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THE MAGNITUDE OF ANAEMIA AND THE ASSOCIATION OF NUTRITIONAL STATUS AND DIETARY INTAKE AMONG PREGNANT WOMEN IN SOUTHEAST OF OROMIA REGION, ETHIOPIA: A COMMUNITY BASED CROSS-SECTIONAL STUDY

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ABSTRACT

Objective: This study aimed to determine the magnitude of anaemia and the association of nutritional status and dietary intake among pregnant women in Southeast of Oromia region, Ethiopia: **Methods:** Community based cross-sectional study was conducted. Sample size was determined using Gpower computer software. Multistage sampling method was used to select districts, households and 825 pregnant women. Blood samples were taken by using Microcuvettes and analyzed with HemoCue Hb 301®Analyzer. Maternal nutrition status, dietary sources and meal frequency and iron/folic supplementation were assessed using questionnaires and measurements. Data were entered with EpiData 3.0 version and analyzed by SPPS version 20. **Results**: Eight hundred eight study participants were involved in this study and the rest 17 of them were sick and not included in the study. The prevalence of anaemia among pregnant women was 355(43. 94 %). On multivariate analysis, Mid Upper Aram Circumference ≤21cm had Adjusted Odds Ratio (AOR): 2.9 and Confidence Interval (CI): 2.4-3.2), Illiterate-primary level education (AOR: 4.1, 95%CI: 3.9-5.1), monthly income (AOR: 3.6, 95% CI: 3.1-4.5), not supplied iron/folate (AOR: 8.3, 95%CI: 7.1-12.5) were statistically significant association with anaemia and twice meal frequency among study participants had 4.7 times risk of anaemia compared to those had quadric meal (OR: 4.78 CI: 3.57-6.44). **Conclusions**: High prevalence of anaemia (43.94%) was found among pregnant women in the study area. maternal age malnutrition, illiterate-primary education, income, not supplied iron/folate were risk factors for developing anaemia. Therefore, it is essential to strength the implementation of Essential Nutritional Action and increase accessibility and quality of antenatal care.

KEYWORDS: Anaemia, Pregnant women, Community, Oromia, Southeast, Ethiopia

INTRODUCTION

Anaemia is a major nutritional consequence for human health as well as social and economic development.[1] It is affecting both developing and developed countries with major prevalent among pregnant women.[1] The negative consequences of iron deficiency Anaemia [IDA] are lower physical capacity and increased susceptibility to infections and its severity level increases risk of maternal and child mortality.[2] Almost half of all pregnant women in the world are thought to have anaemia.[3]

Among these risk factors, previous experienced and current malnutrition directly and indirectly take large maternal mortality.[4] Serving food frequency and their sources enhance or inhabit iron absorption from the gut and these can eliminate or exacerbate anemia. Anamia is the most predominant factors for causing maternal mortality especially among pregnant women which accounted up to 28%.[3] This large mortality rate, the extent of its contribution has not been measured because the main reported causes of maternal mortality relays to hemorrhage, obstructed delivery, eclampsia, sepsis, and unsafe abortion [4]. Many women continue to experience protein energy malnutrition (PEM) and micronutrient deficiencies (MND) during their reproductive years, particularly during pregnancy.[4]

Maternal death due to pregnancy can be prevented with daily iron with folic acid tablets provision for enhancing favorable pregnancy outcomes.[2] Family health, including antenatal care (ANC) and Essential Nutritional Action (ENA) have proven to preventive effect of prenatal maternal mortality. Further, when antenatal care provided with quality and adequate services can improve maternal health during pregnancy and birth outcome.[4]
It is difficult to estimate the extent of women's malnutrition and dietary intake behavior during pregnancy in developing countries, because few nationally representative studies have been conducted.

This is compounded by the lack of consensus on the appropriate indicators and reference standards for women health.

Anemia rates (based on haemoglobin concentration) and women's mid upper arm circumference (MUAC) and other health risk assessment methods in wide community can elicit the most important indicators for pregnant women health problem definition in ecologically hazardous areas.

This current study focused to the rural part of the region where clustered for health and communication services. Therefore, this study provided information to specific risk factors and population at risk associated with anaemia to be intervened, initiate researches and programmers to react with the problem using this study finding as foundation.

METHODS

Study area, design and period

Community based cross sectional study was conducted with Multi-stage sampling in wide area of Southeast districts of Oromia Region. Sex (6) districts were selected using simple random sampling from 12 districts found in lowland of Arsi Zone bordered to *Awash River*.

