ORIGINAL ARTICLE

MAGNITUDE OF ANEMIA AND ASSOCIATED RISK FACTORS AMONG PREGNANT WOMEN ATTENDING ANTENATAL CARE IN SHALLA WOREDA, WEST ARSI ZONE, OROMIA REGION, ETHIOPIA

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ABSTRACT

BACKGROUND*: Anemia during pregnancy is a common problem in developing countries and affects both the mother's and her child's health. The main objective of this study was to determine the prevalence of and the factors associated with anemia among pregnant women.*

METHODS*: Facility based cross-sectional study design was conducted from June to August, 2011 on 374 pregnant women. Mothers who came for ANC during the study period and who met the inclusion criteria were interviewed and a capillary blood sample was taken. Hemoglobin level was determined by using HemoCue photometer, and interviewer administered questionnaire was used to collect data. Data were cleaned, coded and fed into SPSS version 16.0 for analysis.*

RESULT: *The mean hemoglobin concentration was 12.05±1.5 g/dl and prevalence of anemia was 36.6%. Family sizes (COR=2.67, CI (1.65, 4.32), third trimester (COR=1.45, CI (1.11, 2.23), meat consumption <1x/wk (COR=3.47, CI (1.58, 7.64) and pica (COR=2.33, CI (1.52, 3.58) were significantly associated with anemia. Having five or more children (AOR=5.2, CI [1.29, 21.09]), intake of vegetables and fruits less than once per day (AOR= 6.7, CI [2.49, 17.89]), intake of tea always after meal (AOR = 12.83.CI [45-28.9]), and recurrence of illness during pregnancy (AOR=7.3, CI [2.12-25.39]) were factors associated with anemia.*

CONCLUSION: *This study showed that anemia is a moderate public health problem. Less frequent meat and vegetable consumption, parity ≥5 are risk factors for anemia. Therefore, reducing parity, taking balanced diet and use of mosquito nets during pregnancy are recommended.*

KEYWORDS: Hemoglobin, Anemia, Pregnancy, ANC

INTRODUCTION

Anemia is a global public health problem affecting people of different age groups (1). In the developing world, pregnant women and their children are frequently exposed to parasitic infections like malaria and intestinal helminths, which co-exist widely with micronutrient deficiencies and contribute to IDA (2, 3). Anemia in pregnancy is also related to different sociodemographic, dietary and economic factors (4).

According to WHO's estimate, the global prevalence of anemia in pregnant women is 68%. In Africa its prevalence is estimated to be 66.8% (5). In Ethiopia, anemia is the severe problem affecting 62.7% of pregnant mothers and 52.3% non-pregnant women (6, 7). According to EDHS report of 2005, the prevalence of anemia in pregnant women was 30.6% at the country level and 24.9% in Oromia Regional State (8).

The main risk factors for iron deficiency anemia (IDA) include low intake of iron, poor absorption of iron from diets, high phytate or phenolic compounds or increased requirements during childhood and pregnancy (9).

There is an increased iron requirement during pregnancy due to greater expansion in plasma volume that results in a decrease in haemoglobin level to 11g/dl. Therefore, any hemoglobin level below 11g/dl in pregnancy is considered as anemia (10, 11).

The consequences of anemia in pregnancy include: still-birth, low birthweight and pre-term births, reduced work capacity, decreased mental performance, low tolerance to infections, death

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from anemic heart failure and maternal deaths due to uncontrolled bleeding (6, 12,13, 14).

Centers for Disease Control and Prevention (CDC) recommend screening for anemia in pregnant women and universal iron supplementation to meet the iron requirements of pregnancy except in the presence of certain genetic disorders such as hemochromatosis (15). The rationale is that treatment maintains maternal iron stores and may be beneficial for neonatal iron stores. The recommended daily dietary allowance of ferrous during pregnancy is 27 mg, which should be present in most prenatal diet (16).

