

Prevalence of Anemia and Associated Factor Among Pregnant Women Attending Ante Natal Care in Arba Minch Public Health Institutions, South Ethiopia

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Abstract: Anemia is a global public health problem affecting both developing and developed countries with major consequences for human health as well as social and economic development. It occurs at all stages of the life cycle, but is more prevalent in pregnant women. The highest prevalence of anemia among pregnant women in the developing world is due to its multi-factorial causes. Anemia leads to complication that will affect both the mother and the growing fetus. Objectives of the study was to determine the prevalence of anemia and associated factor among pregnant women that attends antenatal care at Arba Minch public health institutions, 2019. Institutional based cross sectional study was conducted on 374 pregnant women attending ANC at Arba Minch public health institutions. Systematic random sampling was used to recruit pregnant women. Semi-structured questionnaire used for assessment of socio-demographic and socioeconomic factor. Venous blood was collected from pregnant women and Hemoglobin was estimated using CBC machine analyzer. Blood film for Hemoparasite as well as morphological types of anemia was assessed. Stool sample was taken for examination of intestinal parasites by using wet mount direct microscopy and formol ether concentration. Binary logistic regressions were done to determine association of variables by using SPSS version 21. Results of the study shows that, the prevalence of anemia was found to be 28.8% among pregnant women. Mild, moderate and severe anemia was 75.7%, 23.3% and 1% among anemic women respectively. Multivariate logistic regressions shows, monthly income [AOR=3.37, 95%: 9.35-10.09, P< 0.000], fruit consumption [AOR=6.9, 95%: 1.36-4.9, P<0.000], blood loss [AOR=3.66, 95%CI: 1.56-8.7, P<0.000] and being infected with malaria [AOR=6.10, 95%CI: 2.25-16.43, P<0.000] were independently associated with anemia. Morphologically, 75.5% of anemic pregnant women had Normocytic Normochromic, 23.3% had Microcytic hypochromic, and only 1% had Macrocytic normochromic. It is concluded that, the prevalence of anemia among pregnant women was moderate public health significances which is independently associated with low monthly income, habit of fruit consumption, blood loss and being infected with malaria parasites. It is recommended that creating awareness of the pregnant women on feeding iron rich foods like fruit, liver, poultry, cereals and green vegetables and giving health education on how to prevent malaria.

Keywords: Anemia, Pregnant Women, ANC, Arba-Minch

1. Introduction

Anemia is defined as a state or condition in which the reduction of hemoglobin concentration, hematocrit or in RBC mass for the same age, sex and geographical locations,

resulting in lower quantities of oxygen available to support the body's activities. Which decrease the oxygen carrying capacity of RBC to tissues [1]. It can be occur at all stage of life cycle, but it is more prevalent in pregnant women, because the hematological system undergoes changes in

order to meet the needs of developing fetus and placenta.

Anemia in pregnancy can be classified in to two; one is physiological, which is due to increase in plasma volume / pseudo anemia/, in addition with marked demand of extra iron during pregnancy. The other is pathological, it can be due to deficiency of micronutrient (iron, folic acid vitamin B₁₂) or due to infection (hemoparasite and intestinal parasites) or it can be due to hemoglobinopathies and by other causes [2-4].

Anemia due to deficiency of micro nutrients (iron deficiency) is the common cause of anemia in pregnancy. In pregnancy the rate of erythropoiesis increase's, so during erythropoiesis there are factors needed to be fulfilled such as iron for synthesis of Heme/part of Hgb/, in pregnancy an extra of 1000mg of iron needed, other nutrients such as vitamin B₁₂ for synthesis of RNA, folic acid (vitamin 9) for later stages of DNA synthesis, also trace elements such as Zinc for protein metabolism & nucleic acid metabolism and others can be needed for erythropoiesis. If there is micronutrient deficiency or poor nutrition it will leads to anemia [5].

Also parasitic infection mostly Malaria & Hookworm can be associated with anemia in pregnancy, in which they cause reduction of RBC, as in malaria once the sporozoite form enter human host it will go to liver, it will multiplies & exit into the blood stream in the merozoite form, the merozoite then invades erythrocytes which leads to phagocytosis of infected blood cells by the spleen or sequestered in spleen. In normal adults infected blood cells sequestered in spleen but in pregnant women it will also sequestered in placenta. In case of *plasmodium falciparum* also there is direct lyses of RBC so it will decrease the number of RBC, which can leads to anemia [6].

