Research article

Under-nutrition and associated factors among pregnant women in public health care hospitals of Gedeo Zone, southern Ethiopia: A cross-sectional study

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ABSTRACT

Background: Balanced and adequate nutritious food during pregnancy helps to improve maternal weight and for the healthy growth of the fetus. There has been little progress in reducing pregnant undernutrition in Ethiopia; it has been too slow.
Objective: The objective of this study was to assess the prevalence of undernutrition and associated factors among pregnant women in public health care hospitals of Gedeo Zone, Southern Ethiopia.
Method: A cross-sectional study design was used in public hospitals of Gedeo Zone, Southern Ethiopia from February 01 to March 01, 2019. Pretested structure questionnaire was used to collect data on the socio-economic and demographic characteristics of the study participants. Epi-data was used to code and enter the data and SPSS-25 was used to analyse and interpret the data. To assess the relationship between the dependent and the independent variables, bi-variable and multivariable logistic regression analysis was done.
Results: In this study, the prevalence of undernutrition among pregnant women was 21% (95% CI: 20.8–21.2). After controlling other co-variables, the multivariable logistic regression model revealed that average monthly income, women's educational status, nutrition education and counseling, and parity were found to have a significant association with pregnant women's nutritional status. The odds of under-nutrition among pregnant women whose monthly income is <800 ETB were 2.8 times higher than those whose monthly incomes were >1500 (AOR: 2.89; 95%CI: 1.49–5.6).
Conclusion: In this study the magnitude of undernutrition among pregnant women was found to be higher than the previously reported findings. Average household monthly income, family size, mother's educational status, nutrition education and counseling, current health condition of the mother, and parity were factors significantly associated with undernutrition of pregnant mothers. Therefore, Interventions should be initiated in earlier stages of pregnancy to prevent the high level of undernutrition during the second and third trimester in this study area.

1. Introduction

Pregnancy makes women more conscious of the value of good nutrition and makes them search out more nutrition-related knowledge [1, 2]. Inadequate maternal nutrition has been linked to an increased risk of complications like intrauterine growth restriction, low birth weight, premature, prenatal and child mortality, and morbidity. Inadequate nutrient intake, on the other hand, has been shown to have pathophysiologic effects that manifest as growth and development defects in children and adult chronic disease in adults over time [3].

In addition to individual effects such as maternal and infant mortality, undernutrition results in large healthcare costs due to excess morbidity, premature birth, and increased risks of disease. The economic effects of malnutrition are serious, resulting in lost productivity as well as diminished intellectual and learning abilities. Because undernourished mothers give birth to undernourished infants; malnutrition can transfer from generation to generation. If they are daughters, these children are more probable turn into undernourished mothers and the vicious cycle continues [4, 5].

During pregnancy, the body undergoes several hormonal and physical changes. A balanced diet at the time of pregnancy aids the mother's

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anticipated weight gain as well as the fetus's growth and development [6]. It also aids in the improvement of birth outcomes and the prevention of illnesses like heart disease and obesity later in life [7]. A lack of essential nutrients during this time may raise the risk of other pregnancy complications like early fetal death, neural tube defects, and preeclampsia [8]. Although good efforts are made by the Ethiopian government by developing a food and nutrition policy [9], and a national nutrition program to address malnutrition, there has been little progress in reducing pregnant undernutrition in Ethiopia; it has been too slow [10].

2. Methods

2.1. Study area and period

A cross-sectional study was conducted in public health care hospitals of Gedeo Zone, Southern Ethiopia from Feb 01 to March 01, 2019. Based on the 2018 report of the finance and economic office of Gedeo zone the estimated total population was 1,166,695. The study populations were all pregnant mothers attending anti-natal care services at public health care hospitals of Gedeo zone during the study period.

2.1.1. Exclusion and inclusion criteria

All Pregnant mothers attending ANC service at public health care Hospitals were included and pregnant mothers, those who were seriously ill and unable to speak were excluded from the survey.

2.2. Sample size determination

The sample size for the study was determined by considering the prevalence of undernutrition (p) 14% from a recent study done [11], using a single population proportion with 95% ($\alpha = 5\%$), and precision (d) 0.05 and adding 10% non-response rate. This yielded a sample size of 202; despite this, due to the cluster sampling, 242 pregnant mothers who were found on ANC follow-up were involved in the survey. A cluster sampling method was employed. There are four public hospitals in the zone and all pregnant mothers attending ANC service in these four hospitals during the study period were considered.

2.3. Data collection instruments and procedure

The data were collected using an interviewer-administered Amharic and Gedeofa version questionnaires. The questionnaire was adapted from the Ethiopian demographic and health survey and from other literatures [12, 13].

