

# Prevalence of Anemia and Associated Risk Factors among Pregnant Women Attending Antenatal Care in Selected Health Centers in Addis Ababa, Ethiopia

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## Abstract

**Background:** Anemia is a major public health problem and a significant health concern globally. It affects all age groups of people and is particularly more prevalent in pregnant women in developing countries and major risk factor for unfavorable outcome of pregnancy both for the mother and the fetus. This study was conducted to determine the prevalence of anemia and associated risk factors among pregnant women who received antenatal health services in Wereda 9 health centers in Addis Ababa, Ethiopia.

**Methods:** Retrospective study design was used to collect secondary data from antenatal care and laboratory logbook of 3-year document of pregnant women from January 2014 to December 2016. Socio-demographic data of study participants and associated risk factors was collected using a structured questionnaire. Data was entered and analyzed using SPSS Version 20 and reported using frequency, tables and figures. P-value less than 0.05 were taken as statistically significant at 95% Confidence Interval (CI).

**Results:** A total of 3091 pregnant women data over three years period was analyzed in this study. The mean ( $\pm$  SD) age of the study participants was  $25.51 \pm 4.47$  years with a range of 15-42 years. Mean hemoglobin was  $13.32 \pm 1.52$  g/dL. The mean hemoglobin in anemic group and normal group was  $11.03 \pm 1.09$  g/dL and  $13.87 \pm 1.04$  g/dL, respectively. The overall burden of anemia among study participants in the study area was 312 (10.1%).  $\chi^2$  analysis of categorical variables like age group ( $\chi^2=0.69$ ,  $p=0.707$ ), gravidity ( $\chi^2=0.033$ ,  $p=0.856$ ) had no association with anemia among study populations whereas taking tablets for prevention of anemia ( $\chi^2=40.706$ ,  $p=0.000$ ), nutritionally consulting by health care professional ( $\chi^2=40.150$ ,  $p=0.000$ ) and frequency of visiting health facilities ( $\chi^2=9.913$ ,  $p=0.019$ ) during their antenatal follow up had association with prevention of anemia.

**Conclusion:** The overall anemia prevalence in the pregnant women is substantially higher and efforts to minimize the problem such as supplementary tablets and frequent health facility visits should be promoted and provided by all concerned stakeholders.

**Keywords:** Anemia; Pregnant women; Antenatal care; Public health; Malnutrition

**Abbreviations:** ANC: Antenatal Care; AIDS: Acquired Immunodeficiency Syndrome; Hgb: Hemoglobin; HIV: Human Immunodeficiency Virus; PRIME-K: Partnership in Innovative Medical Education in Kenya; SPSS: Statistical Package for Social Sciences software; WHO: World Health Organization

## Introduction

### Background

Anemia remained as a major public health problem among children, pregnant women and non-pregnant women leading to morbidity and mortality in tropical and sub-tropical countries [1]. It

can be defined in many ways where one is lowered ability of the blood to carry sufficient oxygen to the tissue; as a result it could lead to weakness, nausea, loss of consciousness noticeable pale color of the skin [2].

The reduction in oxygen supply could be because of blood loss as in trauma and gastrointestinal bleeding among others, or decrease production of Red Blood Cells (RBCs) due to Iron deficiency, lack of vitamins B12, thalassemia and a number of Neoplasia of the bone marrow [3], with major consequences for human health as well as social and economic development [4].

In developing countries pregnancy associated mortality and morbidity is one of most important public health problems such as, premature birth, intra uterine growth retardation, and high infant mortality [5]. Lower socio-economic communities in developing countries are at high risk for maternal death associated with blood loss

and anemia [6]. Mental impairment of children who were anemic in the very beginning of their life had been reported born from mothers who were anemic during pregnancy [7].

Women who are pregnant are at a higher risk for developing anemia due to the consumption of substances and nutrients by the baby needed for hemoglobin synthesis. Anemia during pregnancy can be a mild condition and easily treated if caught early on however it can become dangerous of both the mother and the baby if it goes untreated well [8,9].

In Ethiopia, the magnitude of anemia among pregnant women was 22% and the prevalence of anemia in pregnant women living in rural area is 1.75 times higher as compared to those who live in urban area. Ethiopia is among the poorest country in Africa with high rates of food insecurity and malnutrition [10,11].