Hook worm infection cause anemia in pregnancy, after the entry to human host it will go to small intestine or if it ingested it will directly go to small intestine which result blood loss by laceration or enzymatic damage to the intestinal mucosa leading to blood loss, others helminthes such as *Tricuristricurua* cause blood loss also *Ascaris lumbricoid* associated with reduced vitamin absorption, decreased appetite will co-releate with anemia in pregnancy [7].

The most common way or primary method for the diagnosis of anemia is measuring or determining hemoglobin concentration. As WHO classify in terms of hemoglobin concentration in which (10-10.9) g/dl considered as mildly anemic, (7.9-9.9) g/dl as moderately anemic and (<7.0) g/dl considered as severely anemic [8].

Anemia is a global public health problem affecting both developing and developed countries with major consequences for health as well as social & economic development but it is more common in developing countries like countries in Africa and Asia as they have poor nutritional status and high prevalence of intestinal parasite [2].

The global Prevalence of anemia as WHO declared in 2011 was 38. 2% (Hgb concentration <11.4 g/dl) or nearly 32.4 million in pregnant women that are in age of 15-49 years, also it declares the prevalence of severe anemia in pregnant women with hemoglobin level (<7g/dl) is 0.9% or

0.8 million (800,000) [9, 10]. There is an established relationship between anemia and maternal mortality, IDA anemia alone was estimated to be an underlying factor for 22% of maternal deaths [11].

Anemia can be taken as indicator of both poor nutrition as well as poor health status because among the causes of anemia in pregnancy deficiency of micronutrient takes major role in its occurrence prevalence. In developing countries there is poor socioeconomic status and also high prevalence of intestinal parasite and hemoparasite that leads to its occurrence. The most dramatic health effect of anemia is increased risk of maternal and child mortality due to severe anemia [12].

Severe anemia (Hgb<7g/dl) during pregnancy has been associated with major maternal and fetal complication or death, Such as increase pre term delivery, neonatal and maternal death, inferior neonatal health [13-15].

Prevalence of anemia is high in developing countries as compared to developed countries, mostly the greatest burden of anemia come from Asia and Africa, especially in south Asia like India, a high prevalence of anemia in pregnancy was observed which is 96.5%, of which 22.8% had mild, 50.9 per cent had moderate and 22.8% had severe anemia in a study conducted in Delhi [16]. Generally in Asia the prevalence of anemia in pregnancy is 60% and in Africa is 52%. Also in sub Saharan Africa it is estimated that 20% of maternal deaths are associated with anemia [17].

In our country Ethiopia the prevalence of mild anemia (Hgb<12) is 23% and the prevalence of severe anemia (Hgb<7g/dl) is 1.1%, although the prevalence at the national level is considered to be mild, some regions in the lowlands exhibited extremely high prevalence of anemia. For instance in Somalia region nearly 50% of women were anemic in 2011, in Afar 40.4% & in dire-dawa 33% [10].

Many researchers have been conducted to show anemia its associated factors among pregnant women in the world. But it remains the main public health problem, especially in developing countries. The etiology of anemia in Ethiopia is not well established and the information available is limited in representativeness of the whole country. Even if various researchers came up with different conclusions despite the problem being among the ten top morbidities reported by most health institutions in the country [18, 19]

Hence, this study was conducted to determine the prevalence of anemia and associated factor among pregnant women attending antenatal care center in Arba-Minch public health facilities. Information from the study might be used for policy maker for developing health intervention programmes designed to control and prevent anemia.

2. Methods and Materials

2.1. Study Area and Study Design

The study was conducted in Arba Minch Public health facilities. Arba-Minch town is located in Gamo Gofa zone Southern Nation Nationality and peoples region (SNNPR) about 500 KM south of Addis Ababa, at the elevation of

1285m above sea level [33]. The total population of the town is about 103,965 people; by using conversion factor for 2014/15 of SNNPR pregnant women in the town it is expected to be 4296 [34].

Institutional based cross sectional study was conducted.

2.2. Study Period

The study was conducted January 21 to April 21/2019.

2.3. Source Population/Study Population

All pregnant women attend antenatal care unit during study period.

2.4. Inclusion and Exclusion Criteria

2.4.1. Inclusion Criteria

Pregnant women that were resident in study area and that attend antenatal care unit in Arba Minch Public health institutions.