Cluster sampling, method was applied to select the study area. The study area had long time history of prevalent malaria and food insecurity related with drought. Because of these the population was under food aid program.[21] The average altitude of study area was 1680 m and 1690 m and the population size of the study area was 1, 344,520 and pregnant women population was 40, 3355. These information were obtained from projection of the Central Statistical Agency (CSA) 2007 report.[6] The study was conducted from February to June, 2017.

Study population

All pregnant women who resided near to *Awash River* districts were considered as study population.

Sample size estimation

Sample size was calculated by using GPower3.0 computer software of Generic binomial statistical test with the assumptions of 95% confidence level, effect size (0.43) and prevalence of anaemia among pregnant women was 36%[10] and power 0.98. Thus, sample size was calculated to be 825.

Sampling procedure

We used a multi-stage sampling method for selection of sample among districts and *kebeles* (Smallest Administrative Unit) to households. Initially sex districts (Ogolcho, Arata, Dodota, Dera, Chefe Jilla andAwash) were randomly selected and two *kebeles* were selected from each district. Hence, a total of 22 *kebeles* were finally included into the study.

Instruments of data collection

Data were collected by trained data collectors using standardized pre-structured questionnaire with appropriate variables and indicators which met study objectives. A capillary blood samples were taken from the middle finger on the right hand. A laboratory technologist was trained on the procedures and guidelines outlined in the Hb 301 operating manuals (Hemocue Hb; Angelholm, Sweden). Each participant's hand was warmed and relaxed. The finger was cleaned with 70% alcohol and was allowed to dry completely prior to the finger prick. The finger prick was applied on the side of the fingertip.[7] The first two drop of blood was wiped away. Light pressure was applied to the fingertip, and microcuvatte was filled from the 3rd or 4th drop of blood (approximately 10 uL). Then, the filled microcuvatte was put into HemoCue® apparatus using HemoCue® system with Hb 301 Microcuvettes to determine haemoglobin [Hb] level. Subsequently, numerical value was appeared in the apparatus, which signified the quantitative level of hemoglobin.[7] Hemoglobin level was categorized as normal if Hb >11g/dl and anemic if Hb < 11g/dl[22] The magnitude of anaemia categorized in three level.; mild from 10g/dl to10.9g/dl, moderate from 7g/dl to 9.9g/dl and severe <7g/dl.[23] Altitude of the study area was measured to adjust hemoglobin level[8]

Anthropometry measurement was conducted by using MUAC tape and categorized into normal if it had the value > 21cm and malnourished if it had the value ≤21cm Alice M.et al. 2016 [9,24] MUAC was recorded to the nearest 0.1cm. Height and weight were measured by using stand standard height and weight digital scale. Weight measurements tolerance levels have been set for 0.5 kg and classified into low maternal at cutoff weight <45kg. Also maternal height was recorded to the nearest 1.0 cm and categorized into too short if its value < 145 cm.[3]

Quality control measure

The accuracy of data was maintained through training of data collectors. The questionnaire was prepared in English first, and then, it was translated in to *Afan-Oromo* (local language). Questionnaire was pre-tested. Each completed questionnaire was checked by supervisors to ascertain that data were properly collected and filled. Largest acceptable differences between repeated anthropometric measurements tolerance levels had been set for 0.5 kg of weight and 1.0 cm for height. We used MUAC ≤ 21cm by considering the range of MUAC 19.0 cm to 23.0 cm as reference for to determine malnutrition among pregnant women.[9]

Data analysis

Data was entered EpiData 3.0 and analyzed by using IBM SPSS Statistic 20 version. Logistic regression models were used to identify predictors of anaemia

among pregnant women. Odds ratios with 95% of confidence intervals with corresponding p value <0.2 were considered to predict the presence of association between independent variable and anaemia and entered into multiple logistic regression. A P value less than 0.05 was used to declare a statistically significant association.

RESULT

Socio demography

This study included 808 study participants 97.14% and the rest 17 were sick and not included in the study. Majority of 46.30% study were age 20 to 35 years and 37.94 % of the participants were age lees than 20 years. The mean (±SD) age of the respondents was 23.6 (±4.3) years. Among study participants, 77.10% household had average monthly income less than 1000 Ethiopian Birr. The greater part (96.78%) study participants were married and 3.22%without formal marriage had pregnancy. Majority of 74.30 % of respondents were rural dweller and 57.08%participants were illiterate and 28.08% were only able to read /write (Table1).