The role of early and quality antenatal care (ANC) in preventing maternal anemia cannot be overemphasized. Good nutritional awareness and practices or quality prenatal services and utilization among well motivated and highly aware women are expected to reduce the prevalence of anemia in pregnancy in any society. Nutritional and prenatal practices in Ethiopia like in most African countries are not evolving, and anemia in pregnancy is one of the eloquent reflections of the two of a kind [12].

Therefore, this research was aimed to assess the prevalence of anemia and associated risk factors among pregnant women who were following up antenatal care in a Wereda 9 health facility and assess new protocol or focused antenatal care program [13-23].

## Material and Methodology

### Study setting and context

A facility based retrospective cross-sectional study was conducted among pregnant women who had antenatal follow up care from January 01, 2014 to December 30, 2016. The study was conducted in Kolfe Keranio Sub-City, Wereda 9 health centers, Addis Ababa, Ethiopia. The health centers were delivering service for about 150-200 out patients per day.

On average 40-50 pregnant women visited the antenatal care clinics on daily bases. The health facility with fairly well established and staffed maternity section and medical record department. Its annual delivery rate was about a 550 deliveries. The laboratory was fairly well equipped with Humanlyser hematological automated analyzer among other laboratory equipment.

### Source population

All pregnant women, who attended antenatal care, follow up in the health centers, Addis Ababa, Ethiopia

### Study population

Data of 3091 pregnant women who attended ANC follow up and had screening test for anemia in the Wereda 9 health center from January 01, 2014-December 30, 2016 was collected. The data was collected conveniently from available record logbook in ANC and laboratory registration logbook.

Analysis was limited to only 3091 women (study population) who fulfilled the inclusion criteria of registering and attending antenatal clinic to term or delivering at the facility. Those with incomplete booking/term hematocrit pair records were excluded from the study.

Excluded also were antepartum, preeclampsia, sickle cell disease patients and preterm deliveries, because of referring to nearby Hospitals from health centers for better managements.

### Data collection procedure

Socio-demographic variables and others relevant clinical data were collected from antenatal and laboratory logbook by using standard structured checklist designed to extract all necessary data.

Logbook is defined for the purpose of this study as having registered and thereafter attended antenatal clinic at least once before delivery. The gestational period is divided into trimesters: The first, second and third trimesters corresponding to the first 13 weeks, 14-27 weeks and 28 weeks to term respectively.

### Data quality assurances

Before data collection, adequate training was given for data collectors and supervisors by the principal investigator to clarify how to collect data. Data collectors were instructed to check the completeness of each data before submission. This was also double checked by the principal investigator.

### Data management and statistical analysis

Data was entered using Excel Microsoft system and transferred to SPSS version 20.0 for analysis. Association between the burden of anemia and risk factors was assessed by Chi-square ( $X^2$ ) tests. Logistic regression was used to determine the effect of independent variables on the burden of anemia.

In all case a 95% confidence interval was used and P-values less than 0.05 is considered as statistically significant. Figures and tables are used for data presentation and results expressed using frequency and percentages.

## Results

A total of 3091 pregnant women data from the year (2014-2016), was collected and analyzed in this study. The mean ( $\pm$  SD) age of the study participants was  $25.51 \pm 4.47$  years. The participant's age range was 15-42 years. Majority of the study subjects' age group was 17-24 (43.0%). About 51% of the pregnant women were first pregnant whereas, 49% was multi-pregnant women.

Frequency of visiting the health facility for their antenatal follow up showed that 41.2%, 15.8%, 18.9% and 24.1% were visiting once, two times, three times and four times respectively.

Most (86.8%) of pregnant women had taken nutritional consultation and anemia prevention tablets by health professional during their antenatal follow up (Table 1).