2.4.2. Exclusion Criteria

Those pregnant women who were seriously sick and unable to give data.

2.5. Sample Size Determination

The Sample size of 374 was determined using single population proportion formula. Level of confidence taken was 95%, 5% margin of error, P is 32.8% which is from the study conducted previously on anemia and associated factors in pregnant women attending ANC in health institution of Arba Minch town in 2016 [31]. Ten percent non-response rate was added to the sample size as a contingency.

2.6. Sampling Strategies

All pregnant women who attend for antenatal care follow up and who meet the inclusion criteria were included in our study. Participants were included only once on their first visit during the study period by using systematic random sampling after proportional allocation done for AMH and two health centers which, 200 and 174 respectively. The interval 'K' is calculated based on the data obtained from the previous two month on logbook by the formula N/n . From the previous two month data before data collection $N=400$ from the logbook, which $K=400/200 \sim 2$ for AMH and $250/174 \sim 2$ for health centers. We recruited the pregnant women every 2 interval until sample was fulfilled.

2.7. Variables of the Study

2.7.1. Dependent Variable

Anemia.

2.7.2. Independent Variable

Age, Diet, income, occupation, educational level, residence, blood loss during current pregnancy, spacing number of child, gestational period, parasitic infection, abortion, iron and folate supplementation, gravidity, usage of contraceptives before pregnancy.

2.8. Operational Definition

Anemic pregnant women: -pregnant women that have Hgb concentration less than 11g/dl.

Non anemic pregnant women:-pregnant women that have Hgb concentration greater than 11g/dl.

Mild anemia: - when the Hgb concentration of pregnant women is b/n 10-10.9 g/dl.

Moderate anemia: - when the Hgb concentration of pregnant women is b/n 7.0 to 9.9 g/dl.

Severe anemia:-when the Hgb concentration of pregnant women is less than 7 g/dl.

Normocytic Norm chromic: - when RBCs have normal size or RBCs similar to the nucleus of size of small lymphocyte and Red cell with a small central pallor (about 1/3 of the cell diameter).

Microcytic Hypo chromic:-erythrocytes having small size or smaller than nucleus of small lymphocyte and with a more pronounced central pallor (i.e. greater than 1/3 the diameter of the cell).

Macrocytic norm chromic: -erythrocytes that have large size than nucleus small lymphocyte and with normal central pallor.

2.9. Data Collection Procedure and Quality Management

2.9.1. Socio-demographic and Socioeconomic Data

A semi structured questionnaire was used to obtain data on demographic and socio economic variables also other relevant possible associated factors.

2.9.2. Laboratory Data

i. Blood Specimen for Hemoglobin Determination

Three ml (3 ml) of venous blood was collected in EDTA tube and transferred to CBC automated hematology analyzer for Hgb determination.

ii. Blood Specimen for Morphology Study

The blood specimen was placed on slide and thin smear was prepared and stain with Wright stain and examined by senior technologist.

iii. Blood Specimen for Hemoparasite Examination

The blood specimen was placed on slide, thick and thin film was prepared and stain with Giemsa then it was examined by expertise.

iv. Stools Specimen for Intestinal Parasite

Stools specimen was collected and examined for identification of intestinal parasite, by using direct wet mount and formol ether concentration technique.

v. Data Quality Management

Training was given for data collectors before data collection. The questionnaire was developed in English and then was translated into local language (Amharic language) again it was translated to English for similarity check. Blood sample was collected and placed on proper anticoagulant such as EDTA and analyzed within a hour. For automated hematology analyzer background count and precision of the result was performed daily. Blood Smear with bullet shape prepared on clean microscopic slide for morphology and

hemoparasite examination. Quality of stain was maintained by proper preparation of stain and staining in proper time.

Stool sample was collected with proper instruction in clean, dry material and wet mount was prepared on clean microscopic slide and examined within one hour, and negative result was rechecked by another investigator. Every laboratory procedure was performed according with standard operating procedure (SOP).

2.10. Data Processing and Analysis

Data was edited, cleaned, using SPSS version 20. Dependent variable frequencies, percentage, mean, range was calculated. Binary logistic regression analysis was used to determine association of anemia and with independent variables. Odds ratios (OR) and 95% confidence intervals (CI) was estimated and variables whose level statistically significant ($P < 0.25$) on Bivariate analysis was entered jointly into a multivariate logistic regression. P-value less than 0.05 were considered as statistically significant. Data was presented in different tools such as by cross tabulation.

