPR), and Tigray region of Ethiopia, respectively [1]. Despite the Ethiopian government's development of the National Nutrition Program, which includes maternal and child nutrition as a goal, undernutrition of the women during pregnancy continues to be a public health concern in Ethiopia. Therefore it needs updated data on the nutritional status of pregnant women's, which is essential to develop specific interventions in this area. In addition, there is limited information on the prevalence and factors associated with maternal undernutrition among pregnant women in the study area. Therefore, this study aimed to assess the prevalence of maternal undernutrition and its associated factors among pregnant women at the public hospital of Bench-Sheko and Kaffa zone, southwest Ethiopia.

2. Methods

2.1. Study setting

This research was done in three public hospitals in the Bench-Sheko and Kaffa zones of SNNPR, Ethiopia. The administrative center of the Bench-Sheko zone is Mizan-Aman town, which is situated 562 km from Addis Ababa, Ethiopia's capital city. According to zonal annual reports of 2019, the total population of the zone was 653,270, of whom 324,542 were men and 328,728 women. There is one general hospital in the Bench-Sheko zone with a 3-month average number of 540 antenatal care (ANC) attendants before the data collection period. Bonga town, 468 km from Addis Ababa, serves as the administrative center of the Kaffa zone. In 2017, the zone's overall population was predicted to be 1,171,133, with 578,151 men (49.4 %) and 592,982 women (50.6 %). There is one general hospital and one primary hospital in the zone. with the 3- months an average number of 490 and 401 ANC attendants before the data collection period in each hospital respectively. The study was conducted from March to May 2021.

2.2. Study design

A hospital -based cross-sectional study design was used.

2.2.1. Source population

All women in the Bench-Sheko and Kaffa zones, Southwest Ethiopia, received ANC at the public hospitals.

2.2.2. Study population

All women who were systematically selected during ANC follow-up.

2.3. Inclusion and exclusion criteria

2.3.1. Inclusion criteria

All pregnant women attended ANC at public hospitals.

2.3.2. Exclusion criteria

The pregnant women who were sick or mentally unstable.

2.4. Sample size and sampling technique

2.4.1. Sample size determination

In this study, the sample size was calculated using a single population proportion formula with the following assumptions in mind: The prevalence of undernutrition (P) among pregnant women from the Silte zone study finding, 21.8% [14], 5% marginal error(d), 95% confidence level ($Z\alpha/2 = 1.96$), none responses rate of 10% and the design effect of 2. As a result, the sample size was calculated as follows: $n= ((1.96)^2 *0.218 (1-0.218))/(0.05)^2 = \sim 262$. Thus, a minimum number of 262 pregnant women were the required number for the study. Then when we considered the design effect of 2 (262*2) it became 524. Finally, adding a 10% none-response rate (524 *10%), 524 + 52 = 576 of sample size were used.

2.4.2. Sampling technique

First, each public hospital of the Bench-Sheko and Kaffa zones received a proportionate share of the entire sample size based on their average number of clients attending ANC before the data collection period. Next, a systematic random sampling technique was used to select the study units by using the list of pregnant mothers attending ANC as a sampling frame, and the sampling interval (K^{th}) was calculated by using the formula of k = N/n. Finally, every K^{th} person (roughly 2), as they registered, was included in the study until the desired sample size was attained from each hospital.

2.5. Study variables

2.5.1. Dependent variable

Undernutrition of pregnant women.

2.5.2. Independent variables

Age, marital status, religion, family size, occupation, education, income level, television (TV)/radio, mobile, household food insecurity, meals frequency, skipping meals, eating a snack, eating additional meals, excessive workload, residency, number of live birth, number of pregnancies, pregnancy interval, number of ANC visits, trimester, history of illness, nutrition information, source of nutrition information, dietary knowledge and attitude of pregnant women were independent variables.

2.6. Data collection procedures

Structured and semi-structured questionnaires administered by Midwives and Nurses were used to collect the data. The data on sociodemographic and economic, obstetric and pregnancy-related factors, household food insecurity, dietary knowledge, dietary attitude, a dietary related habit of pregnant women like, eating habit of snacks, skipping of meals, meals frequency, eating additional meals, and nutritional status of pregnant women were assessed. The general content validity of the questionnaires was checked by relevant professionals against the conceptual framework of the study and its reliability was checked by using a test-retest method and the questions with less than 0.7 Pearson coefficient values were avoided from the questionnaire. The household food insecurity level was measured with standardized and validated tools of Household Food Insecurity Access Scale (HFIAS)that was developed mainly by Food and Nutrition Technical Assistance (FANTA), and classified the households as food secured or not [15, 16]. The tool consists of nine questions that represent the severity of food insecurity in general (access). Nine "frequency-of-occurrence" questions inquire about changes in households' diets or food consumption patterns over the previous 30 days due to limited food resources. Participants were assigned a score between 0 and 27 based on their responses to the nine questions and their frequency of occurrence over the preceding 30 days. A higher HFIAS score indicates more inadequate access to food and greater household food insecurity, while a score of 0 indicated secure access to food.

