

Magnitude and Associated Factors of Under Nutrition among Pregnant Women in Malga District, Southern Ethiopia

Amelo Bolka Gujo

Department of Social and Population Health, Yirgalem Hospital Medical College,

Yirgalem, Ethiopia

Corresponding e-mail: amelobolka@gmail.com, Mobile no: +251916052205

Abstract

Background: Maternal nutrition remained a public health problem and a major cause of maternal and under-five children morbidity and mortality in Ethiopia but literature is scarce in the country. The aim of this study was to determine the magnitude and associated factors of undernutrition among pregnant women attending antenatal care in Malga District, Sidama Zone, Southern Ethiopia.

Methods: Facility-based cross-sectional study was conducted in Malga District from 1 January to 30 March 2018. Pregnant women (n=361) were randomly drawn from four health centers using antenatal care (ANC) follow-up. Trained data collectors administered the questionnaire. Nutritional status of the women was assessed by the mid-upper arm circumference (MUAC) taken on the non-dominant upper limb. Capillary blood was collected and analyzed for hemoglobin using the Hb301 instrument and adjusted for altitude. A multivariate logistic regression analysis was employed to identify factors associated with undernutrition. Adjusted

odds ratio (AOR) with corresponding 95% confidence interval (CI) was computed to show the strength of association and a P-value of < 0.05 was used to declare statistical significance.

Results: The prevalence of undernutrition among pregnant women was 26% [95% CI 20.5, 30.5]. Hemoglobin level $< 11\text{g/dl}$ was identified in 27.1% (95% CI: 22.6, 31.6) of respondents. The result of multivariable analysis revealed that the odds of undernutrition were higher among pregnant women with low income (AOR = 4.9, 95% CI: 2.04, 11.98), not knew antenatal care (ANC) visit importance (AOR = 5.3, 95% CI: 2.33, 12.1), birth interval < 2 years (AOR = 3.5, 95% CI: 1.54, 7.91), not counseled about nutrition during ANC visit (AOR = 3.2, 95% CI: 1.16, 8.67) and anemic (AOR = 8.2, 95% CI: 3.6, 18.65).

Conclusion: Strengthening income-generating activities, family planning services, counseling on ANC importance and nutrition and diet diversity may help to reduce the burden of undernutrition in pregnant women.

Keywords: Pregnancy, Undernutrition, Anemia, Antenatal Care, Malga District, Ethiopia

Corresponding author: amelobolka@gmail.com (Mr. Amelo Bolka Gujo)

1. Introduction

Nutrition is a fundamental pillar of human life. Globally, malnutrition is an important health concern predominantly in under-five children and pregnant women(1). During pregnancy, a woman needs a healthy and balanced diet for herself and a growing fetus in her womb(2). Therefore, the mother is the source of all nutrients that allow the regular development and growth of the fetus until birth (3).

The prevalence of low body mass index in adult women remained higher than 10% in Africa and Asia(4). Ethiopia is one of the Sub-Saharan Africa countries with a high burden of maternal and child under nutrition(5). Ethiopia demographic and health survey presented 22% chronic undernutrition in reproductive age women and 29.1% prevalence of anemia in pregnant women. Despite improvements in several health and development indicators in recent years, maternal under nutrition still remains a major public health problem in Ethiopia(6).

Undernutrition nutrition in pregnancy is a common cause of maternal mortality and morbidity (7). It is responsible for 45% under five children deaths (more than 3 million deaths each year) (8). Another outcomes associated with under nutrition during pregnancy include increased risk of low birth weight, preterm birth, micronutrient deficiencies, low nutrient stores in infants, fetal growth restriction, per-natal mortality, child stunting and later adulthood chronic diseases (4, 9-12).

Poor maternal nutrition is serious problem but limited researches have been done to assess magnitude and its association with maternal undernutrition in study area but information on maternal nutritional status and determining factors are needed for governmental and nongovernmental organization in policy development and implementation of programs focused on improving maternal nutrition. Therefore, this study was conducted to fill information gap regarding the magnitude and associated factors of undernutrition among pregnant women.

2. Methodology

2.1. Study design

A facility based cross-sectional study among antenatal care attendant pregnant mothers was held on 1 January to 30 March 2018 in four government health centers of Malga district, Southern Ethiopia.