2.11. Ethical Consideration

Prior to data collection, written permission letter was taken from Arba Minch University college of medicine and health science, ethical Review Committee and legal permission from Arba Minch Hospital and health centers in order to conduct the study. Written informed consent was taken from each participant, and the purpose of the study properly described by the data collector's. During the course of the study the information of the participant was kept confidential and optimal amount of sample was taken. To insure confidentiality the name of the patient was not written on the questionnaire rather it was coded.

3. Result

3.1. Characteristics of Study Participants

In this study 312 pregnant women attending antenatal care were participated with 83% of response rate. The mean age of the participants was 24.8. Around 100 (32.1%) of respondent were in age group of 26-23 years and about 3 (1%) were in age group of >36 years. Majority of the women interviewed were married 303 (97.1%) and urban dwellers 213 (68.3%). About 134 (42.9%) of the participant had primary school level and 109 (34.9%) had secondary school level and above. Regarding occupational status, majority of the respondent were house wives 123 (39.4%) which was shown in (Table 1).

Table 1. Socio demographic and socio economic Characteristics of study participants among pregnant women that attend ANC in Arba Minch Public health institutions in Arba Minch town, South Ethiopia, 2019 (n=312).

Variables	Frequency	Percentage
Age		
<20	84	26.9%
21-25	91	29.2%
26-30	100	32.1%
31-35	34	10.9%

Variables	Frequency	Percentage
>35	3	1%
Residence		
Urban	213	68.3%
Rural	99	31.9%
Marital status		
Married	303	97.1%
Unmarried	8	2.6%
Others	1	0.3%
Occupation		
Farmer	78	25%
House wife		
Merchant	123	39.1%
Government employee	77	24.7%
Others	30	9.6%
Monthly income		
<650	4	1.3%
650-1300	87	27.9%
>1300	143	45.8%
Educational level		
Unable to read and write	82	26.3%
Primary	69	22.2%
Secondary and above	134	42.9%
	109	34.9%

3.2. Dietary Habits of Pregnant Women

Out of the 312 participants 129 (41.3%) had the habit of eating animal and animal products once per month, 92 (29.5%) had the habit of eating fruits 2-4 per week and 157 (50.3%) had the habit of eating green vegetables daily. Almost half (47.8%) of the participant drink milk after meal and 252 (80.8%) drink tea immediately after meal (Table 2).

Table 2. Dietary habits among pregnant women that attend ANC in Arba Minch Public health institutions in Arba Minch town, South Ethiopia, 2019 (n=312).

Variables	Frequency	Percent
Consumption of fruit		
Never	35	11.2%
Once a month	65	20.8%
Once a week	86	27.6%
2-4 per week	92	29.5%
Daily	34	10.9%
Consumption of meat and poultry		
Never	63	20.2%
Once a month	129	41.3%
Once a week	74	23.7%
2-4 per week	37	11.9%
Daily	9	2.9%
Consumption of green vegetables		
Don't eat	14	4.5%
Once a month	11	3.5%
Once a week	57	18.5%
2-4 per week	73	23.4%
Daily	157	50.3%
Consumption of legumes		
Don't eat	73	23.4%
Once a month	68	21.8%
Once a week	111	35.6%
2-4 per week	46	14.7%
Daily	14	4.5%
Drinking milk after meal		
Yes	149	47.8%
No	163	52.2%
Drinking tea after meal		
Yes	252	80.8%

Variables	Frequency	Percent
No	60	19.2%

3.3. Pregnancy and Obstetrics Related Characteristics

Concerning obstetrical history, 136 (43.6%) were in their second trimester, 190 (60.9%) of the women had previous pregnancy, 194 (62.2%) were multigravida (2-4 pregnancy), 193 (61.9%) had no child, 58 (18.6%) had blood loss during the current pregnancy, 34 (10.9%) experienced abortion and 200 (64%) had taken iron/folic acid supplementation and 92 (29.5%) taken for at least month, 124 (39.7%) of the pregnant women was on their second ANC visit. 167 (53.5%) of participant use oral contraceptives (Table 3).

Table 3. Pregnancy and obstetrical characteristics of pregnant women that attend ANC in Arba Minch Public health institutions in Arba Minch town, South Ethiopia, 2019 (n=312).