Ten open-ended questions adapted from a previous study were used to assess dietary knowledge, which tried to evaluate the nutritional knowledge of pregnant women's on the nutritional aspects of pregnancy [17]. Its reliability in this study was a Cronbach Alpha of 0.92. The items measuring nutritional knowledge were scored on a dichotomous scale as 0 = does not know and 1 = knows. Each correct answer was coded as 1 and each incorrect answer was coded as 0. Then the total score was obtained by summation of each score. Finally, nutritional knowledge level was categorized as knowledgeable if she correctly answered greater than or equal to 70% of the total nutrition knowledge questions and not knowledgeable If respondents scored <70% [18, 19]. The attitude of pregnant women toward nutrition during pregnancy was assessed by using nine questions. The reliability of the attitude questions was checked and showed a Cronbach Alpha of 0.84. The pregnant woman was given one mark if the answer were a favorable attitude toward nutrition during pregnancy and zero scores if the response were an unfavorable

attitude [18, 20]. Following the summation of the scores, the respondent was classified as having a favorable attitude if their attitude score was greater than or equal to the median of the scores, and as having an unfavorable attitude if their attitude score was less than or equal to the median of the scores [18].

2.7. Anthropometric measurement

The circumference of the middle upper arm (MUAC) was measured with MUAC tape that was non-elastic and non-stretchable. First, we removed any clothing that might cover the pregnant mother's left arm then calculated the midpoint of the pregnant mother's left upper arm by first locating the tip of the pregnant mother's shoulder, bending the pregnant mother's elbow to make a right angle, and inspected the tension of the tape on the pregnant's arm. We also made sure that the tape has proper tension and was not too tight or loose. When the tape was in the correct position on the arm with the correct tension, read and called out the measurement to the nearest 0.1cm, and the average value was taken after measuring twice. A range <23 cm was used as a cut-off point for undernutrition and while a range of ≥23 cm was for normal nutritional status.

2.8. Ethical approval and consent to participate

This study was conducted according to the Declaration of Helsinki. First, ethical approval was obtained from Mizan-Tepi University Institutional Research Ethics and Review Committee to conduct this study. A formal letter was sent to the Bech-Sheko and Kaffa zone health bureau administrators, as well as the selected hospitals, prior to the study. Before any data was collected, the study's goal, benefits, confidentiality, and risks were explained to the participants, and all respondents signed a written informed consent form. The respondents have agreed to maintain their anonymity, and the information they provide will be used solely for the purposes of the study.

2.9. Data processing and analysis

After ensuring that all data were complete and consistent internally, they were coded and entered into the Epi Data 3.1 computer software package. For further analysis, the data was exported to the Statistical Package for Social Science (SPSS) version 21 software. Undernutrition was classified and coded as 1 for "yes" if the MUAC was 23 cm and 0 for "no" if the MUAC was 23 cm [14,21–25]. The household food insecurity access score was calculated for each household by summing up the nine food insecurity frequencies in the previous 30 days. The nine items were recorded as 0 for "no" to each occurrence and 1 for "yes" response, and then it was categorized as food secure when all items had been answered "no" and food insecure for "yes". For the descriptive statistics analyses, percentage, frequency, mean and standard deviation were calculated. We used bivariate logistic regression to examine the relationship between the dependent and independent variables. Multivariate logistic regression models were constructed using variables with a P-value <0.25 in bivariate logistic regression analysis to control for all possible confounders and identify factors that are independently associated with the undernutrition of pregnant women. To determine the strength and direction of association between dependent and independent variables, the Crude Odd Ratio (COR) and Adjusted Odd Ratio (AOR) with a 95% Confidence Interval (CI) were calculated. Finally, in multivariate logistic regression analysis, the variable with a (P-value < 0.05) is considered statistically significant. Standard error (SE) was used to test for multicollinearity between independent variables, and SE values greater than 2 were excluded from the analysis. The Hosmer-Lemeshow test was used to determine the model's fitness for goodness of fit, and the model was considered fitted if the Hosmer-Lemeshow P-value was greater than 0.05.