Water sources, food security and nutritional status

About water sources, 60.15% study participates' households accessible to tap water, 16.95 %protected spring water and 22.90% used river water. Target (food supplementation was intervention used to treat person already had malnutrition) and blanket (intervention was food supplementation to prevent person from becoming malnourished) programs were accessed to 96.12%) of study participants' households but few of study participants' (3.88%) households did not need food aid. Among the study subjects, 60.76% had supplied with iron/folic acid tablets (Table 2).

The mean ±standard deviation [SD] of study subjects' haemoglobin concentration was 11.80 g/dl±1.4. The prevalence of anemia among the study population with haemoglobin level < 11 g/dl was 351 (43.44%, and interims of severity level among anaemic women; mild anaemia (10g/dl-10.9g/dl) was 195 (55.56%), moderate 7g/dl-9.9g/dl) was 139 (39.16%), severe <7g/dl was 16 (1.98%). The prevalence of malnutrition among pregnant women (MUAC ≤ 21cm) was 308 (38.11%) and the mean± SD was 21.3± 2.5cm. The average mean value of height [Ht] of the study participants' was 154± 11cm and the proportion of stunting (Ht<145cm) was 38 (4.7%). Further, 145(17.95 %) of the study participants had weight below 45 kg (Table 2).

Pregnant Women Dietary intake

From different level of serving of food and frequency, above half proportion of study participants 367(45.42%) had maximum of twice meals. No intake of mangoes, papayas, pineapple and fruits was (332(41.10 %). The highest proportion of study participants (572(70.79%) had not consuming meat such as beef, lamb, goat and chicken in meals. Lack butter in serving exposed to anaemia more than 2.5 times compared to pregnant women used in meals (Table-3)

Association of variables

The association of maternal age >35years had more than two times risk of anemia in pregnant women compared to age less than 20years (AOR 2.63, 95% CI: 2.1-3.9). Study participants who were illiterate to primary education had high risk of anaemia (AO: 4.1, CI: 3.9-5.1) compared to those study participants who had higher education. Study participants with average household monthly income less than one thousand Ethiopian Birr (currency) were more than 3 times likely to had anaemia (AOR: 3.6; 95% C: 3.9, 5.1)compared to households who had more or equal to 1000 Ethiopian Birr. Study participants who had family members greater than 6 were 2 times more likely to have anaemia than those study participants who had less than 6 household members.

The association of anaemia with maternal nutritional status also predicts that malnourished pregnant women (MUAC≤ 21cm) had more than 2 times risk of developing anaemia (AOR: 2.14, 95% CI: 2.4-3.2) compared to those pregnant women who had not exposed to malnutrition. The association of no iron supplementation highly increased risk of anaemia compared with those who received (OR: 8.3, CI: 7.1-12.5) (Table4).

The association anaemia was very higher with twice meal frequency among study participants and had 4.7 times risk of anaemia compared to those had quadric meal (OR: 4.78 CI: 3.57- 6.44). Lake of cow milk intake also had risk of anaemia (OR: 2.39, CI: 1.64-3.49). Lack of consumption of ripe mangoes, ripe papayas and pineapple were increased the likelihood of anaemia (OR: 1.46, CI: 1.10-1.93). Further, study participant who did not use egg with meal had anaemia (OR: 2.5, CI: 1.81-3, 34). Study subjects not consuming meat such as beef, lamb, goat and chicken in meals had 1.39 time risk of anaemia than study participants who had (OR:1.39, CI:1.02-1.90). Anaemia was more likely observed among pregnant women who had not consumed butter (OR: 1.77, CI: 1.33-2.37) (Table 3).

Family size, pregnant women education level, household income, and malnutrition were statistically significant as compared to other variables in multiple logistic regression analysis.

Table-1: Socio-demographic characteristics of the respondents in Southeast of Oromia Region, Ethiopia.