Variables	Frequency	Percent
Previous pregnancy		
Yes	190	60.9%
No	122	39.1%
Gravidity		
Premigravid (first pregnancy)	116	37.2%
Multi gravid (2-5)	194	62.2%
Grand gravid (>5)	2	0.6%
Parity		
Nuliparous (no child)	116	37.2%
Multiparous (2-5 child)	193	61.9%
Grand multiparous (>5)	3	1%
Pregnancy gap b/n current and last pregnancy		
<2year	20	6.4%
2years	60	19.2%
>3 years	116	37.8%
Blood loss during last delivery		
Yes	58	18.6%
No	254	81.4%
Oral contraceptive usage		
Yes	167	53.5%
No	145	46.5%
Abortion		
Yes	34	10.9%
No	278	89.1%
Malaria infection within one year		
Yes	83	26.6%
No	229	73.4%
Gestational age in weeks		
1 st trimester (0-14)	82	26.3%
2 nd trimester (14-26)	136	43.6%
3 rd trimester (>27)	94	30.1%
Iron /folic supplementation		
Yes	200	64.1%
No	112	35.9%
ANC visitation		
1 st	124	39.7%
2 nd	104	33.3%
3 rd	47	15.1%
4 th and above	37	11.8%

3.4. Anemia Status Among Study Participants

Among 312 study participants, 90 (28.8%) were anemic (hgb<11gm/dl). The majority of anemic cases 16% (50/90) were mild type of anemia followed by moderate 12.5% (39/90) and 0.3% (1/90) had severe anemia (Table 4). Among

anemic pregnant women 68 (75.6%) had Normocytic normochromic, 21 (23.3%) of them had Microcytic hypochromic and only 1 (1.1%) had Macrocytic normochromic red cell morphology.

3.5. Intestinal and Hemo-parasites Among Pregnant Women

With respect to blood film examination 54 (17.3%) study partisans were malaria positive, among malaria positive participants 39 (12.5%) of them had *p.vivax*, 15 (4.8%) had *p. falciparum* infection. Regarding stool examination, 12 (3.8%) had *Gardia lamblia*, 6 (1.6%) had *Entamoeba histolitica*, 7 (2.2%) *Ascaris lumbricoid*, were among intestinal parasites detected in the stool of pregnant women (Table 5).

Table 4. Severity of anemia among pregnant women that attending ANC in Arba Minch public health institutions in Arba Minch town, South Ethiopia, 2019 (n=312).

Variables	Frequency	Percent
Anemic	90	28.8%
Mildly anemic	50	16%
Moderately anemic	39	12.5%
Severely anemic	1	0.3%
Non anemic	222	71.2%

Table 5. Status of malaria and intestinal parasits among pregnant women that attending ANC in Arbaminch public health facilities in Arbaminch town, South Ethiopia, 2019 (n=312).

Laboratory tests	Frequency	Percent
Blood film examination		
<i>p. vivax</i>	39	12.5%
<i>p. falciparum</i>	15	4.8%
Negative	258	82.7%
Stool examination		
No IP	281	90.1%
<i>Gardia lamblia</i>	12	3.8%
<i>E. histolitica</i>	6	1.9%
<i>Ascaris lumbricoid</i>	7	2.2%
Others	6	1.9%
Morphological types		
Normocytic normochromic	68	75.5%
Microcytic hypochromic	21	23.3%
Macrocytic normochromic	1	0.3%

3.6. Factors Associated with Anemia

Since our dependent variables is dichotomous logistic regression was used to assess the predictors of anemia. First bivariate analysis was carried out in order to analyze the crudes odds ratio. After bivariate analysis those variable whose crude odds ratio less than 0.25 was candidate for multivariate analysis. So, after bivariate analysis, variables like monthly income, mother educational level, consumption of fruit, consumptions of green vegetables, blood loose during the previous delivery, gestational age, iron and folate usage and malaria are entered together for multivariate analysis and the results shown in (Table 6).

Table 6. Multivariate logistic regressions for factors associated with anemia among pregnant women that attend ANC in Arba Minch Public health institutions in Arbaminch town, south Ethiopia, 2016 (n=312).