The nutritional status of pregnant women was assessed using a Middle Upper Arm Circumference and categorized as undernutrition if MUAC <22 and normal if MUAC ≥22 [11,13]. Three BSc. graduates Nurses were trained about the techniques of the data collection. The overall data collection activity was supervised on the daily basis. The midpoint between the tip of the shoulder and the tip of the elbow on each woman's left arm was used to measure the MUAC. The measurement was taken with MUAC tape, which is non-flexible and non-stretchable. The woman's MUAC was read and registered to the nearest 0.1 cm after ensuring that the tape was applied correctly.

Most of the prior studies employed BMI as a measure of pregnant women's undernutrition and the prevalence and associated factors were differ from place to place. MUAC varies little during pregnancy and hence can be used as the best indicator of pregnant women's dietary practice during pregnancy. MUAC has been linked to infant mortality, prematurity, and other adverse fetal outcomes, and is more useful than weight during pregnancy [14, 15, 16, 17].

Nutrition Education/advice was assessed using items adapted from a similar study done in Ethiopia. The variable nutrition education or advice was created by integrating three questions that asked the pregnant mother whether she had gained any of the following counsel: (1) advised eating more, (2) advised to eat a healthy diet and (3) advised eating a variety of fruits and vegetables. Those pregnant mothers who responded 'yes' to each piece of advice were categorized as "received nutrition education/counseling"; otherwise, no [18].

2.3.1. Dietary diversity score (DDS)

For each pregnant mother, DDS was determined by calculating the number of food groups consumed during the previous 24-hour dietary recall method. Ten distinct food groups based on their nutrients were included in the dietary questionnaires.

These ten groups were grains (white roots, tubers, and plantains), pulses (beans, peas, and lentils), nuts and seeds, dairy, meat (poultry and fish), eggs, dark green leafy vegetables, vitamin A-rich fruits and vegetables, vegetables, and fruits. Pregnant women who scored above the mean (eating five or more) were classified as having good DDS, whereas those who scored below the mean were not [8, 19].

2.4. Data management and analysis

The socio-demographic and economic data were manually cleaned before being entered into Epi-data version 3.3. Statistical analysis was performed using SPSS-25. Bivariable and multivariable logistic regressions were done to assess the predictor variables with pregnant women undernutrition. Variables with p-value < 0.25 in the bivariable logistic regression analysis were candidates for multivariable logistic regression analysis. In the multivariable analysis, multicollinearity test was done among the independent variables using variance inflation factor (VIF), and no significant (VIF >10) collinearity was detected. Model goodness of fitness was assured through the non-statistical significance result of the Hosmer-Lemeshow test. Then, from the multivariable logistic regression analysis, adjusted odd ratio (AOR) with 95% confidence interval (CI) were calculated and the statistical significance of associated variables were declared at P < 0.05.

2.5. Ethical approval

The study was reviewed and approved by the Institutional Review Board (IRB) of Dilla University, College of Medicine and Health Science. The study purpose, procedures, possible risks, and benefits were explained to participants in local languages. Informed written consent was obtained and signed. Confidentiality of information collected from each study participant didn't disclose.

3. Results

3.1. Socio-demographic and maternal characteristics of the pregnant women

From the total 242 pregnant women, 235 (97%) of them have participated in this study. The mean age of the study participants was 25.8 (±5.82) years. 40.7% of pregnant women were unable to read and write; around 21% can only read and write; 22.5% attended primary school education and 14.8% attended secondary school education and above. The details of the respondents' socioeconomic and demographic characteristics are shown in Table 1.

Regarding obstetric and general health-related information; 29.7% of participants are nulliparous, 59.6% are primiparous and 10.6% are multiparous. 70% of participants had 2 or less than 2 ANC visits and 30% had 3-4 ANC visits. The details of the respondents' obstetric and general health-related characteristics are shown in Table 2.

3.2. Magnitude of undernutrition

The magnitude of undernutrition among pregnant women in public health care hospitals of Gedeo zone was 21% (95%CI: 20.8–21.2). Only 46% of the pregnant mothers fulfilled the minimum dietary diversity score. 47 % of participants received nutrition education and counseling.

Table 1. Socio-economic and demographic characteristics of pregnant women in public health care hospitals of Gedeo Zone, Southern Ethiopia 2019, (n = 235).