The nutritional status of women in Ethiopia, like in other developing countries, is low while their daily workload is often enormous to ensure survival of their children (17). To improve the nutritional status (the major cause of anemia in pregnancy) of Ethiopian women, there have been several interventions by the Ministry of Health through its Essential Nutrition Action Plan (ENA), consisting of supplementation of three major nutrients (vitamin A, iron, and iodine) and other promotive activities to improve maternal and child nutrition (18). But according to EDHS 2005 report, iron supplementation for pregnant women is only 10.4% and 10.3% at national level and Oromia Region respectively (8).

Antenatal care is one of the pillars of safe motherhood interventions that are believed to reduce maternal and perinatal mortality (19). Universal access to antenatal care is a matter of priority in both developed and developing countries (20). The condition may then be treated or monitored to secure a better outcome (12, 13). In Ethiopia, 66.3% of pregnant women attend antenatal care at least once per pregnancy (6, 16, 21, 22).

The magnitude of anemia in pregnant mothers, as indicated in WHO's reports, both in developed and developing nations is quite alarming. The severity of the problem in poor countries like Ethiopia is widespread and associated with socioeconomic status and other factors of the population. Despite the wider scope of the problem, no sufficient research data has been documented to disclose the severity of anemia in ANC. Therefore, the main aim of the present study was to identify the magnitude of anemia and associated risk factors among pregnant women.

SUBJECTS AND METHODS

Facility based cross-sectional study was conducted in three health centres in Shalla Woreda from June 1 to August 30, 2011. Shalla Woreda is located 290 km to the south of Addis Ababa and 35 km to the west of Shashemene Town, with altitude ranging from 1800-2125 meters above sea level.

The required sample size (n) was determined using one population proportion formula at a confidence level of 95%, value of a standard normal distribution score using 0.05 level of significance; expected prevalence of anemia in pregnant women is (15.1% - 62.7%) (23), average 40%, d = 0.05, degree of accuracy desired. Thus applying the formula, the sample size was 369 pregnant women. Since the source population was < 10,000 or n/N is greater than 0.05, population correction formula was used to determine sample size to be 340. By adding 10% for non-response rate the final sample size was 374.

First visit pregnant women who came for ANC during the study period were included as study participants. Pregnant women with acute illness (active bleeding, acute febrile illness and diarrheal diseases), and revisits (follow ups) were excluded. The required sample size was determined using one population proportion formula that gives a total of 374 pregnant women. The total sample size was proportionally allocated to each study health centres depending on their monthly case load prior to the study time.

Data were collected using pretested interviewer administered questionnaire, which contains socio-demographic characteristics, obstetric history, simplified food frequency questionnaire (FFQ) developed by Hellen Keller International (24). This questionnaire was adopted and modified by Ethiopian Health and Nutrition Research Institute EHNRI (25) to include maternal habits and anemia risk reduction behaviors such as use of ITNs, deworming, consistent wearing of shoes and pica. Blood sample was collected via finger-prick with disposable lancet and hemoglobin level was determined by laboratory technicians using portable digital hemoglobin meter (HemoCue AB Angelholm, Sweden).

Highly sensitive and specific hemoglobin measuring method was used. While ≥ 95% precision was the strength, recall bias could be a limitation of this study.

Data were collected by two trained nurses working at the health centres. All pregnant women attending ANC during the study period were supplemented with iron tablet (ferrous sulphate 60mg/dl for one month). Pregnant women with Hgb level < 7g/dl were referred to the nearby hospital.

The collected data were checked for completeness, coded and fed to SPSS version 16.0 and edited for consistencies. Hemoglobin level was adjusted for altitude depending on tabulated values proposed by different researchers (15) and recommended by WHO and CDC (1). Descriptive statistics such as frequency, percentage, mean and standard deviation were used to describe selected variables. Bivariate analysis using binary logistic regression was carried out one by one for each independent variable and $p < 0.05$ was taken as cut off point to label the significance of the variables. Variables which were significant in the bivariate analysis were used as inputs for multivariate logistic regression analysis. Multivariate logistic regression analysis was carried out by backward stepwise method to identify the most important influencing factors of anemia in pregnant women by controlling the effects of confounding variables. The strength of association was measured by using adjusted odds ratio.