Variables	COR (95%CI)	p-value	AOR (95%CI)	P-value
Monthly income				
<650	5.96 (2.84- 12.54)	0.00	3.07 (9.3, 10.09)	0.045
650-1300	1.8 (0.88- 3.75)	0.105	0.12 (0.36-3.6)	
>1300	1 (ref)			
Educational level				
Unable to read and write	4.31 (2.21-8.38)	0.00	2.2 (0.77-8.4)	0.12
Primary	1.24 (0.677-2.29)	0.49	1.35 (0.48-3.78)	0.56
Secondary and above	1 (ref)			
Consumption of fruit				
Never	3.85 (1.37-10.86)	0.011	3.9 (1.36-6.94)	0.02
Once per month	2.3 (0.9-5.87)	0.079	2.1 (0.42-10.39)	0.03
Once per week	0.5 (0.194-1.4)	0.209	0.65 (0.13-3.11)	0.59
2-4 per week	1.1 (0.458-2.87)	0.77	0.86 (0.45-7.67)	0.39
daily	1 (ref)			
Consumption of green vegetables				
Do not eat	1.21 (0.35-4.07)	0.75	0.96 (0.15-6.1)	0.96
Once per month	8.06 (2.039-3.9)	0.00	2.79 (0.4-18.4)	0.30
Once per week	1.28 (0.65-2.52)	0.46	1.79 (0.603-5.33)	0.29
2-4 per week	1.30 (0.704-2.42)	0.39	1.187 (0.43-3.27)	0.74
daily	1 (ref)			
Blood loss				
Yes	2.47 (1.26-4.8)	0.008	3.66 (1.53-8.7)	0.003
No				
Gestational age				
1 st trimester	2.32 (1.21-4.43)	0.011	1.58 (0.42-5.8)	0.49
2 nd trimester	1.01 (0.59-2.01)	0.78	1.43 (0.53-3.86)	0.47
3 rd trimester	1 (ref)			
Iron/folate usage				
Yes	1			
No	2.02 (1.22-3.51)	0.006	1.21 (0.42-3.46)	0.71

COR=Crude odds ratio, AOR=Adjusted odds ratio.

After multivariate analysis using multiple logistic regressions, factors like Educational level, consumption of green vegetables, gestational age and iron/folate usage were changed to non significant showing no effect on anemia. But monthly income, fruit consumption, blood loss and malaria infection remained independently associated with anemia.

Pregnant women that have monthly income <650 is 3 times more likely hood of anemic than pregnant women that have monthly income >1300 with AOR of 3.07 (95%CI: 9.35, 10.09) and also those pregnant women that didn't consume fruit nearly 4 times more likely hood of anemic than the pregnant women that consume fruit daily with AOR of 3.9 (95%CI: 1.36, 6.94). The likely hood of being anemic were 3.6 times higher among pregnant women that have a previous history of blood loss during delivery than with no history of blood loss (AOR=3.66, 95% CI: 1.56-8.7) and pregnant women that have malaria infection, 6 times more likely to develop anemia than those who have not infected with AOR of 6.10 (95%CI: 2.26-16.43).

4. Discussions

The result of the study shows that the overall prevalence of anemia among pregnant women was 28.8%. According to WHO cutoff points to rank the public health significance of anemia in a population, it is moderate public health

significance in the area [12]. However, other studies revealed the prevalence anemia among pregnant women is higher such as in india, Nepal, Kenya it was 82%, 42%, 40% respectively [22, 23, 25]. The variation is due to differences in income, differences in diet and lifestyle that may affect anemia levels. In some parts of our country the prevalence of anemia in pregnant women such as in Nekemte is high relative to our study which is 52% (Mihiret H. *et al* 2011), the variation is due to socio economic and Sociodemographic factors [29].

The prevalence of anemia in our study site is higher than those similar studies reported from different areas like, Gonder Azezo which is 21% (Meseret A. *et al.*). [26] The higher the prevalence could be the low socioeconomic status, lower nutritional status and a parasitic infestation of the study area than those reported from elsewhere. But it was relatively consistence with similar study carried out in Harerge which is 27.1% (Kefyalew F *et al.*). [28]

Regarding anemia status by severity, High proportions of anemia were mild (55.5%) followed by moderate (43.3%) and sever anemic 1% which was consistence with similar study conducted in Sidama Region, Ethiopia by Samson G. *et al.* [27]

Our study tried to demonstrate the common morphological characteristic of anemia among pregnant mother. Out of the total anemic pregnant women, 75.7% had Normochromic normocytic, 23.3% had Microcytic hypochromic and only 1%

had macrocytic normochromic. This finding is deviated from studies conducted in India [22], Normocytic normochromic blood picture were the most common morphological types of anemia found in this study, which are characteristic of anemia due to blood loss or other obstetrical issues. Our morphological study result agreed with studies conducted in Gonder [26], the high percent of Normocytic Normochromic anemia suggested that majority of them were might be in the early stages of iron deficiency anemia.