2.10. Data quality control

A pretest was conducted on 5% of the total study population. The final version of the questionnaire prepared in English was translated into the local language of the respondents and then translated back to English. Two days of training were given for collectors and supervisors on the instruments, data collection method, how to take anthropometric measurements, ethical issues, and the purpose of the study. The intra and inter-observer variability of the data collector's relative technical error of measurement (%TEM) was calculated during training among ten pregnant women to minimize random anthropometric measurement error. The accepted relative technical measurement errors for intra-observers were less than 1.5%, while inter-observers were less than 2%. During training and pretesting, the accuracy of data collectors' anthropometric measurements was standardized with their trainer. Data collectors have measured anthropometric measurements twice and then the average value was taken. Double data entry was done to compare two data cells and resolve whenever there was some difference.

Table 1. Socio-demographic and economic characteristics of study participants at the public hospital of Bench-Sheko and Kaffa zone, southwest Ethiopia, 2021 (N = 566).

Variables		Frequency (N)	Percent (%)
Age	16–24	167	29.5
	25–34	357	63.1
	≥35	42	7.4
Religion	Orthodox	224	39.6
	Protestant	267	47.2
	Muslim	73	12.9
	Others	2	0.4
Ethnicity	Bench	148	26.1
	Kaffa	228	40.3
	Sheka	26	4.6
	Amhara	132	23.3
	Others	32	5.7
Marriage	Married	552	97.5
	Others	14	2.5
Residency	Urban	371	65.5
	Rural	195	34.5
Mother education	No formal education	173	30.6
	Primary	170	30.0
	Secondary	93	16.4
	College and above	130	23
Husband education	No formal education	125	22.1
	Primary	142	25.1
	Secondary	111	19.6
	College and above	188	33.2
Mother occupation	Housewife	327	57.8
	Merchant	79	14.0
	Employers	124	21.9
	Others	36	6.4
Husband occupation	Farmer	164	29.0
	Merchant	173	30.6
	Employer	160	28.3
	Others	69	12.2
Family size	<5	437	77.2
	≥5	129	22.8
Average family monthly income	<1000 EBR	247	43.6
	1000-2000 ETB	71	12.5
	>2000 ETB	248	43.8
TV/Radio	Yes	382	67.5
	No	184	32.5
Mobile	Yes	404	71.4
	No	162	28.6
Households food security	Secure	462	81.6
	Insecure	104	18.4

Notes: TV: Television, ETB: Ethiopian Birr.

3. Results

3.1. Socio-demographic and economic related characteristics of pregnant women

A total of 566 pregnant women participated in our study, with a response rate of 98.3%. The mean (±SD) age of the study participants was 27.01 (±4.86), and about 357 (63.1%) were between the age group of 25 and 34 years. Around 267 (47.2%) pregnant women were protestant religion followers, and 228 (40.3%) were Kaffa by ethnicity. Almost all, 552 (97.5%) pregnant women are married, and 371 (65.5%) pregnant women were urban dwellers. Among the study participants, 247 (43.6%) of pregnant women had less than 1000 birr monthly income, and 382 (67.5%) had TV/radio. In this study, 104 (18.4%) household food insecure households (Table 1).

3.2. Obstetric and pregnancy-related characteristics of the study participants

It was found that 471 (83.2%) of study participants had less than or equal to two live birth, and only 65 (11.5%) had four and above ANC follow-up. Among the studied pregnant women, 269 (47.5%) were in their second trimester of pregnancy. Around 335 (59.25%) pregnant women had less than or equal to two pregnancies in their lifetime. Around 414 (73.1%) had nutrition information, and only 103 (18.1%) had a history of any types of illness (Table 2).

3.3. Dietary knowledge, attitude, and practice of pregnant women

Half, 286 (50.5%) of study participants had good dietary knowledge. On the other hand, around 308 (54.4%) of pregnant women had an unfavorable attitude to dietary practice. Regarding specific dietary practice, more than half, 305 (53.9%) of the study participants had <3 meal frequency, and about 263 (46.5%) had no habit of eating snacks during pregnancy (Table 3).

Table 2. Obstetric and pregnancy-related characteristics of study participants at the public hospital of Bench-Sheko and Kaffa zone, southwest Ethiopia 2021 (N = 566).