Ethical approval was obtained from Ethical Review Board of Jimma University. Clients' consent was ensured and confidentiality was maintained.

The following operational definitions were used;

Pregnant woman: a woman whose pregnancy is confirmed by HCG test or abdominal examination and fetoscope at the study health center

Anemia in pregnancy: hemoglobin level below 11g/dl during pregnancy

Mild anemia: hemoglobin level from 9 -10.9 g/dl

Moderate anemia: hemoglobin level from 7- 8.9 g/dl

Severe anemia: hemoglobin level from 4- 6.9 g/dl

Very severe anemia: hemoglobin level below 4 g/dl (1, 12)

RESULTS

A total of 374 first visit pregnant women attending antenatal care in three health centres of Shalla Woreda took part in the present study, a response rate 100%. One hundred sixty one (43.1%) of them were from Adje Health Center, 125(33.4%) were from Sanbate Shalla Health Center and 88(23.5%) were from Awara Health Center.

The mean ± SD age of respondents was 25.2 ± 5.28 years. Three hundred seven (82.1%) of them were in the age group of 20-35 years. The median monthly income of the families was 650.00 Birr.

The mean ± SD hemoglobin concentration was 12.05±1.5 g/dl and the current prevalence of anemia was 137 (36.6%). In terms of severity, mild anemia was 32.6%, moderate anemia was 3.7% and severe anemia was 1 (0.3%). After calibration of the instrument at sea level, the mean ± SD hemoglobin level became 11.3 ± 1.5g/dl. Proportion of anemia increases as the age of the respondents increases. According to the present finding, place of residence, age, income and educational status had no statistically significant association with the occurrence of anemia in pregnancy. But, family size of five or more was found to be significantly associated [OR = 2.7 (1.7, 4.3)] with the occurrence of anemia in pregnancy as shown in table 4.

The gestational age of pregnancy of the respondents ranged from 8 to 38 weeks with a mean of 27.1. Gestational age at recruitment was the first trimester for 10 (2.7%) women, second trimester for 150 (40.1%) women and third trimester for 214 (57.2%). The mean hemoglobin concentration was found to be lower in the first and the third trimesters. The mean of hemoglobin concentration was 11.9 g/dl ±1.9 in the first trimester, 12.2 g/dl ±1.5 in the second and 11.9 g/dl ±1.5 in the third trimester as shown in figure 1.

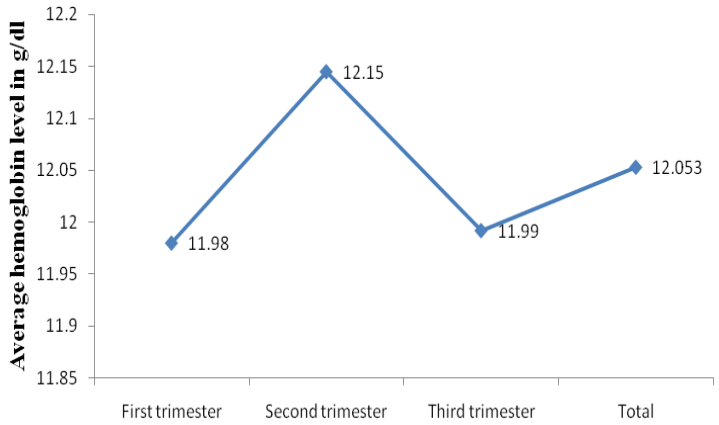

Figure 1: Distribution of mean hemoglobin level (g/dl) in three trimesters among pregnant women attending antenatal care, Shalla Woreda, West Arsi Zone, Ethiopia, 2011 (N=374)

Table 1: Association of Obstetric History of the Pregnant Women and Anemia in Pregnancy, Shalla Woreda West Arsi Zone, Ethiopia, 2011(N=374).