Multivariate logistic regression analysis showed that, monthly income AOR 3.07 (9.35-10.0) with p value <0.000, pregnant women that didn't consume fruit AOR 6.9 (1.36-34.941), those that have previous blood loss AOR 3.66 (1.53-8.7) with P-value < 0.000, and that have malaria infection AOR 6.10 (2.25-16.4) with p value <0.000, was independently associated with Anemia

5. Conclusions

The result of the study shows that prevalence of anemia among pregnant women that attend ANC in Arba Minch Public health facilities was 28.8%. It is moderate public health significance among pregnant women according to WHO level of public health significance. The majority of the anemia was mild (55.5%) and moderate anemic 43.3%. only 1% was severe anemia.

The anemia observed is associated with multiple factors such as socioeconomic factors like family income, dietary habit in consumption of fruit, heavy blood loss in previous pregnancy, and malaria infection.

Morphologically, majority were Normocytic normochromic (75.7%), and Microcytic hypochromic anemic is (23.3%)

Based on the result obtained from this study the following recommendations were forwarded.

- 1) Awareness should be created for pregnant women on utilization of easily available and affordable iron rich diet such as fruits, green vegetables and others.
- 2) Giving HID utilization of ITN and other malaria prevention mechanisms.
- 3) Another further study should be done to identify the causes of anemia by evaluation of iron indicators like serum ferritin, serum transferrin etc.

Competing Interest

The authors declare that they have no competing interests.

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References

- [1] WHO/UNICEF: Iron deficiency Anemia, Assessment, prevention, and control: A guide program managers Geneva: WHO; 2011.
- [2] Bruno de Benoist et al, WHO, CDC worldwide prevalence of anemia 1993-2005; WHO Global data base on anemia, 2008.
- [3] Chowdhury, Rahman, M. Moniruddin ABM, 'Anemia in pregnancy'; *Medicine Today*, 2014; 01 (26): 49-52.
- [4] Reveiz L, Gyte GM, Cuervo LG. Treatments for iron-deficiency anemia in pregnancy (Review). The Cochrane Library. 2007.
- [5] Milman N, Bergholt, Byg K. E Ericson L, Gradual N. Iron status and balance during pregnancy, A critical reappraisal of iron supplementation *Acta obstetrics Gynecology Scand* 1999; 78749-57.
- [6] Scantz Dunnj, Nour NM, Malaria and pregnancy. A Gobar health perspective; *Reviews in obstetrics & Gynecology*, 2009; 2 (3): 186-192.
- [7] Huddle JM, Gibson RS, Cullinan TR. The impact of malarial infection and diet on the anemia status of rural pregnant Malawian women. *European journal of clinical nutrition*. 1999 Oct; 53 (10): 792-801.
- [8] WHO. Hemoglobin concentrations for the diagnosis of anemia and assessment of severity. Vitamin and Mineral Nutrition Information System. Geneva, World Health Organization, 2011 (WHO/NMH/NHD/MNM/11.1).
- [9] WHO. The global prevalence of anemia in 2011. Geneva: World Health Organization; 2015.
- [10] Trends in maternal health in Ethiopia, in depth analysis of EDHS 2000-2011. Adis Ababa 2012.
- [11] Stoltzfus, Mullany, Black. Iron Deficiency Anemia, "Comparative quantification of health risks: Global and regional burden of disease attributable to selected major risk factors: WHO 2004.
- [12] Iron deficiency anemia, assessment, prevention and control. A guide for program managers, Geneva, WHO, 2001.
- [13] F. W Lone, R. N Qureshi, and F. Emanuel, 'maternal anemia & It's impact on prenatal outcome. *tropical medicine and international health*, 2011; 4 (9): 486-490.
- [14] T. kousar, v. memon, S. shekh, S, Memon, and R. Sehto "risk factors and causes of death in neonates, *Rantal Medical journal*, 2010; 2 (35): 205-208.
- [15] B, J, Brabin, M, Hakimi, and D. peuetier, An analysis of anemia and pregnancy related maternal mortality." *journal of nutrition*, 2010; 2 (131): 6045-6155.
- [16] Virender P, Gautam, Bansal Y, Taneja DK and Saha R. Prevalence of Anemia amongst Pregnant Women and Its Sociodemographic Associate in Rural Area in Delhi, *Indian Journal of Community Medicine*, 2002 (28).
- [17] Leanstra T, Karinuki SK, Kurtis JD, prevalence and severity of anemia and iron deficiency cross sectional studies in pregnant women in western Kenya. *Eur clin Nutr* 2010; 58: 681-691.