Variables		Frequency (N)	Per cent (%)
Trimester	First trimester	58	10.2
	Second trimester	269	47.5
	Third trimester	239	42.2
Total number of pregnancy	≤2	335	59.2
	3–4	163	28.8
	≥5	68	12.0
Total number of live birth	≤2	471	83.2
	3–4	82	14.5
	≥5	13	2.3
Pregnancy interval	≤2	352	62.2
	3–5	138	24.4
	>5	76	13.4
Number of ANC visit	One	188	33.2
	Two	210	37.1
	Three	103	18.2
	Four and above	65	11.5
History of illness	Yes	103	18.2
	No	463	81.8
Nutritional information	Yes	414	73.1
	No	152	26.9
Source of nutrition information	Health professionals	348	61.5
	Family	23	4.1
	Media	32	5.7
	Friends	7	1.2
	Others	4	0.7

Table 3. Dietary knowledge, attitude, and practice of pregnant women at the public hospital of Bench-Sheko and Kaffa zone, Southwest Ethiopia 2021 (N = 566).

		Frequency	Percentage
Dietary knowledge level	Poor knowledge	280	49.5
	Good knowledge	286	50.5
Dietary attitude level	Unfavorable attitude	308	54.4
	Favorable attitude	258	45.6
The habit of skipping meals	Yes	123	21.7
	No	443	78.3
Iron-folic supplements	Yes	466	82.3
	No	100	17.7
Following a specific dietary regimen	Yes	62	11
	No	504	89
Meal frequency	<3	305	53.9
	≥3	261	46.1
The habit of avoiding food	Yes	142	25.1
	No	424	74.9
Avoiding excessive workload	Yes	357	63.1
	No	209	36.9
Eating snack	Yes	303	53.5
	No	263	46.5
The habit of craving food	Yes	194	34.3
	No	372	65.7

3.4. Nutritional status of pregnant women

According to this study, the prevalence of undernutrition, based on MUAC less than 23 cm among pregnant women was 42.4% (95% CI: 38.3, 46.5) (Figure 1).

3.5. Factors associated with maternal undernutrition

In multivariate logistic regression, women age groups between 16-24 years old, household food insecurity, and poor dietary knowledge were significantly associated with undernutrition among pregnant women. The women with the age group of 16–24 years were 3.94 times more likely undernutrition (AOR = 3.94,95% CI: 1.60, 9.70) than age groups of ≥35 years old. The mother from a food-insecure household was 1.8 times more likely undernourished (AOR = 1.8, 95% CI: 1.04, 3.15) than their counterparts. The mother who had poor dietary knowledge was 3.25 more likely undernourished (AOR = 3.25, 95% CI: 1.94, 5.47) than their counterparts (Table 4).

4. Discussion

This study aimed to assess the maternal undernutrition and associated factors among pregnant women at the public hospitals of Bench-Sheko and Kaffa zone, Southwest Ethiopia. According to this study, the prevalence of maternal undernutrition among pregnant women was 42.4%, which is almost consistent finding with the study from the Guji zone (41.2%) [21], Tigray region, (40.6%) [23], from the rural district of Oromia region (41%) [3], Konso district of Ethiopia (43.1%) [26] and India (38%) [27]. This alignment might be because the measurement cut-off points used were similar to this study's cut-off points for undernutrition, which all used <23 cm, and the socio-economic status of the study participants. However, much higher than the study reported from Silte zone 21.8% [14] and Dessie town 19.5% [28] of Ethiopia. The possible explanation for this discrepancy might be the socioeconomic and cultural variation. Likewise, the studies from Iluu Aba Bor zone 17.4% [29], Alamata 22.3% [30], University of Gonder Hospital 16.2% [31], Dire Dawa 18.2% [32], Gambela 28.6% [33], Central Rift valley of Ethiopia 31.8% [34], Sudan (4.4%) [35], Nigeria (21.7%) [36] and Benin