2.2. Study setting

Malga district is located 299 km south to Addis Ababa, the capital of Ethiopia. It's one of the 30 rural districts and six reform town administrations found in the Sidama Zone, Southern Ethiopia. The district lies about 2400 meters above sea level. The total populations residing in the district were estimated about 142, 573 of which 32,792 childbearing age and 5,560 pregnant women. The study populations were all pregnant women in the district and surrounding area who attend ANC at the government health centers of the district.

2.3. Sample size

A sample size of 365 was computed using a single population proportion formula with following assumptions; 95% confidence level, 5% margin of error, 35.5% expected prevalence of undernutrition among pregnant women (13) and 10% non-response rate.

2.4. Sampling technique

Systematic random sampling method was employed to identify study participants. To allocate the study subjects in the health centers proportionally, first, the average number of pregnant women visited ANC daily three months prior to data collection period was obtained by referring clients' registration book/record. Then, the total sample size was allocated to the health centers proportional to their ANC client flow rate.

2.5. Data collection

Well, a structured, pre-tested and interviewer-administered questionnaire was used to collect data. The questionnaire was prepared in the English language and translated into the local language (Sidamigna) for data collection. The questionnaire was adapted and modified from demographic and health survey (DHS) (6), Food and Agriculture Organization (FAO) guideline for measuring household and individual dietary diversity (14) and previously published studies for the purpose of standardization. Four midwifery nurses and four laboratory technicians for data collection and two BSc public health officers for supervision were recruited.

Mid-upper arm circumference (MUAC) measured at the midpoint between the tip of the shoulder and the elbow after left-arm bent at 90⁰ to the body using flexible but not stretchable measuring tape. The measurement was taken twice and the average value was used for data analysis

Hemoglobin concentration was measured by taking a finger-prick capillary blood sample of each pregnant woman using HemoCue 201. A prick was made on the middle finger of the left hand after the site was cleaned with clean cotton and disinfectant. The first drop of the blood was cleaned off and the second drop was collected to fill the micro cuvette which is then placed in the

cuvette holder of the device for measuring hemoglobin concentration by laboratory technologists.

2.6. Data quality control

Data quality was assured by using properly designed and pretested questionnaire. Data collectors and supervisors were trained for two days before data collection on the objective and significance of the study. The completed questionnaire was checked for consistency and completeness daily by principal investigator until data collection completed and then, the correction was given next morning if any inconsistency and incompleteness observed.

2.7. Data management and analysis

Data were coded and entered into SPSS version 25 statistical package for analysis. Then, frequency distribution and percentages were computed to describe socio-demographic and some other variables and presented by tables and figures.

The individual dietary diversity score was calculated as the sum of food groups consumed over 24 hours. DDS ranged from one to nine. Then, three groups of DDS were computed with the highest group (≥ 6 food groups) defined as diversified diet, while the 4-5 food groups and ≤ 3 food groups were labeled as medium and low respectively

Before analysis hemoglobin was adjusted for altitude according to the 2011 hemoglobin recommendation of the WHO (15). Anemia was defined as hemoglobin level of less than 11.0 g/dl during the first or third trimester or less than 10.5 g/dl during the second trimester(16).

Binary logistic regression was employed to determine the odds ratio for bi-variable analysis. Twelve candidate variables with p -value ≤ 0.25 in the binary logistic regression model were selected for multivariable logistic regression analysis. Those variables significant at p -value less than 0.05 were considered statistically significant.

2.8. Ethical consideration

Ethical clearance was obtained from the Institutional Review Board of College of Medicine and Health Science of Hawassa University (IRB). Verbal consent was obtained from each study participants prior to participation in the study after the nature of the study was fully explained to them. Nutrition counseling was given to all study participants. Undernourished women were referred to the therapeutic feeding center. Iron and folic acid was provided to anemic women.

IJSER

3. Results

3.1. Socio-demographic characteristics of respondent

The response of the rate of study was 98.9%. The mean age of the respondents was 27.87 (± 5.18) years. Two-third, 228 (63.2%) of the participants were within the age range of 21-30 years. The vast majority, 315 (87.3%) were Sidama in ethnicity and 303 (84%) were protestant in religion. Nearly three fourth of respondents, 277 (76.7%) lived in rural area. Concerning education status, 160 (44.3%) of respondents and 129 (35.7%) of their husbands were not attended formal education. Pertaining occupation, 302 (83.7%) of the study participants were housewives while 222 (61.5%) of their husbands were farmers. The median monthly income of the respondents was 1890 Eth birr and nearly half (53.2%) income level was \leq 1900 Eth birr (table 1).