Vairables	Indicators	No (%)
Maternal age	<20 years	310(38.37)
	20 -35 tears	375(46.41)
	36 to 49 years	123(15.22)
Religion	Muslim	371(45.82)
	Orthodox	402(49.75)
	Protestant	35(4,33)
Education	Illiterate	452(56.19)
	only Read & Write	233(28.82
	Secondary and above	121(14.98)
Ethnicity	Oromo	565(69.93)
	Amhara	182(22.52)
	Others	61(7.55)
Marital Status	Married	799(96.78)
	Unmarried	26(3.22)
Monthly Income In Ethiopian currency		
	<1000Birr	623(77.10)
	≤1001Birr	185(22.89)
Household Family Size		
	<6members	295(36.5)
	≥6members	513(63.49)
Occupation	Civil servants	47(5.81)
	Traders	39(4.82)
	Informal laborers	135(16.70)
	Housewife	4477(59.03)
	dependant to parent	110(13.61)
Residency	Rural	596(7376)
	Urban	212(26.23)

Table 2: Characteristics pregnant women (n= 808) by food aid, iron/folic supplementation, MUAC, height, weight and anaaemia in Southeast of Oromia Region, Ethiopia.

Variables		**Indicators**	**No (%)**
Water resources		Tap water	486(60.15)
		spring water	137(16.95
		River source	185(22.90)
food Aid supplementation		Accessed	776 (96.03)
		Not required	32(3.96)
Iron/folic acid supplementation		No	317(39.23)
		Yes	491(60.76)
MUAC		MUAC >21cm	500(61.88)
		MUAC ≤ 21cm	308(38.11)
Height		<145cm	38(4.70)
		≥ 145 cm	770(95.29)
Weight		<45kg	145(17.94)
		≥ 45kg	663(82.05)
Anaemia	yes	Haemoglobin < 11 gm/dl	351(43.44)
	No	Haemoglobin ≥ 11 gm/dl	457(56.56)

cm- centimeter, dl- deciliter, gm-gram, kg-kilogram, MUAC- mid upper arm circumference,

Table 3: The association of anaemia with dietary intake as a predictor among pregnant women in Southeast of Oromia Region, Ethiopia.

Variables	Indicators	No (%)	Anaemia		AOR(95%CI)
			Yes(n=355)	No(n=470)	
Usual frequency of meals					
	Twice	367(45.42)	233(28,84)	134(16.58)	4.78(3.57-6.44)*
	Thrice	389(48.14)	122(15.10)	268(33.17)	1.51(1.10-2.31)*
	Quadric	51(6.31)	0	51(6.31)	1
Did drink cow milk?					
	No	645(79.82)	294(36.39)	351(43.44)	2.39(1.64-3.49)*
	Yes	163(20.17)	44(5.45)	119(14.73)	1
Bread, porridge, rice, noodles, foods made from grains					
	No	290(35.89)	103(12.75)	187(23.14)	0.61(0.46-0.83)
	Yes	518(64.11)	252(31.19)	266(32.92)	1
White potatoes, white yams, manioc, cassava, carrots, squash or any from roots?					
	No	669(82.80)	287(35.51)	382(47.27)	0.75(0.52-1.08)
	Yes	139(17.20)	68(8.41)	71(8.81)	1
Ripe mangoes, ripe papayas, Pineapple that are yellow or orange fruits					
	No	332(41.10)	169(20.92)	163(20.17)	1.46(1.10-1.93)*
	Yes	476(58.91)	186(23.02)	290(35.89)	1
Any meat such as beef, lamb, goat, chicken					
	No	572(70.79)	267(30.04)	305(37.75)	1.39(1.02-1.90)
	Yes	236(28.60)	88(10.89)	148(18.32)	1
Fresh or dried fish, shellfish, or seafood?					
	No	751(92.94)	332(41.09)	419(51.86)	1.12(0.65-1.94)
	Yes	57(7.05)	23(2.85)	34(4.21)	1
Eggs	No	453(56.06)	229(28.34)	223(27.59)	2.50(1.81-3,34)*
	Yes	356(43.15)	109(13.49)	247(30.57)	1
Cheese, yogurt, or other milk products					
	No	635(78.59)	257(31,81)	378(46.78)	0.49(0.36-0.69)
	Yes	173(21.41)	98(12.13)	75(9.28)	1
Butter	No	484(59.90)	249(30.82)	235(29.08)	1.77(1.33-2.37)*
	Yes	324(40.10)	89(11.02)	235(29.08)	1

AOR- adjusted odds ratio; CI- confidence interval therefore

Table 4: Bivariate and multivariable logistic regression models predicting the possibility of anaemia among pregnant women in Southeast of Oromia Region, Ethiopia.