Variables	Frequency	Percent (%)
<b>Age group</b>		
17-24	1328	43
25-29	1196	38.7
>30	565	18.3
<b>Year</b>		
2014	1214	39.3
2015	1056	34.2
2016	821	26.6
<b>Frequency of health facility visit</b>		
Once	1275	41.2
Twice	488	15.8
3 times	583	18.9
4 times	744	24.1
<b>Anemia prevention taken</b>		
Yes	2681	86.7
No	410	13.3
<b>Nutritional consult</b>		
Yes	2682	86.8
No	409	13.2
<b>Number of pregnancy</b>		
First pregnancy	1580	51.1
Multi pregnancy	1511	48.9
<b>severity of anemia</b>		
Moderate	15	0.5
Mild	297	9.5
<b>Anemia status</b>		
Anemic	312	10.1
Non-anemic	2779	89.9

**Table 1:** Shows frequency of socio-demographic characteristics and associated factors among study subjects, 2014-2016 (n=3091).

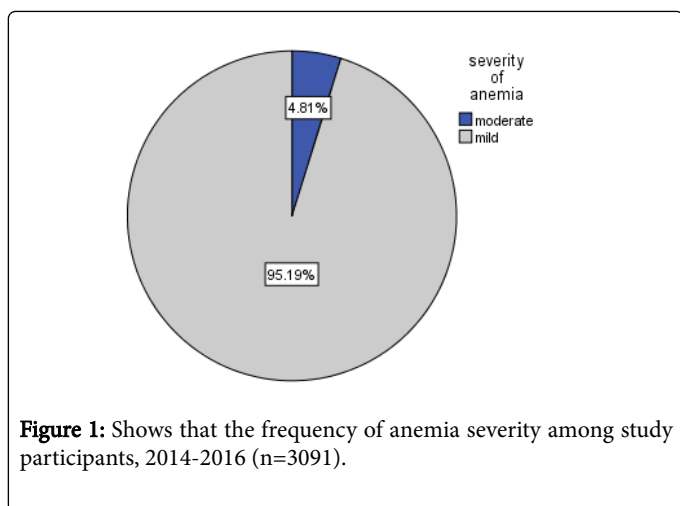
Mean hemoglobin was  $13.32 \pm 1.52$  g/dL, 95%CI: 13.19-13.52. The mean hemoglobin in anemic group and normal group was  $11.03 \pm 1.09$  g/dL and  $13.87 \pm 1.04$  g/dL, respectively (Table 2).

The overall burden of anemia among study participants in the study area was 312 (10.1%) of these anemic pregnant women, majority

(95.19%) of the anemic cases were of the mild type of anemia (Hgb 10.0-10.9 g/dL) and 4.81% cases were moderate anemia (7.0-9.9 g/dL) and while none of them had severe anemia (Figure 1).

Variables	Anemia status		X <sup>2</sup>	P-value
	Anemic, N (%)	Non-anemic, N (%)		
<b>Age group</b>				
17-24	129 (4.2)	1199 (38.8)	0.693	0.707
25-29	121 (3.9)	1075 (34.8)		
>30	62 (2.0)	503 (16.3)		
<b>Year</b>				
2014	133 (4.3)	1081 (35.0)	3.277	0.194
2015	109 (3.5)	947 (30.6)		
2016	70 (2.3)	751 (24.3)		
<b>Number of pregnancy status</b>				
First pregnancy	161 (5.2)	1419 (45.9)	0.033	0.856
Multi-pregnant	151 (4.9)	1360 (44.0)		
<b>Frequency of health facility visit</b>				
Once	151 (4.9)	1275 (41.2)	9.913	0.019*
Twice	51 (1.6)	488 (15.8)		
3 times	53 (1.7)	583 (18.9)		
4 times	57 (1.8)	745 (24.1)		
<b>Anemia prevention taken</b>				
Yes	156 (5.05)	2525 (81.7)	407.06	0.000*
No	156 (5.05)	254 (8.2)		
<b>Nutritional consultation</b>				
Yes	157 (5.1)	2525 (81.7)	401.5	0.000*
No	155 (5.0)	254 (8.2)		

**Table 2:** Burden of anemia by socio-demographic and behavioral characteristics among study participants, 2014-2016 (n=3091) [\*Shows that statistically significant].