Table 1- Socio-demographic characteristics of respondents in Malga District, 2018

Variable (n =361)	Categories	Frequency	Percent(%)
Age of women	11-20	36	10
	21-30	228	63.1
	31-40	97	26.9
Ethnic group	Sidama	278	77
	Oromo	55	15.2
	Amhara	28	7.8
Religion	Protestant	303	84
	Orthodox	33	9.1
	Muslim	25	6.9
Place of residence	Urban	84	23.3
	Rural	277	76.7
Educational level	No formal education	160	44.3
	Primary level	137	38
	Secondary level and above	64	17.7
Occupation	Housewife	302	83.7
	Merchant	38	10.5
	Government employee	22	5.8

Monthly income	≤1900 Eth birr	192	53.2
	>1900 Eth birr	169	46.8

3.2. Obstetric history of the respondents

The mean gestational age was 28.4 (± 5.75) weeks. Among the total respondents of the study, 235 (65.1%) of pregnancies were planned. About half of the respondents, 189 (52.4%) were in the second trimester of the pregnancy and two-third, 239 (66.2%) of them knew to visit health institutions during pregnancy for ANC was important for their health. Regarding parity, 162 (44.9%) were multipara women and 91 (44.8%) inter-pregnancy birth interval less than two years. More than half of the respondents, 188 (52.9%) did not get nutrition counseling during ANC visit and only 93 (25.8%) supplied with iron and folic acid (table 2).

Table 2- Obstetric history of ANC attendant pregnant women in Malga district, 2018

Variable (n = 361)	Frequency	Percent (%)	
Gestational age	First trimester	2	0.6
	Second trimester	189	52.3
	Third trimester	170	47.1
ANC visit important	Yes	239	66.2
	No	122	33.8
Frequency of ANC visit received	One time	123	34.1
	Two times	132	36.6
	Three times	82	22.7
	Four or more times	24	6.6
Parity	Nullpara	87	24.1
	Primipara	71	19.7
	Multipara	162	44.9
	Grandmultipara	41	11.4
Birth interval	≤2 years	161	44.6
	>2 years	200	55.4
Nutrition counseling	Yes	170	47.1
	No	191	52.9
IFA supplementation	Yes	93	25.8
	No	268	74.2
Health problem	Yes	63	17.5

No	298	82.5
----	-----	------

3.3. Dietary practices and variety of foods consumed by respondents

Kocho (Enset) and maize-based foods were staple diet for 343 (95%) study participants. Two-third, 244 (67.6%) of the pregnant women ate two times per day. More than half of the pregnant women (57.1%) consumed no meat per week whereas twenty seven (7.5%) mothers reported that they did not take milk and milk products per week. Almost all of the pregnant women 343 (95%) ate no fishes per week. Of the total studied pregnant women, 104 (28.8%) did not eat eggs per week; meanwhile, more than half, 205 (56.8%) of the study participants took fruits and vegetables once a week. The mean (standard deviation) dietary diversity score of the previous 24 hours was 4.9 (± 1.5). Only 101 (28%) consumed diversified diet (table 3).

Table 3- Dietary practices of the respondents in Malga district, 2018.

Variable (n = 361)	Frequency	Percent (%)
Staple diet		
Kocho and maize based	343	95
Other	18	5
Frequency of food from legumes, nuts and seed		
None	70	19.4
Once a week	165	45.7
Twice a week	126	34.9
Frequency of food from vegetables and fruits		
Once a week	27	7.5
Twice a week	129	35.7
Three or more times per week	205	56.8
Frequency of food from animal sources		
None	206	57.1
Once a week	107	29.6
Twice a week	49	13.3
Frequency of food from milk and milk products		
None	27	7.5

Once a week	116	32.1
Two or more times per week	218	60.4
Frequency of food from eggs		
None	104	28.8
Once a week	174	48.2
Two or more times a week	83	23
Frequency of food from fish and sea foods		
None	343	95
Once a week	18	5
Dietary diversity score		
Low	101	28
Medium	161	44.6
High (diversified diet)	99	27.4

3.4. Prevalence of under nutrition

Nutritional status was evaluated by MUAC. MUAC measurement less than 22cm (under nutrition) was identified in 94 pregnant women out of 361 with a prevalence of 26% (95% CI: 21.5-30.5%). The MUAC value ranged from 19cm to 27cm with a mean 22.81cm (± 2.08 cm). Hemoglobin was adjusted for altitude. The mean (\pm SD) hemoglobin level was 12.8g/dl (± 2.73 g/dl). Anemia was identified in 27.1% (95% CI: 22.6-31.6) of respondents. The hemoglobin measurement value lied between 7.2-19.8g/dl (fig 1).