Variables	Anaemia		COR (95%CI)	AOR (95%CI)
	Yes (Hg <11gm/dl)	No (Hg ≥11gm/dl)		
Maternal Age in year	**n (%)**		**n (%)**	
<20	102(12.36)	211(26.12)	1	1
20-35	196(24.25)	179(22.15)	1.8(0.39-2.79)	1.96(1.4-2.8)*
>35	87(10.76)	36(4.36)	2.3(2.01-3.45)	2.63(2.1-3.9)*
Education				
Secondary & above(higher)	2(0.24)	119 (14.73)	1	1
Illiterate, read/write, primary	344(42.58)	343(42.45)	3.5(3.2-4.86)	4.1(3.9-5.1)*
Estimated average household monthly income birr				
≥1001	22(2.72)	163 (20.18)		
≤1000	453(56.06)	170(21.04)	3.8(2.49-4.1)	3.6(3.1-4.5)*
Family Size (household members)				
PW with family members <6	156(19.30)	179(22.14)	1	1
PW with family members ≥6	190(23.51)	284(35.14)	1.23(0.98-1.9)	1.14(0.9-1.8)
Nutritional status of pregnant women				
MUAC >21cm	189(22.91)	334(40.48)	1	1
MUAC≤21cm	166(20.54)	136(16.83)	1.7(1.35- 3.7)	2.9 (2.4-3.2)*
Weight in kilogram				
Wt ≥ 45kg	299(37.00)	364(45.04)	1	1

Wt<45kg	48(5.94)	97(12.00)	0.56(0.5- 1.2)	0.19(0.1- 0.5)
Iron/folate supplementation of during pregnancy				
Yes	117(14.48)	378(46.78)	1	1
No	230(28.47)	83(10.27)	1.8(1.02-8.15)	8.3(7.1-12.5)*

cm- centimeter, Hg- haemoglobin, dl- deciliter, gm-gram, COR- crude odds ratio; AOR- adjusted odds ratio; CI- confidence interval, MUAC- mid upper arm circumference, pw- women wt-weight.
Adjusted*: for maternal age, , status of education, household monthly income ,women weight, nutritional status of pregnant women, Iron/folate supplementation and family size.

DISCUSSION

This study illustrated with the intention of the prevalence of anaemia among pregnant women was 43.03%. The present study finding is much higher than the national prevalence of anemia among pregnant women is 22%.[5] This finding was also much higher than in both facility based study findings found to be 19.7% in Mekelle town and 36.1% in Northern Ethiopia.[11] This study finding might be highbred due to the inclusion of wide rural dwellers community but facilities based focused pregnant women who had ANC awareness and included urban that were accessed to the service while excluded the rural community. This study clustered towards history of high prevalence of malaria areas located along with Awash River ecology has lesser anaemia prevalence than the study conducted in Eastern Ethiopia shows the prevalence of anaemia is 56.8%.[16]

In this study finding age ≤35 has less risk to develop anaemia but pregnant women who were age >35 years had more than 2 times risk of developing anemia. This finding is consistent with study conducted in Turkey which has shown that maternal age >35 years has significant association with anaemia.[19] Illiterate and primary was the second socio demographic factor which highly associated with anaemia. This study finding has resemblance with health facility based study finding in Turkey which reviled that pregnant women those were illiterate has significant association with anaemia.[19] Further, a significance factor which increased risk of anaemia among pregnant women was household income. Average monthly income of 87.8 % household was less than 1000Eth.Birr (Ethiopian currency) which was equals to the national poverty line (US$1.25 PPP a day*28).[18] Thus, higher proportion of study participants lived below the national poverty line compared to the national proportion of population (31%) below the poverty.[18] This finding predicts that most study participants were living under poverty due to prolonged effect of drought and poor ecological status in the districts. This study described the fact that pregnant women living in low-income countries are often unable to meet the micronutrient demands due to a chronically poor diet and accesses to animal source food limited by their expense cost.