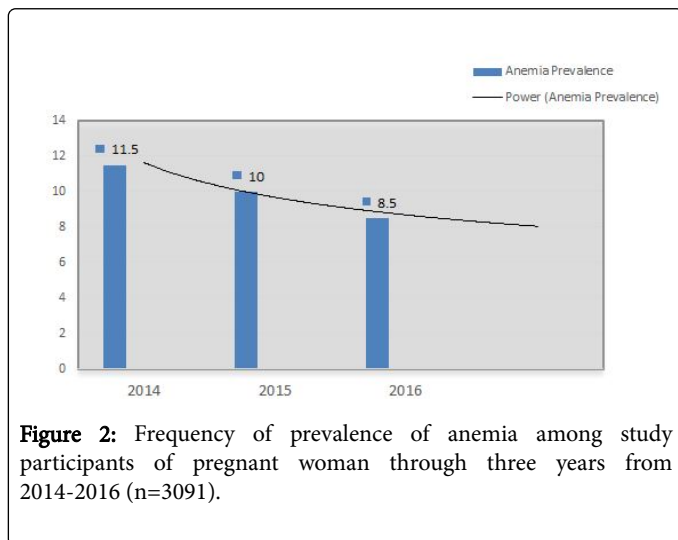


With regard to the risk factors, 4.2%, 3.9% and 2.0% of anemic pregnant women were within age group of 17-24, 25-29 and >30 years respectively. There is no difference in between anemic study participants who were used to tablets for prevention of anemia was (5.05%) and who didn't used (5.05%). In this study anemic prevalence also the same for these who nutritionally consulted and not consulted by health professional during their antenatal care follow up.

Study participants who visited health facilities only one time during their antenatal follow up care were more anemic than those who visited the health facilities two time, three time, and four times, 4.9%, 1.6%, 1.7% and 1.8% respectively.

In this study chi-square analysis of categorical variables like age group ( $X^2=0.69$ ,  $p=0.707$ ), gravidity ( $X^2=0.033$ ,  $p=0.856$ ) had no association with anemia whereas taking tablets for prevention of anemia ( $X^2=40.706$ ,  $p=0.000$ ), nutritional consulting by health professional ( $X^2=40.150$ ,  $p=0.000$ ) and frequency of visiting health facilities ( $X^2=9.913$ ,  $p=0.019$ ) during their antenatal care follow up had significant association with anemia status (Table 2).

There was a slightly decrement of anemia prevalence through a three year from 2014, 2015 and 2016 indicating that 11.5%, 10.0% and 8.5% respectively Figure 2.



**Figure 2:** Frequency of prevalence of anemia among study participants of pregnant woman through three years from 2014-2016 (n=3091).

## Discussion

The overall magnitude of anemia among the pregnant women in the current study is 10.1%. Compared to the previous studies in various settings in Ethiopia, this figure is much lower, for instance, a prevalence of 53.9% were reported from Gilgel Gibe dam area south west Ethiopia [24], 56% from Gode south eastern Ethiopia (25), 16.6% reported from Gondar north west Ethiopia and 16.3% in Addis Ababa, Selam Health Center. Outside of Ethiopia for instance the prevalence of anemia was much lower (4.7%) among pregnant women in Iran [25].

The possible variation might be the factor such as malaria endemicity particular in Gilgel Gibe dam and Gode area which increases the magnitude of anemia among these populations. Another possible explanations was among country like Iran also the altitude of the area, sampling size, socio-economic and other baseline characteristic of the study population, iron and foliate supply are routinely prescribed for pregnant women and that might be among the reason for very low prevalence rate in the country [26]. When we come to our country, foliate, Iron supplement and nutritional consult was started on 2016, focused on antenatal care protocol and this could be one possible reason for the decrement of anemia prevalence over the years in the current study.

Another study in Ethiopia has indicated that moderate anemia constitutes a significant portion of anemia in pregnant women attending ANC follow up clinics [24]. In fact, moderate anemia causes considerable consequences such as loss of energy and hinders these women activities such as child care and household management as well as job performance, as a result, they are more vulnerable to infections and improvement from infections may be prolonged [10]. Therefore, increased health education on risk factors and interventions to prevent the prevalence and severity of anemia among pregnant women should be a priority for mothers attending ANC in our study area and the result showed that anemia is mild public health problem among the women were no severe case, the result markedly different from south east Ethiopia were the prevalence of severe anemia was 12.5% [25]. This might be due to different socio-economic status and level of health facility, level of health awareness difference.