Obstetric history	Total (n=374) n (%)	Anemia Yes (n=137) n (%)	Anemia No (n=237) n (%)	COR(95%CI)
Trimesters				
First	11(2.9)	6 (4.4)	5 (2.1)	1.21(0.756,4.456)
Second	149(39.8)	44 (32.1)	105 (44.3)	1
Third	214(57.2)	87 (63.5)	127 (59.8)	1.45(1.11,2.231)
Parity				
Nullipara	90(24.3)	23 (25.6)	67 (74.4)	0.609(0.346,1.074)
One	56(14.9)	19 (33.9)	37 (66.1)	0.911 (0.483,1.719)
Two to four	172(45.9)	62 (36.0)	110 (64.0)	1
≥ five	56(14.9)	33 (58.9)	23 (41.1)	2.546 (1.374,4.716)
Birth interval				
< 24 month	98(26.2)	47 (48)	51 (52)	1.648(1.01,2.694)
≥ 24 month	198(52.9)	71(35.9)	127 (64.1)	1
History of abortion				
Yes	46(12.3)	24 (52.2)	22 (47.8)	2.076(1.115,3.865)
No	327(87.4)	113 (34.5)	215 (65.5)	1
Contraceptives use				
Yes	51(13.6)	18 (35.3)	33 (64.7)	1
No	323(86.4)	119 (36.8)	204 (63.2)	1.069(0.577,1.982)
Menstrual cycle				
Regular	323(86.4)	94 (29.1)	229 (70.9)	1
Irregular	51(13.6)	10 (19.6)	41 (80.9)	0.763(0.405,1.437)
Excess menstrual bleeding Yes	61(16.3)	28 (45.9)	33 (54.1)	1.588(0. 912 ,2.765)
No	313(83.7)	109 (34.8)	204 (65.2)	1

1= Reference groups

The magnitude of anemia was higher in the first trimestersm 4 (40.0%) and in the third trimesters, 86 (40.2). Of the 374 participants, 90 (24.1%) were primigravida; 172 (45.9%) were multipara (2 to 4) and 56 (14.9%) were grandmultipara (≥ 5). The prevalence of anemia among the three categories of parity was found to be 25.6%, 36.2% and 58.9% respectively. The magnitude of anemia decreases as the gap between previous birth and current pregnancy increases, i.e. mothers who delayed the subsequent pregnancy for more than two years had lower prevalence of anemia, 71(35.9%), than those who delivered in less than two years, 47 (48.0%). The proportion of anemia was higher among pregnant women who had history of abortion, 24 (52.2%), did not use contraceptive, 119 (36.8%), and experienced excess menstrual bleeding prior to the current pregnancy, 25 (45.9%), compared to their counterparts.

Bivariate analysis showed that reproductive history of the women like gestational ages being in the third trimester, parity of more than four children, birth interval below two years and history of abortion were significantly associated with occurrence of anemia in pregnancy as shown in table 4.

Among the study participants those who eat vegetables and meat less frequently, the occurrence rate of anemia was higher (vegetables 60.3% vs. 24.6%, and meat 39.8% vs 16.0%) than those who eat these food items more frequently. The magnitude of anemia was higher among pregnant women who had been taking tea, coffee and khat more frequently than less frequent users of these substances. Consumption of animal products like red meat, organ meat and egg less than once per week, vegetables less than once per day, and taking of tea always after meal, showed statistically significant association with anemia in pregnancy [OR =3.5 (1.6, 7.6), 4.7 (2.9, 7.4) & 7.8 (1.6, 37.9)] respectively as shown in table 2.

Table 2: Association between dietary plus other maternal habits and prevalence of anemia among pregnant women attending ANC in Shalla Woreda, West Arsi Zone, Ethiopia, 2011(N=374).