Malnutrition (MUAC<21c.m) was found factor to increase the risk of developing anemia. This study has shown that MUAC≥21c.m had lesser risk of developing anaemia among pregnant women. This study finding was higher than studies done in Boricha District in Ethiopia which is 35.5% and in rural community of Eastern part of Ethiopia 9.1%[14, 15] This finding was consistent with community based study conducted in Bangladesh 59%.[13]

The risk of developing anaemia was increased among pregnant woman who did not receive iron/folate supplementation during their pregnancy period compared to those received. This finding is lesser than from studies finding of Eastern Ethiopia and Northern Ethiopia which designate that lacked to supply iron/folic during pregnancy is the highest significant factors for developing anemia during pregnancy.[16,17] Intensity of absent from taking iron/folic supplementation during pregnancy is the most significant risk factor for developing anaemia.[2] The odds of pregnant women having meal twice a day had more than 4.7 times risk anaemia compared to those pregnant women who had meal quadric times. In this study dietary sources especially animal source foods intake among study participants was very less and 70.79% pregnant women did not consumed any of these sources. As a result, most of study participants did not meet the requirement of iron during their pregnancy. Naila Baig-Ansari, et al., finding shows that 74.0% of pregnant women who had anaemia did not consumed red meat and 75.5 % and chicken during their pregnancy time.[25] In current study, 56.06% study participants those did not consume egg had more than 2.5 times risk of anaemia compared to pregnant women who had. A study conducted by Nivedita K et al found that most pregnant women who had not consumed egg (58.87%) and 57.02 % did not consume milk during their pregnancy increase likelihood of anaemia.[26] This studies findings have constantly similar with these study finding, this might be due to due to the nature of study settings and characteristics of study population. Dietary intake at any population could not meet the need iron for risk population. So, Iron/folate supplementation is the major approach to balance iron intake and need.[8]

CONCLUSIONS

High prevalence of anaemia was found among pregnant women in the study area. Primary maternal age, illiterate to primary education and less household income, not supplied with iron/folate during pregnancy were risk factors for developing anaemia. Therefore, it is essential to strengthen the implementation of Essential Nutritional Action as routine services and increase accessibility and quality of antenatal care services. Finally, fundamental transformation is important for ecologically affected districts which require long and short duration of

intervention with different problem solving programs for sustainable change.

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Author Contribution
Ferede A. The conception of the design of the research project, data collection, data entry, analysis, preparation and write up manuscript and appraisal. RA: participated in the designing, analysis, preparation and appraisal of the manuscript. All authors read and approved the final manuscript for publication.

Abbreviation
ANC - Ante Natal Care, AOR-Adjusted Odds Ratio, COR - Crude Odds Ratio, CSA - Central Statistical Agency, EDHS - Ethiopian Demographic Health Survey, ENA-Essential Nutritional Action, Eth.Birr-Ethiopian currency, FGAE - Family Guidance Association of Ethiopia, Hb - Hemoglobin, Ht - Height, HIV - Human Immunodeficiency Virus, ITNs - Insecticide Treated bed Nets, MUAC - Mid Upper Arm Circumference, PPP-Purchasing Power Parity, Wt - Weight, PMTCT-Prevention Mother-to-Child HIV Transmission, WHO - World Health Organization.

Ethical Approval
This research was approved by Ethical Review Committee of Arsi University. Letter of permission was obtained from counties of *Arsi* and *East Showa* administrative and health department offices. At the end, we obtained permission from 12 *Kebeles* (Smallest Administrative Units which were site for data collection) administrations offices. In addition, all of the study participants including teenagers were informed about the purpose of the study and finally their oral consent was obtained before interview and ensured during each activity of data collection. The respondents were notified that they have the right to refuse or terminate at any point of the interview. The information provided by each respondent was kept confidential.