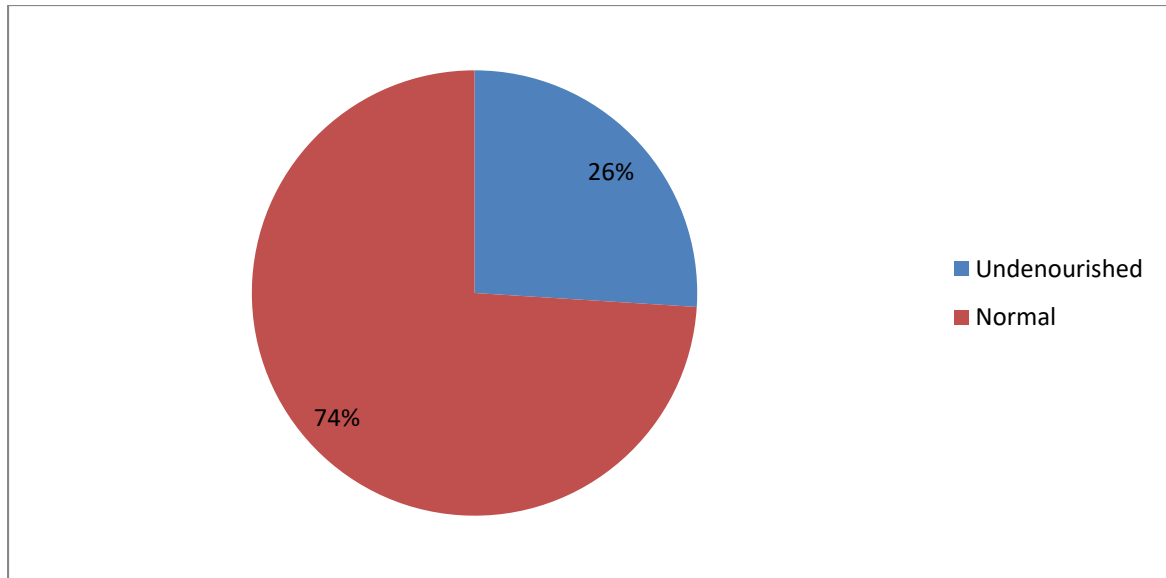


Figure 1- Nutrition status of pregnant women in Malga District, Southern Ethiopia

IJSER

3.5. Factors associated with under nutrition

In bivariate analysis; place of residence, household monthly income, birth interval, family size, pregnancy plan, ANC visit importance, nutrition counseling purchasing power, toilet availability, and anemia status were found with a p-value less than 0.25. Multivariate analysis showed that household monthly income, birth interval, ANC visit importance, nutrition counseling and anemia status were significantly and independently associated with undernutrition.

The odds of under nutrition were higher among pregnant women with low monthly income (AOR = 4.9, 95% CI: 2.04, 11.98), not knew ANC visit importance (AOR = 5.3, 95% CI: 2.33, 12.1) and birth interval less than 2 years (AOR = 3.5, 95% CI: 1.54, 7.91). Increased odds of undernutrition were also observed among pregnant women not counseled about nutrition during ANC visit (AOR = 3.2, 95% CI: 1.16, 8.67) and anemic (AOR = 8.2, 95% CI: 3.6, 18.65) (tab 4).