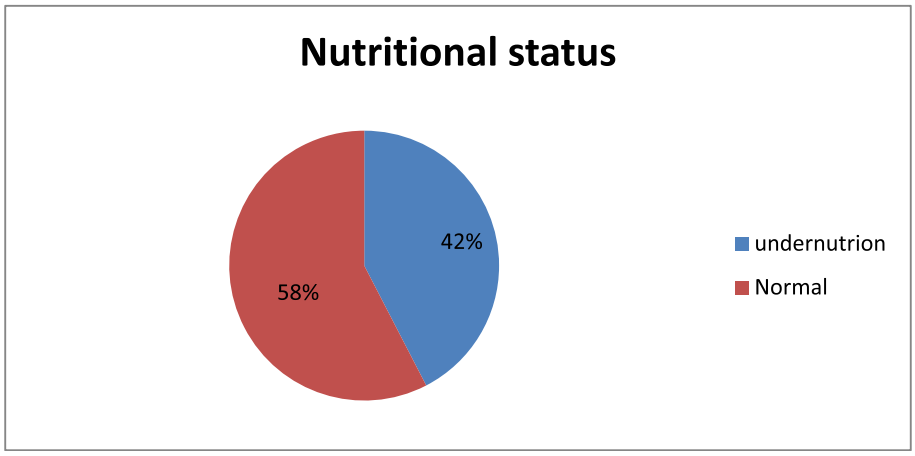

Figure 1. Nutritional status of the study participants at the public hospital of Bench-Sheko and Kaffa zone, Southwest Ethiopia, 2021 (N = 566).

Table 4. Factors associated with undernutrition of the study participants at the public hospital of Bench-Sheko and Kaffa zone, southwest Ethiopia, 2021 (N = 566).

Variables	Undernutrition		COR (95% CI)	AOR (95% CI)
	Yes	No		
Age of women				
16–24	94 (39.2%)	73 (22.4%)	3.63 (1.71,7.70)**	3.94 (1.60, 9.70)*
25–34	135 (56.2%)	222 (68.1%)	1.70 (0.80,3.50)	1.77 (.76, 4.10)
≥35	11 (4.6%)	31 (9.5%)	1	1
Residency				
Urban	129 (53.8%)	242 (74.2%)	1	1
Rural	111 (46.2%)	84 (25.8%)	2.48 (1.74,3.54)**	1.16 (.68, 1.98)
Nutrition information				
Yes	150 (62.7%)	264 (81%)	1	1
No	90 (37.5%)	62 (19%)	2.56 (1.75,3.74)**	0.94 (.57, 1.55)
Mother education				
No formal education	94 (39.2%)	79 (24.2%)	3.11 (1.91,5.06)**	1.50 (.53, 4.09)
Primary education	75 (31.2%)	95 (29.1%)	2.06 (1.26,3.36)*	1.16 (.50, 2.70)
Secondary education	35 (14.6%)	58 (17.8%)	1.58 (0.89,2.78)	1.23 (.57, 2.64)
College and above	36 (15%)	94 (28.8%)	1	1
Husband education				
No formal education	71 (29.6%)	54 (16.6%)	3.02 (1.89,4.84)**	0.54 (.19,1.53)
Primary education	63 (26.2%)	79 (24.2%)	1.83 (1.16,2.89)**	0.90 (.41, 1.98)
Secondary education	49 (20.4%)	62 (19%)	1.82 (1.12,2.96)*	1.73 (0.85, 3.53)
College and above	57 (23.8%)	131 (40.2%)	1	1
Mother occupation				
Housewife	162 (67.5%)	165 (50.6%)	2.31 (1.49,3.59)**	0.78 (.37, 1.64)
Merchant	41 (17.1%)	74 (22.7%)	1.30 (0.76,2.24)	0.96 (.46, 2.01)
Employers	37 (15.4%)	87 (26.7%)	1	1
Husband occupation				
Farmer	106 (44.2%)	58 (17.8%)	3.80 (2.40,6.02)**	1.72 (0.70, 4.24)
Merchant	82 (34.2%)	160 (59.1%)	1.06 (0.70,1.63)	0.62 (.33, 1.19)
Employers	52 (21.7%)	108 (33.1%)		1
Food security				
Food secure	2171 (71.2%)	291 (89.3%)	1	1
Food insecure	69 (28.8%)	35 (10.7%)	3.36 (2.14,5.25)**	1.81 (1.04,3.15)*
Knowledge				
Poor knowledgeable	171 (71.2%)	109 (33.4%)	4.93 (3.44,7.19)**	3.25 (1.94, 5.47)**
Good Knowledgeable	69 (28.8%)	217 (66.6%)	1	1
Income				
<1000 ETB	121 (50.4%)	126 (38.7%)	2.22 (1.53,3.20)**	.92 (.50, 1.69)
1000-2000 ETB	44 (18.3%)	27 (8.3%)	3.76 (2.17,6.52)**	1.82 (.89, 3.73)
>2000 ETB	75 (31.2%)	173 (53.1%)	1	1
Iron-folic supplement				
No	57 (23.8%)	43 (13.2%)	2.05 (1.32,3.18)*	1.39 (0.82, 2.37)
Yes	183 (76.2%)	283 (86.8%)	1	1
Avoiding excessive workload				
No	119 (49.6%)	90 (27.6%)	2.58 (1.81,3.66)**	1.41 (.89, 2.24)
Yes	121 (50.4%)	236 (72.4%)	1	1

Notes: *P-value<0.05, **P-value <0.001, ETB: Ethiopian Birr.