The absence of severe case and overall lower anemia status in this study is a good indication that the disorder could be further reduced if the control effort is scaled up. The prevalence of anemia in the rural women was significantly higher than prevalence of anemia in urban women. Similar results obtained in a study conducted at Asendabo and Mettu, anemia among pregnant women was consistently higher in rural women compare to the urban counterparts. This was more likely due to lack of awareness of adequate supply of micro nutrients during pregnancy, antenatal care and health education. Similar results were found in Ethiopia [27]. In this study pregnant Women who were from outside Addis Ababa had higher prevalence of anemia than those residing in Addis Ababa perhaps due to relatively better health education, living standard and other related factor. Moreover, a study conducted on pregnant women in India showed a statistically significant association between residence and anemia which is consistent with the current study [5]. This finding indicates the need for strengthening of interventions in rural areas to create awareness of antenatal care, balanced diet during pregnancy and family planning.

The role of good nutrition and balanced dieting in the prenatal period will help in ameliorating anemia in pregnancy. According to WHO iron deficiency anemia accounts for some 50% of anemia generally [28] therefore, proposed increased iron supplementation, especially to vulnerable groups like the pregnant women, especially through food based approaches such as food fortification and dietary diversification.

In most of the settings mothers for multifaceted reasons ranging from maternal age, education, parity, cultural belief, ignorance, poverty, or over confidence fail to access the facilities for prenatal care. Even the few that try to avail this, poorly comply with the prenatal interventional measures in place [17-20]. This study also indicated that the prevalence of anemia is relatively higher in pregnant women who attended (visited) ANC follow up only one time than a pregnant women who had attended (visited) ANC follow up more than two and three times, this indicated that early commencement of prenatal care as suggested from this study is one of the invaluable aspects for quality prenatal service delivery as it positively influenced the anemia recovery at term. WHO recommended commencement of ANC as early as the first trimester of pregnancy for optimal benefits of the prenatal services, which means there is less chance to monitor them by checking hemoglobin concentration and other health conditions and to take appropriate treatment and preventive measurements to prevent them from being become anemic. Improved women education, Health education, empowerment and home visiting those women defaulting antenatal clinic attendance are recommended to improve on their utilization of prenatal interventions. This is expected to make them appreciate better the need for early commencement and compliance with prenatal care [21].

The limitation of the study, this work though drew its strength on the sample size, it was health center based study, lacked randomization and multicenter spread population therefore the findings may not be generalized (representative) to the rest of pregnant women in Ethiopian, but it will add to the pool of the findings from other centers to give the Ethiopian anemia in pregnancy situation. We also recognize physiological hemodilution in pregnancy capable of leading to false hematocrit results as a potential limiting factor in anemia in pregnancy studies. A well designed prospective study will be more appropriate.

In conclusion, present study indicated that prevalence of anemia in study population was categorized as "mild" type and was decreasing year after year and if we keep going well on focused antenatal care,

health education in health facilities and at community level by health extension workers we will be listed under categories of the lower prevalence of anemia among pregnant women soon, Although anemia in pregnancy is still a public health concern in the country, it appeared amenable to quality prenatal interventions. Early commencement of ANC for early detection and control of anemia in pregnancy is offered.

## Declarations

## Ethical consideration

This study was conducted after getting an approval from Institutional Review Board (IRB) committee of Addis Ababa University, School of Medical Laboratory Science and letter was written from the university to the health centers. Moreover, the official letter of cooperation granted by Addis Ababa city administration health bureau, and Kolfe Keranio Sub-city health office. Permission was obtained from respective health facilities.

## Availability of data and material

The data sets generated during the current study are available from the corresponding author on reasonable request.

## Competing interests

The authors declare that, they have no competing interest.

## Consent for publication

Consent for publication was received from respective health facilities.

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The authors had no funding support or funding to report.

## Authors' contributions

BL conceived and designed the study protocol collected data, performed analysis, interpretation of data. All of the authors (KT, DG, DT, MN) were participated in data collection, analysis, interpretation, critically evaluated and approved the manuscript.

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