REFERENCES
1. World Health Organization (2008) worldwide prevalence of anaemia1993–2005: Available www.who.int/vmnis.
2. World Health Organization (2012) Guideline. Daily iron and folic acid supplementation in pregnant women Geneva, Switzerland: http://www. who.int/nutrition/
3. World Health Organization (2012) Nutrition of women in the preconception period, during pregnancy and the breastfeeding period: Sixty-fifth world health assembly A65/12 Provisional agenda item 13.3.
4. Jose O Mora and Penelope S Nestel Improving prenatal nutrition in developing countries: strategies, prospects, and challenges: American Society for Clinical Nutrition. Am J Clin Nutr., 2000; 71: 1353S–63S
5. Ethiopian Central Statistical Agency demographic health survey (2012) EDHS Addis Ababa, Ethiopia: Document/CSA/2: Available http://www. measure edhs.com.
6. Ethiopian Central Statistical Agency.Tthe (2007) Population and Housing: Census of Ethiopia http://microdata.worldbank.org/index. Php/catalog/2747.
7. HemoCue (2013) HemoCue Hb 301 operating manual Angelhom; HemoCue AB: http:// www.hemocue.com.
8. World Health Organization (2011) Haemoglobin concentrations for the diagnosis of anaemia and assessment of severity: WHO/NMH/ NHD/ MNM/ 11.1
9. Alice M. Tang, Mei Chung, Kimberly Dong, Norma Terrin (2016) Determining a Global Mid-Upper Arm Circumference Cutoff to Assess Malnutrition in Pregnant Women: 2016. *(FANTA) FHI* 360 1825 June
10. Abrehet Abriha, Melkie Edris Yesuf and Molla Mesele Wassie Prevalence and associated factors of anemia among pregnant women**:** *BMC*, 2014; 7: 888.
11. Abel Gebre1 and Afework Mulugeta Prevalence of Anemia and Associated Factors among Pregnant Women in North Western Zone of Tigray, N orthern Ethiopia: A Cross-Sectional Study. *Journal of Nutrition and Metabolism*, 2015; 165430: 7.
12. Christine L Roberts, Jane B Ford, Charles S Algert, Sussie Antonsen et al. Population-based trends in pregnancy hypertension and pre-eclampsia: an international comparative study: BMJ, 2011; **1**: e000101.
13. Hossain B , Tanvir Sarwar, Salim Reja and Mst Nasima Akter Nutritional Status of Pregnant Women in Selected Rural and Urban Area of Bangladesh. Department of Nutrition and Food Engineering, Daffodil International University, Dhaka, Bangladesh : *J Nutr Food Sci*., 2013; 3: 4.
14. Moges M and Loha E (2013) Nutritional status and associated factors among pregnant women in Boricha District, Sidama Zone, Southern Ethiopia 2015. https://www. researchgate.net/publication/282451941.
15. Kedir H, Berhane Y and Worku A (2014) Magnitude and determinants of malnutrition among

pregnant women in Eastern Ethiopia 2014: http://213.55.85.90/ bitstream/handle.

16. Kefyalew Addis Alene and Abdulahi Mohamed Dohe (2014) Prevalence of anemia and associated factors among pregnant women in an urban area of E astern Ethiopia. Hindawi Publishing Corporation : Article ID 561567, 7.
17. Abel Gebre and Afework Mulugeta (2015)Prevalence of Anemia and Associated Factors among Pregnant Women in North Western Zone of Tigray, Northern Ethiopia: Hindawi Publishing Corporation Journal of Nutrition and Metabolism ID 165430, 7.
18. World bank (2015) Ethiopia poverty assessment. Poverty global practice Africa region : Report No. AUS6744.
19. A. Masinde, B. Gumodoka, A. Kilonzo and S.E. Mshana (2009) Prevalence of urinary tract infection among pregnant women at Bugando Medical Centre, Mwanza, Tanzania: Tanzania Journal of Health Research, July, 2009; 154-161.
20. .Cüneyt Eftal Taner, Atalay Ekin, Ulaş Solmaz, Cenk Gezer(2015) Prevalence and risk factors of anemia among pregnant women attending a high-volume tertiary care center for delivery. *Turkish-German Gynecological Education and Research Foundation, Turkey, 2015. :10.5152/jtgga.2015.15071*
21. Abebe Ferede Mariyam and Bekele Dibaba.(2018) Epidemiology of Malnutrition among Pregnant Women and Associated Factors in Central Refit Valley of Ethiopia, 2016: J Nutr Disorders Ther., 2018; 1-8.
22. World Health Organization (1968): Nutritional anaemias. Report of a WHO scientific group. Geneva, 1968. (WHO Technical Report Series, No. 405). Available at http://whqlibdoc.who.int/trs/WHO_TRS_405.pdf
23. World Health Organization (1989)Preventing and controlling anaemia through primary health care: a guide for health administrators and programme managers. Geneva, World Health Organization, 1989. Available at http://www.who.int/nutrition/ publications/ micronutrients/anaemia_iron _deficiency /9241542497 .pdf
24. SPHERE P (2011)The Sphere Handbook: Humanitarian charter and minimum standards in humanitarian response, 2011.
25. Naila Baig-Ansari and Salma Halai Badruddin (2008) Anemia prevalence and risk factors in pregnant women in an urban area of Pakistan. *Food Nutr Bull*, June, 2008; 29(2): 132–139.
26. Nivedita K.*, Fatima Shanthini N. Knowledge, attitude and practices of pregnant women regarding anemia, iron rich diet and iron supplements and its impact on their hemoglobin levels. *Int J Reprod Contracept Obstet Gynecol, Feb, 2016; 5(2): 425-431.*