(29.8%) [37] showed a lesser prevalence of undernutrition then of this study. This discrepancy could be due to differences in measurement cut-off points <21–22.5cm that they used, the difference in measurement like some other studies were used BMI and weight to determine undernutrition, socio-demographic and economic difference, and study setting variation from the current study. Nevertheless, it is lower than the study findings from Kacha Birra district (52.6%) [24], Gumay district (44.9%) [22], Jordan (49.2%) [38], Benin (44.3%) [39], and Assam (48%) [40]. This discrepancy could be occurred due to the study participants socio-demographic, culture and study setting variation.

According to this study, the mother with the age groups of 16–24 years was 3.9 times more likely undernutrition than ≥35 years old. This study finding is consistent with the previous study findings [14, 41, 42]. This finding might be due to the increased nutritional needs of younger pregnant women for their growing body, which increases their vulnerability for undernutrition than their counterparts. Moreover, the younger women are more exposed to unfavorable environments, increasing the risk of younger pregnant women for undernutrition than their counterparts. It might also be due to the lack of decision-making power of younger women about food distribution in their households. However, this finding is inconsistent with the study findings of Alamata, which reported that being age groups of 15–24 years decreases the risk of undernutrition compared with age groups of 35–49 years olds [30].

In this study, the dietary knowledge of pregnant women was negatively associated with undernutrition. For example, the mother who had poor dietary knowledge was 3.25 times more likely undernourished than good dietary knowledge. This study finding is aligned with other study findings [14, 28]. Therefore, the possible explanations might be that poor dietary knowledge about nutrition practice during pregnancy could result in inadequate dietary intake, which is one of the possible factors for the high prevalence of undernutrition during pregnancy.

The others factor which significantly associated with undernutrition was household food insecurity. The mother from a food-insecure household was 1.8 times more likely undernourished than from food-secure households. It is consistent with the study finding from the Illu Aba Bor zone [29], Guji zone [21], Gambella [33], Gumay [22], and Somali region [43]. This finding might be due to pregnant women from food-insecure households being unable to access optimal amounts and quality of diets that meet the increased nutrition demands during pregnancy.

The study's limitations: One of the study's main limitations was that it only looked at public hospitals and excluded other public health institutions. This study did not include minimum dietary diversity as predictors of undernutrition. Finally, due to the nature of the cross-sectional study design, this study could not establish the cause-effect relation between predictors and undernutrition.

5. Conclusion

According to this study finding, the prevalence of undernutrition among pregnant women at the public hospitals of Bech-Sheko and Kaffa zone, southwest Ethiopia was very much high. The age groups of 16–24 years old, poor dietary knowledge, and household food insecurity were identified as the predictors of undernutrition among the study participants. Therefore, maternal undernutrition should be considered as the leading public health problem in the study area. So that, the strategies and programs targeted towards reducing and preventing undernutrition among pregnant mothers should be made at all levels to improve pregnant women's nutritional status. The health professionals should be provided or strengthened the health information and nutrition counseling service to the pregnant women during ANC follow-up about nutrition practice and its effect during pregnancy to improve their nutritional knowledge, primarily by focusing on the aged groups between 16-24 years, and the governments should provide a food assistant for pregnant women from food insecure households.

Generally, these study findings will provide information about maternal undernutrition for policymakers and health professionals to design nutrition intervention strategies and programs, and to strengthen the health service provided during ANC follow up which mainly should focus on specific context-based factors. It will also be used to provide the information that improves the inconsistent research findings gaps regarding factors related to maternal undernutrition. Moreover, it uses as baseline information for others researchers to identify more variables that may determine undernutrition during pregnancy in the study area.

Declarations

Author contribution statement

Abel Girma Tilahun: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

Rahel Dereje Taddesse, Dinaol Abdissa Fufa: Analyzed and interpreted the data; Wrote the paper.

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Data availability statement

Data will be made available on request.

Declaration of interests statement

The authors declare no conflict of interest.

Additional information

No additional information is available for this paper.

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