Variable	Frequency	%
Age		
15–19/Adolescent	29	12.3
≥20/Adult	206	87.7
Marital status		
Married	218	92.7
Single	11	4.6
Widowed	4	1.7
Separated	2	0.8
Family size		
<5	196	83
≥5	39	17
Residence		
Urban	147	62.6
Rural	88	37.4
Pregnant Women Occupational status		
House Wife	150	63.8
Government work	33	14.2
Merchant	49	20.8
Farmer	3	1.2
Pregnant Women Educational status		
Unable to read and write	96	40.7
Only read and write	51	21.6
Primary school	53	22.5
Secondary school and above	35	14.8
Husband's Occupational status		
Government Work	71	30.1
Farmer	59	25
Merchant	56	23.7
Daily labourer	41	17.4
Other*	8	3.4
Husband's Educational status		
Unable to read and write	74	31.4
Only read and write	51	21.7
Primary school	42	17.9
Secondary school and above	68	28.9
Average Household Income per month		
<800	57	24.3
801-1500	50	21.2
>1500	128	54.5
Ownership of Livestock		
Yes	43	18.4
No	192	81.6

* NGO, Barber, Bucher.

3.3. Predictors of undernutrition

After adjusting the possible confounding variables; multivariable logistic regression analysis revealed that average monthly income, mothers' educational status, nutrition education and counseling, health condition of the pregnant women, and parity had statistically significant predictors of nutritional status of pregnant women. Based on the odds of undernutrition among pregnant women whose mean monthly income less than 800 ETB were 2.89 times higher than those whose monthly income greater than 1500ETB (AOR = 2.89; 95%CI: 1.49, 5.6). Those pregnant mothers who had greater than seven family members were 2.5 times more likely to be undernourished than those pregnant women who had less than six family members (AOR: 2.5; 95%CI: 1.2–3.91). Among pregnant women whose educational level was no education were four times more likely to be undernutrition compared with those whose

Table 2. Obstetric, Nutrition and General Health related information of Pregnant Women in Public Health care Hospitals of Gedio Zone, SNNPRS, Ethiopia 2019. (n = 235).

Variable	Frequency	Percent
Number of ANC visits		
<2 visits	166	70
3–4 visits	69	30
Parity		
Primiparous	70	29.7
2–4 children	140	59.6
Multiple ≥5	25	10.6
Family history of still birth		
Yes	8	3.4
No	227	96.6
Family History of Diabetes mellitus		
Yes	21	9
No	214	91
General Health Condition		
Diagnosed disease	99	42
No Diagnosed disease	136	58
Nutrition Education/Advice		
Yes/received	73	31.1
No/not received	162	68.9
Ion/foliate supplement		
Taken	139	59.1
Not taken	96	40.9
Dietary diversity score		
DDS<5	76	32.2
DDS≥5	159	67.8

educational status secondary and above (AOR = 4.2; 95%CI: 2.34, 7.86). Among pregnant women who did not receive nutrition education and counseling were three times more likely to be undernourished as compared with those who received nutrition education and counseling (AOR = 3.23; 95%CI: 1.6, 15). Among pregnant mothers with a previous disease have the risk of 2.19 times more likely to become undernutrition as compared with the healthy ones (AOR: 2.19; 95%CI: 1.78–5.84) (Table 3).

4. Discussion

This study has attempted to identify the magnitude of undernutrition and its associated factors among pregnant women in public health care facilities of the Gedeo Zone. Accordingly, the magnitude of undernutrition was found to be 21% (95% CI: 20.8–21.2). Moreover; average household monthly income, family size, mother's educational status, nutrition education and counseling, current health condition of pregnant women, and parity were factors significantly associated with undernutrition.

The prevalence of undernutrition found in this study was lower than the cross-sectional study conducted in the Sidama zone of southern Ethiopia which shows that 31.4% [20]; however higher than the two different studies conducted in Gondar town (14.4%) [11] and 16.2% [13]. This difference could be because of the study setup; this study was institution based which might overestimate the true magnitude of the problem compared with a community-based studies. Moreover, the reasons for the observed high magnitude of undernutrition in the current study could be because of their lower educational status, larger family size, and food insecurity.

The prevalence of undernutrition found in this study was still higher than the study conducted in an urban setting Eastern part of Ethiopia (19.8%), [21]; and much higher than a study done at Wondo Genet district, Southern Ethiopia (9.2% [21], that used a MUAC of <21cm,

Table 3. Factors associated with under-nutrition among pregnant women in public health care hospitals of Gedio Zone, SNNPRS, Ethiopia 2019 (n = 235).