Maternal dietary and other habits	**Total n (%)**	**Anemia Yes n (%)**	**No n (%)**	**COR(95%CI)**
Meat consumption per week				
At least once per week		8 (16.0)	42 (84.0)	1
Less than once per week	50(13.4)	129(39.8)	195(60.2)	3.47 (1.58,7.64)
	324(86.6)			
Vegetables & fruits consumption daily				
At least once per day		61 (24.6)	187(75.4)	1
Less than once per day	248(66.3)	76 (60.3)	50 (39.7)	4.66 (2.944,7.376)
	126(33.7)			
Tea in take				
Always after every meal	10 (2.9)*	8 (80.0)	2 (20.0)	7.79 (1.60,37.89)
Once or less per day	165(44.1)*	56 (33.9)	109(66.1)	1
Coffee in take				
Always after meal	10(2.9)*	5 (50.0)	5 (50.0)	1.77 (0.504,6.25)
Once or less per day	344(91.9)*	124 (64.0)	220(36.0)	1
Khat Every day	4(1.1)*	2 (50.0)	2 (50.0)	1.187 (0.150,9.41)
Occasionally	35(9.4)*	16 (45.7)	19 (54.3)	1

1= reference group

*The sums of the percent do not give 100 due to missing value.

Most of the respondents, 314 (84.0%), reported that they had mosquito bed net. Among these, 256 (68.5%) of them mentioned that they use bed net consistently. The prevalence of anemia in pregnant women who do not use bed net every night was 25 (51.0%), and in those who do not wear shoes consistently was 38 (44.2%). Binary logistic regression analysis showed that consistent use of bed net, history of acute febrile illness [COR = 4.14, CI (2.53, 6.79)] during pregnancy and pica were significantly associated with the occurrence of anemia as indicated in table 3.

Table 3: Association between Anemia Risk Reduction Behaviours and Recurrence of Illness and Magnitude of Anemia in Pregnant Women Attending ANC in Shalla Woreda, West Arsi Zone, Ethiopia, 2011(N=374).

Variables		Anemia			COR(95% CI)
		Total N (%)	Yes n(%)	No n(%)	
Consistent use of bed net					
	Yes	265(70.7)	79 (29.8)	186(70.2)	1
	No	49(13.1)*	25 (51.0)	24(49.0)	2.45(1.32,4.55)
Wearing shoes consistently					
	Yes	288(77)	99 (34.4)	189(65.6)	1
	No	86(23)	38 (44.2)	48(55.8)	1.47(0.90, 2.40)
Pica	Yes	156(41.7)	75 (48.1)	81(51.9)	2.33(1.52, 3.58)
	No	218(58.3)	62 (28.4)	156(71.6)	1
Deworming					
	Yes	58(15.5)	18(31.0)	40(69.0)	1
	No	316(84.5)	119 (37.7)	197(62.3)	1.34(0.74, 2.45)
Iron supplementation					
	Yes	33(8.8)	13 (39.4)	20 (60.6)	1
	No	341(91.2)	124 (36.4)	217(63.6)	0.88(0.42, 1.83)
Recurrence of AFI					
	Yes	80(21.4)*	45 (56.2)	35(43.8)	4.14(2.53, 6.79)
	No	292(78.1)	91 (31.2)	201(68.8)	1

AFI = acute febrile illnesses, 1 = Reference groups, *Sum is less than 100% because of missed values

Multiple logistic regression analysis revealed that parity greater than four, less frequent consumption of vegetables and fruits, taking tea after meal and recurrence of acute febrile illnesses during pregnancy remain to be significantly associated with the presence of anemia. Controlling the effect of confounding factors, pregnant women having parity greater than four were found to be 5.2 (AOR) times more likely to develop anemia during pregnancy compared to pregnant women with two-four births. Study participants who consume vegetables less than once per day were 6.68 (AOR) times more likely to develop anemia in pregnancy as compared to those who consume vegetables at least once per day. Pregnant women who reported that they take tea after meal were 12.8 (AOR) times more likely to develop anemia compared to who took less than once per day as depicted in table 4.

Table 4: Multivariate Logistic Analysis of Factors Influencing Anemia in Pregnancy among Pregnant Women Attending ANC in Shalla Woreda, West Arsi Zone, Ethiopia, 2011(N=374).