IJSER

Table 4- Predictors of under nutrition in the binary and multiple logistic regression models among pregnant women in Malga district, Sidama Zone SNNPR, 2018

Variable (n =361)		Under nutrition		COR	AOR
		Yes	No		
Place of residence	Urban	8	76	1	1
	Rural	86	191	4.3(1.98-9.25)	2.13(0.70-6.44)
Income level	≤1900 ETH Birr	78	114	6.5(3.63-11.8)	4.9(2.04-11.98)*
	>1900 ETH Birr	16	153	1	1
Pregnancy planning	Planned	30	205	1	1
	Unplanned	64	62	7.05(4.2-11.84)	2.6(0.91-6.26)
Birth interval	≤ 2years	58	103	2.56(1.58-4.16)	3.5(1.54-7.91)*
	>2years	36	164	1	1
Family size	≤ 4 members	25	148	1	1
	>4 members	69	119	3.4(2.05-5.76)	1.5(0.66-3.35)
Know ANC importance	Yes	17	222	1	1
	No	77	45	22.34(12.1-41.3)	5.3(2.33-12.08)*
Nutritional counseling	Yes	9	161	1	1
	No	85	106	14.3(6.9-29.75)	3.2(1.16-8.67)*
Supplied iron	Yes	18	75	1	1
	No	76	192	1.65(0.92-2.94)	1.56(0.54-4.5)
Toilet available	Yes	82	256	3.4(1.45-8.01)	3.35(0.7115.73)
	No	12	11	1	1
Anemia	Yes	63	35	13.5(7.71-23.53)	8.2(3.6-18.65)*
	No	31	232	1	1
Health problem	Yes	24	39	2.0(1.13-3.56)	1.7(0.62-4.6)
	No	70	228	1	1
Purchasing power	Women	16	184	1	1
	Men	78	83	10.81(5.95-19.6)	1.8(0.75-4.34)

4. Discussion

This study assessed the magnitude and associated factors of undernutrition among pregnant women attending antenatal care in governmental health institutions and came up with the public health significance of undernutrition in the study area. The result of the study showed that 26% of pregnant women were undernourished. Previous studies determined the prevalence of undernutrition in pregnant women lower, 14.4% (17) and 16.2% (18) than the present study. In contradiction to this, higher prevalence reported from Central Refit Valley of Ethiopia 31.8% (19) and Dera District (4). These discrepancies could be resulted from geographical, economic, cultural variation of factors and the seasonal differences in data collection.

Previous studies witnessed consistent findings with the present study, 23.2% (20) and 24.6% (21) regarding the public health significance of undernutrition in pregnant women. The result of the present study was also consistent with the demographic and health survey finding (DHS) 2016 of Ethiopia (6). The prevalence of undernutrition among pregnant in the country is decreasing as compared to earlier studies (6). The possible reasons for this might be the improvement of intervention programs on nutrition, improvement in maternal health care and women empowering programs by the government and non-governmental organizations in the country.

The result also showed that as compared with pregnant women with high-income levels, the odds of undernutrition were higher among pregnant women with low-income level. A comparable result was reported from Southern Ethiopia (21). The possible explanation could be the income status was as an indicator of access to adequate food supplies where household with low income affects the household's food purchasing power in kind and amount resulting in household food

insecurity. Consequently, people living in poor households are found with impaired dietary intake and high risk of nutritional deficiencies.

Knowledge about ANC visits showed a significant association with undernutrition in pregnant women. Undernutrition was 5.3 times higher among women who did not know the importance of ANC visit during pregnancy. A similar result was reported from West Arsi Zone (22) and India (23). This might be because those who frequently visit the health institutions were getting health and nutrition educations as well as advice from the health professionals.

This study revealed nutrition counseling was associated with undernutrition during pregnancy. Compared to counseled women, becoming undernourished was 3.2 times higher among mothers with no nutrition counseling during antenatal care visit. Findings in line with the present result was reported from Jimma Zone (24) and Bangladesh (25). This could imply prenatal dietary advice is one of the key interventions that all health institutions should do integrating it with other services given to pregnant women at antenatal care clinic.

In the current study, birth interval was found to be one of the determinant factors of undernutrition. Pregnant with birth interval less than two years showed increased risk of becoming undernourished compared to their counterparts. Consistent findings was reported from Gondar (18) and Southern Ethiopia (26, 27). Here it might be possible to suggest that as birth interval decreases, the women might be exposed to recurrent blood loss during delivery, depletion of nutrient storage and there might be food share among family members (28).

The present study finding witnessed a significant positive association between anemia and undernutrition. Compared with normal hemoglobin level, the odds of undernutrition were significantly increased among anemic pregnant women. Comparable report was presented from

Ethiopia (13, 19, 29, 30), Kenya (31) and India (32). This can be explained by the fact that undernourished pregnant women have a higher probability of being deficient of micronutrients and therefore more likely to develop anemia. Pregnancy is the most nutritionally demanding period in a woman's life.