Variables		Under-nutrition		COR (95% CI)	AOR (95%CI)
		Yes	No		
Average monthly income	≤800	28 (56%)	29 (15.6%)	6.75 (2–9.54)	2.89 (1.49–5.6)***
	8001–1500	6 (12%)	44 (23.7%)	0.9 (0.08–3.42)	0.2 (0.04–3.2)
	>1500	16 (32%)	112 (60.5%)	1	1
Educational status of Mother	Unable to read	41 (82%)	40 (21.6%)	17 (4.8–23.19)	4 .2 (2.34–7.86)*
	Only reading	5 (10%)	45 (24%)	1.9 (1.2–6.1)	0.54 (0.07–3.29)
	Elementary	2(4%) 2(4%)	66 (35.6%)	0.5 (0.08–2.04)	0.2 (0.09–2.47)
	2ry and above		34 (18.4%)	1	1
Family size	≤6	34 (68%)	162 (87.5%)	1	1
	>6	16 (32%)	23 (12.5%)	3.3 (1.65–7.24)	2.5 (-3.91)***
NEC	No	47 (94%)	115 (62%)	9.5 (11.35–14)	3.23 (1.6–15) ***
	Yes	3 (6%)	70 (38%)	1	1
Health condition	Well	13 (26%)	123 (66.4%)	1	1
	Diseased	37 (74%)	62 (33.6%)	5.6 (2.07–9.4)	2.19 (1.78–5.84)**
Parity	Primiparous 2–4 children	10 (20%)	129 (70%)	1	1
	Multiple ≥5	16 (32%)	32 (17%)	6.45 (3.2–11.66)	1.7 (1.2–7.49)
		24 (48%)	24 (13%)	12.9 (2.14–10.01)	5 (1.56–9.67)**

* Significant at P = <0.05, * * Significant at P = ≤ 0.002, * ** Significant at P = < 0.001.

while we used a MUAC of <22cm, which would understate the prevalence of undernutrition. A higher risk of undernutrition was observed among women who did not receive nutrition education and counseling such results underline the significance of nutritional counseling and adequate feeding practice as valuable interventions; and this study finding is in line with a study finding from eastern Ethiopia [18]. Pregnant women are advised to change their eating habits during pregnancy to meet the improved nutritional demand.

The educational status of pregnant mothers was discovered to be a significant indicator of their nutritional status; this result is consistent with a comparative report on maternal malnutrition in ten Sub-Saharan African countries [22], as well as a study done in southern Ethiopia [23], which showed that the higher educational status the lower the number of undernourished women. Similarly, a study done in Philippines [24], and shown that an increase in maternal education to a lower incidence of malnutrition among young children. Education is a valuable resource that enables women to provide adequate care for their children, which is a critical factor in their growth and development [25, 26, 27, 28, 29].

We found that having a lower monthly income increased the risk of undernutrition. According to demographic health surveys/DHS conducted in developing countries, women from low-income households were consistently affected by malnutrition [22] and the this idea is supported by a study done in Southern Nations Nationalities and Peoples Region of Ethiopia [23]. This is due to the economic status being a key determinant of child and maternal nutritional status, as it affects access to food, use of health care, availability of improved water supplies and sanitation facilities.

A higher risk of undernutrition was observed among women who were Multiparous compared with primiparous; this is consistent with the maternal depletion syndrome hypothesis which showed that mothers with a short birth-to-pregnancy interval do not have adequate time to replenish macro-and micro-nutrients [30]. Similarly, a study in Nigeria showed a higher risk of undernutrition among women who conceived 23 months after a previous birth [31].

5. Conclusion

The magnitude of undernutrition in pregnant mothers in this study area was found to be higher than in the previous findings; nearly one of every five pregnant was undernourished. Average household monthly income, family size, mothers' educational status, nutrition education and counseling, current health condition of the mother, and parity were predictors of undernutrition among pregnant mothers. There is a need for multi-sectoral collaboration and coordination between national and international organizations, as well as immediate intervention.

5.1. Recommendation

- Health professionals should give Nutrition education and counseling properly to all pregnant mothers.
- Improving household socioeconomic position through income-generating projects and activities by government and non-governmental organizations
- Proper follow-up and early treatment of disease during pregnancy by health professionals.
- Family planning education and promotion should be enhanced.

5.2. Limitation of this study

The nature of this study being an institutional-based cross-sectional study might affect the establishment of a causal relationship between the outcome variable and risk factors. This study is failed to incorporate BMI as the risk factor of undernutrition which might also introduce a residual confounding problem. The paper is part of follow up study and weight was taken to know maternal weight gain. Height was also taken to compare BMI and MUAC for other study. The questioner included weight and height for these reasons.

Declarations

Author contribution statement

Adane Tesfaye, Gizaw Sisay: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data; Wrote the paper.

Robel Hussen Kabthymer: Contributed reagents, materials, analysis tools or data.

Tizalegn Tesfaye: Performed the experiments; Analyzed and interpreted the data.

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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