	Anemia			
Variables	**Yes n(%)**	**No n(%)**	**COR(95% C.I)**	**AOR(95%CI)**
Parity				
Nullipara	23 (25.6)	67 (74.4)	0.609(0.35-1.10)	0.567(0.09-3.62)
One	19 (33.9)	37 (66.1)	0.911(0.48-1.72)	2.784(0.93-8.35)
Two to four	62 (36.0)	110 (64.0)	1	1
≥ five	33 (58.9)	23 (41.1)	2.55(1.37-4.72)*	5.22(1.29-21.09)
Vegetables & fruits consumption				
At least once per day	76 (60.3)	50 (39.7)	1	1
Less than once per day	61 (24.6)	187(75.4)	4.66 (2.94-7.38)*	6.68(2.49-17.89)
Tea intake				
Always after meal	8 (80.0)	2 (20.0)	7.79 (1.6-37.89)*	12.78(3.45-28.9)
Once or less per day	56 (33.9)	109 (66.1)	1	1
Recurrence of acute febrile illnesses				
Yes	45 (56.2)	35(43.8)	4.14(2.53, 6.79)	7.33(2.12-25.39)
No	91 (31.2)	201 (68.8)	1	1

1=reference group

DISCUSSION

The prevalence of anemia in the present study was 36.6% in pregnant women attending ANC in the study area, which is consistent with the study results (38.2%) reported from Jimma University Specialized Hospital (26). But, it is higher than the findings (15.1%) reported from Awassa Health Center (23) as well as those reported from rural Southern Ethiopia (29%) (27). The higher prevalence of anemia in the present study than previous reports might be attributed to differences in dietary habits of study participants in which fermented Enset (kocho) contribute more amount of vitamin B_{12} (28) compared with the maize diet group which is the main staple food in the study area.

The mean hemoglobin concentration, 12.05g/dl, of the present study was found to be consistent with the findings reported by Gies et al., 2003(29) in Awassa Health Center (12.3g/dl) as well as Hinderaker et al., 2001(29) in Northern Tanzania (12.1 g/dl). The magnitude of anemia increased from 27.8 to 36.6% after it was adjusted for altitude, which has a similar trend with study done in Tanzania in which the prevalence increased from 22.7 to 36.1% after adjusted for altitude (29).

Pregnant women with family size >5 were 2.7 times more anemic than women with family size less than five. This finding is comparable with a study in Kisumu, Western Kenya in which the prevalence of anemia was higher in women with family size >7 compared to their counterparts (27). The direct relationship of family size with anemia in this study could be associated with food insecurity for large family size.

Anemia prevalence was higher in the first and third trimesters than in the second trimester in this study. Taking the second trimester as reference group, the association of gestational age with anemia was statistically significant for the third trimester. This might be due to increase in hemodilution as a result of increase in estrogen level towards the end of gestational age (10). Increase in anemia prevalence in the third trimester ascertained in this study was similar with what was reported in other studies (23, 30, 31). Anemia was 2.5 times more prevalent in women who had five or more living children than in women having two to four children. Multiparity may induce anemia by reducing maternal iron

reserves at every pregnancy and by causing enevitable blood loss at each delivery. This finding is consistent with the study done in Eastern Anatolian Province, Turkey (32) in which pregnant women with parity of four or more were 2.2 times more anemic compared to those with parity less than four. Child spacing was also found to be associated significantly with the occurrence of anemia in this study, which is in line with other study results (27, 30). The possible reason could be that child spacing minimizes bleeding during delivery and enhances iron reserve in the body.

Frequency of meat and vegetables consumption showed statistically significant association with anemia as reported in different studies (23, 25). Study participants who take tea after meal were found to be 7.8 times more anemic than those who take tea once or none per day. The effect of tea on the absorption of non-heme iron was ascribed to the formation of insoluble iron tannate complexes.

Recurrence of acute febrile illnesses was another factor that showed a significant association with the occurrence of anemia in this study. The study site is a malaria endemic area and most acute febrile illnesses are attributable to malaria, which causes RBCs destruction that leads to anemia.

To wind up, in this study, after controlling the confounding factors, parity greater than four, intake of vegetables and fruits less than once per day, taking tea always after meal and recurrence of acute febrile illnesses were found to be factors independently affecting anemia during pregnancy. Therefore, mothers should be advised to reduce parity, take balanced diet and use mosquito net during pregnancy.

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