5. Conclusion

The results of present study confirmed that the undernutrition among pregnant women is a public health problem in Malga District. The determinant factors of undernutrition are the respondent's income level, knowledge about ANC visit, birth interval, nutrition counseling during ANC visit and anemia. Pregnant women of low monthly income level, not know importance of ANC visit, low birth interval (< 2 years) and anemic were found more likely to be undernourished. Thus, it was recommended that the responsible bodies should work on strengthening income generating and women empowering programs, family planning services, counseling about ANC and nutrition.

6. Acknowledgments

We are grateful to the Hawassa University and Wondo Genet District Health Unit for funding the study. We also like to sincerely acknowledge the managers of the health office, head of health centers, study participants and the data collectors.

7. Abbreviations

ANC: Antenatal Care; AOR: Adjusted Odds Ratio; CI: Confidence Intervals; COR: Crude Odds Ratio; EDHS: Ethiopia Demographic and Health Survey; FAO: Food and Agriculture

Organization; MUAC: Mid-upper arm circumference; OR: Odds Ratio; SD: Standard Deviation;
WHO: World Health Organization

8. Funding

The financial support for this study came from Hawassa University and Wonedo Genet Town Health Unit, Ethiopia. Both of the funding bodies did not involve in the collection, analysis, and interpretation of data and in writing of the manuscript.

IJSER

9. References

1. Desyibelew HD, Dadi AF. Burden and determinants of malnutrition among pregnant women in Africa: A systematic review and meta-analysis. *Burden and determinants of malnutrition among pregnant women in Africa: A systematic review and meta-analysis: Plos One*; 2019. 1-19.
2. WHO. Nutrition of women in the preconception period, during pregnancy and the breastfeeding period. Report by the Secretariat. Executive Board 130th Session Provisional Agenda Item 6.3.: WHO; 2011.
3. Castrogiovanni P, Imbesi R. The Role of Malnutrition during Pregnancy and Its Effects on Brain and Skeletal Muscle Postnatal Development: *Journal of Functional Morphology and Kinesiology*; 2017.
4. Black RE, Victora CG, Walker SP, Bhutta ZA, Christian P, Onis Md, et al. Maternal and Child Nutrition Study Group. *The Lancet Series* 2013.
5. WHO. Nutrition in the WHO African Region. Brazzaville: World Health Organization; 2017. Licence: CC BY-NC-SA 3.0 IGO 2017.
6. Agency CS. Demographic and Health Survey of Ethiopia: Central Statistical Agency Addis Ababa, Ethiopia. The DHS Program ICF Rockville, Maryland, USA 2016. p.
7. Serbesa ML, Iffa MT, Geleto M. Factors associated with malnutrition among pregnant women and lactating mothers in Miesso Health Center, Ethiopia: *European Journal of Midwifery*; 2019.
8. WHO. Comprehensive implementation plan on maternal, infant and young child nutrition. World Health Organization. http://www.who.int/nutrition/publications/CIP_document/en2014.
9. Morrison JL, Regnault TRH. Nutrition in Pregnancy: Optimising Maternal Diet and Fetal Adaptations to Altered Nutrient Supply. MDPI, Basel, Switzerland 2016.
10. Chen X, Zhao D, Mao X, Xia Y, Baker PN, Zhang H. Maternal Dietary Patterns and Pregnancy Outcome. MDPI, Basel, Switzerland. (CC-BY) license (<http://creativecommons.org/licenses/by/4.0/>). 2016.
11. Abu-Saad K, Fraser D. Maternal Nutrition and Birth Outcomes. *Epidemiologic Reviews* Oxford University Press 2010.
12. Black RE, Allen LH, Bhutta ZA, Caulfield LE, Onis Md, Ezzati M, et al. Maternal and child undernutrition: global and regional exposures and health consequences, Maternal and Child Undernutrition Study Group. *Lancet Series* 2008. p.