- [18] Haidar, JA and Pobocik R. Iron deficiency anemia is not a rare problem among women of reproductive ages in Ethiopia: a community based cross sectional study. *BMC blood Disorders* 2009; 9: 1-12.
- [19] Ministry of Health, Planning and Programming Department. Health and Health Related Indicators. FMOH Addis Ababa, Ethiopia 2000.
- [20] WHO, the world health report 2002, Reducing risks, programs healthy life, 2002, <http://WWW.WHO.int/whr/2002/enwhr02-en-pdf>.
- [21] Health Organization. The Prevalence of Anaemia in Women: A Tabulation of Available Information Geneva: WHO; 1992.
- [22] Viveki RG, Halaappanavar AB, viveki, PR, Halki SB, Maledvs Deshpande PS. prevalence of anemia and it's epidemiological determinants in pregnant women. *AL Ameen J Med sci* 2012; 216-223.
- [23] Singh P. Anemia during pregnancy in the women of western Nepal. *Bali Medical Journal*. 2013 Feb 1; 2 (1).
- [24] Mulambalah Chrispinus Siteti, Siamba Donald Namasaka, Ogutu Philip Ariya, Siteti Darwin Injete, Wekesa Antony Wanyonyi. Anemia in Pregnancy: Prevalence and Possible Risk Factors in Kakamega County, Kenya. *Science Journal of Public Health*. 2014; 3 (2): 216-222.
- [25] Dabis F. Anemia during pregnancy in Burkina Faso West Africa 1995-96: Prevalence and associated factors. *Bull World Health Org*. 1999; 77: 916-22.
- [26] Alem M, Enawgaw B, Gelaw A, Kenaw T, Seid M, Olkeba Y. Prevalence of anemia and associated risk factors among pregnant women attending antenatal care in Azezo Health Center Gondar town, Northwest Ethiopia. *Journal of Interdisciplinary Histopathology*. 2013; 1 (3): 137-44.
- [27] Gebremedhin S, Enquselassie F, Umeta M. Prevalence and correlates of maternal anemia in rural Sidama, Southern Ethiopia. *African journal of reproductive health*. 2014 Apr 11; 18 (1): 44-53.
- [28] Kefiyalew F, Zemene E, Asres Y, Gedefaw L. Anemia among pregnant women in Southeast Ethiopia: prevalence, severity and associated risk factors. *BMC research notes*. 2014 Nov 3; 7 (1): 771.
- [29] Mihiretie H, Fufa M, Mitiku A, Bacha C, Getahun D, Kejela M, Sileshi G, Wakshuma B. Magnitude of Anemia and Associated Factors among Pregnant Women Attending Antenatal Care in Nekemte Health Center, Nekemte, Ethiopia. *Journal of Medical Microbiology & Diagnosis*. Sep 18; 2015.
- [30] Nega D, Dana D, Tefera T, Eshetu T. Anemia associated with asymptomatic malaria among pregnant women in the rural surroundings of Arba Minch Town, South Ethiopia. *BMC research notes*. 2015 Mar 31; 8 (1): 110.
- [31] Bekele A, Tilahun M, Mekuria A. Prevalence of Anemia and Its Associated Factors among Pregnant Women Attending Antenatal Care in Health Institutions of Arba Minch Town, Gamo Gofa Zone, Ethiopia: A Cross-Sectional Study. *Anemia*. 2016 Feb 22; 2016.
- [32] Dr. Amit Agravat, Dr. Gauravi Dhruva, Dr. Khyati Mehta, Dr. Nishaparmar, Dr. Rutvi Dave Study of Peripheral Blood Smear Examination with Hemoglobin Estimation in Pregnant Women Attending The Antenatal Clinic *International Journal of Scientific Research* 2014, (3): 9.
- [33] https://en.wikipedia.org/wiki/Arba_Minch#cite_ref-2.
- [34] Central Statistical Authority of Ethiopia (CSA), Population and Housing Census of Ethiopia: Ethiopia Statistical Abstract, CSA, Addis Ababa, Ethiopia, 2007.