13. Derso T, Abera Z, Tariku A. Magnitude and associated factors of anemia among pregnant women in Dera District: a cross-sectional study in northwest Ethiopia: BMC Research Note; 2017.
14. Kennedy G, Ballard T, Dop M. Guidelines for measuring household and individual dietary diversity. Nutrition and Consumer Protection Division, Food and Agriculture Organization of the United Nations: FAO; 2013.
15. WHO. Haemoglobin concentrations for the diagnosis of anaemia and assessment of severity. Vitamin and Mineral Nutrition Information System. Geneva, World Health Organization, 2011 (WHO/NMH/NHD/MNM/11.1) (<http://www.who.int/vmnis/indicators/haemoglobin>). 2011.
16. WHO. The global prevalence of anaemia in 2011. Geneva: World Health Organization 2015.
17. Dadi AF, Desyibelew HD. Undernutrition and its associated factors among pregnant mothers in Gondar town, Northwest Ethiopia: PLoS ONE; 2019.
18. Kumera G, Gedle D, Alebel A, Feyera F, Eshetie S. Undernutrition and its association with socio-demographic, anemia and intestinal parasitic infection among pregnant women attending antenatal care at the University of Gondar Hospital, Northwest Ethiopia Maternal Health, Neonatology, and Perinatology; 2018.
19. Mariyam AF, Dibaba B. Epidemiology of Malnutrition among Pregnant Women and Associated Factors in Central Refit Valley of Ethiopia, : Journal of Nutritional Disorders & Therapy; 2018.
20. Endalifer ML, Tewabe M, Adar AD, Demeke HT, Hagos NM, Dagne S. Undernutrition and associated factors among pregnant women attending ANC follow up in Alamata general hospital, Northern Region, Ethiopia: Journal of Nutritional Health & Food Engineering; 2019.
21. Gizahewu A, Billoro BB, Yousfan MA. Under Nutrition and Associated Factors among Pregnant Women at ANC Clinic, Nigist Eleni Mohammad Memorial General Hospital, Hossana, Southern Ethiopia: Food & Nutrition: Current Research 2019.
22. Y B, B N, M F. Under Nutrition and Associated Factors among Adolescent Pregnant Women in Shashemenne District, West Arsi Zone, Ethiopia: Journal of Nutrition & Food Sciences; 2016.
23. Rathod MS, Borde AN, Patil SP, Bawa MS, Gosavi S, Pagar V, et al. Undernutrition and its association with socio-demographic factors among pregnant women attending tertiary health care

hospital in northern Maharashtra: a cross sectional study: International Journal of Community Medicine and Public Health 2019.

24. Shiferaw A, Husein G. Acute Under Nutrition and Associated Factors among Pregnant Women in Gumay District, Jimma Zone, South West Ethiopia Journal of Women's Health Care; 2019.
25. Nguyen PH, Sanghvi T, Kim SS, Tran LM, Afsana K, Mahmud Z, et al. Factors influencing maternal nutrition practices in a large scale maternal, newborn and child health program in Bangladesh: PLoS ONE 2017.
26. Kuche D, Singh P, Moges D, Belachew T. Nutritional Status and Associated Factors among Pregnant Women in Wondo Genet District, Southern Ethiopia Journal of Food Science and Engineering 2015.
27. Getahun W, Belachew T, Wolide AD. Burden and associated factors of anemia among pregnant women attending antenatal care in southern Ethiopia: cross sectional study BMC Research Notes; 2017.
28. WHO. Report of a WHO Technical Consultation on Birth Spacing. Department of Reproductive Health and Research. Geneva, Switzerland WHO; 2005.
29. Alene KA, Dohe AM. Prevalence of Anemia and Associated Factors among Pregnant Women in an Urban Area of Eastern Ethiopia: Hindawi Publishing Corporation 2014.
30. Bereka SG, Gudeta AN, Reta MA, Ayana LA. Prevalence and Associated Risk Factors of Anemia among Pregnant Women in Rural Part of JigJiga City, Eastern Ethiopia: A Cross Sectional Study Journal of Pregnancy and Child Health; 2017. p.
31. Okube OT, Mirie W, Odhiambo E, Sabina W, Habtu M. Prevalence and Factors Associated with Anaemia among Pregnant Women Attending Antenatal Clinic in the Second and Third Trimesters at Pumwani Maternity Hospital, Kenya Open Journal of Obstetrics and Gynecology 2016.
32. Mondal B, Tripathy V, Gupta R. Risk factors of Anaemia During Pregnancy Among the Garo of Meghalaya, India: Journal of Human Ecology; 2006.