

DOI: 10.21767/1791-809X.1000529

# Prevalence of Anemia and its Associated Factors among Pregnant Women Attending Antenatal Care (ANC) In Mizan Tepi University Teaching Hospital, South West Ethiopia

Befkadua Zekarias, Asrat Meleko\*, Abdu Hayder, Abraham Nigatu and Tilahun Yetagesu

Department of Public Health, College of Medicine and Health Sciences, Mizan -Tepi University, Mizan Teferi, Ethiopia

\*Corresponding author: Asrat Meleko, Department of Public Health, College of Medicine and Health Sciences, Mizan -Tepi University, Mizan Teferi, Ethiopia, Tel: +251-941-9897-97; E-mail: melekoasrat@gmail.com

Received date: 20 September 2017; Accepted date: 20 October 2017; Published date: 27 October 2017

Copyright: © 2017 Zekarias B, et al. This is an open-access article distributed under the terms of the creative Commons attribution License, which permits unrestricted use, distribution and reproduction in any medium, provided the original author and source are credited.

Citation: Zekarias B, Meleko A, Hayder A, Nigatu A, Yetagesu T (2017) Prevalence of Anemia and its Associated Factors among Pregnant Women Attending Antenatal Care (ANC) In Mizan-Tepi University Teaching Hospital, South West Ethiopia. Health Sci J. Vol. 11 No. 5: 529.

## Abstract

**Background:** Even if anemia is a worldwide public health problem affecting numerous people in all age groups, particularly the burden of the problem is higher among pregnant women. Anemia is estimated to contribute to more than 115,000 maternal deaths and 591,000 prenatal deaths globally per year. Maternal mortality is the prime health indicator in any society. Therefore, this study aimed at determining prevalence of anemia and assessing associated factors among pregnant women which might help for intervention and further study.

**Objective:** The objective of this study was to determine prevalence and determinants of anemia among pregnant women attending Antenatal Care (ANC) in Mizan Tepi University teaching Hospital, South West Ethiopia.

**Materials and methods:** Institutional based cross-sectional study was conducted at antenatal care (ANC) departments of Mizan-Tepi university teaching hospital (MTUTH) from April 3 to May 3, 2017. Systematic random sampling technique was used to select the appropriate study unit. The data was collected using questionnaire, physical examination and laboratory investigation. Data was entered, cleaned and checked using Epi Info version 3.5.3 and analyzed using SPSS version 20 statistical software. Bivariate and multivariate logistic regression analysis was performed associated factors. Finally, the result was presented using frequency tables, figures and graph.

**Results and discussion:** The overall prevalence of anemia using a cut off level of hemoglobin <11 g/dl (<33% Haematocrit) was 23.5% (72 /306). Out of all anemic pregnant women about 59.7% (43/72) were mildly anemic, 33.3% (24/72) were moderately anemic and 7% (5/72) were severely. Multiple logistic regression analysis revealed that previous chronic diseases with (AOR=6.695 CI [1.5, 29.8]), knowledge about anemia (AOR=0.216, CI

[0.090-0.516]), excessive menstrual bleeding (AOR=3.361, CI [1.375, 8.217], history of malaria attack (AOR=7.936, CI: [3.807, 16.546]) and history of abortion (AOR=4.562, CI: [ 2.212, 9.412]) had significant association with anemia.

**Conclusion and recommendation:** The finding on the prevalence of anemia obtained from this study emphasized the need for continuous strengthening of interventions on factors associated with anemia. Thus, awareness creation should be promoted through the strengthened health education on risk factors. Similarly it would be better if concerned stakeholders work on increasing the knowledge of pregnant women about anemia and its consequence as well preventive methods.

**Keywords:** Anemia; Pregnant women; Hemoglobin

## Introduction

Anemia during pregnancy is defined by the Centers of Disease Control and Prevention (CDC) and World Health Organization (WHO) as a hemoglobin concentration less than 11 g/dL. Also anemia is considered as a condition in which the number and size of red blood cells, or the hemoglobin concentration, falls below an established cut-off value, as a result lead to impairment of the capacity of the blood to transport oxygen around the body [1].

Anemia is observed as an indicator of both poor nutrition and poor health. It impairs health and well-being in women and increases the risk of maternal and neonatal adverse outcomes. During pregnancy anemia is responsible for a lot of complications in women. Some of those associated problems are less exercise tolerability, puerperal infection, thromboembolic problems, postpartum hemorrhage, pregnancy induced hypertension, placenta praevia, cardiac failure, low birth weight, preterm delivery, and prenatal death [2]. Even if anemia is a worldwide public health problem affecting numerous people in all age groups, particularly the burden of the problem is higher among pregnant women [3].

It is fact that anemia is worldwide disease even though women and under-five children are mostly affected by anemia; it can also touch all individual at any stage of life. Globally anemia affected 1.62 billion people, of these, 56 million anemia cases were found in pregnant women [4]. Also anemia is estimated to contribute to more than 115000 maternal deaths and 591000 prenatal deaths globally per year [5]. Even if 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 its burden is more significant in developing countries [6].

Various studies confirmed that until recent time, anemia in pregnant women remains one of the most unresolved public health problems in developing countries because of various socio cultural problems like illiteracy, poverty, lack of awareness, cultural and religious taboos, poor dietary habits, and high prevalence of parasitic infestation [2]. For instance, current estimates from the World Health Organization (WHO) put prevalence of anemia at 41.8% among pregnant women, with the highest prevalence rate (61.3%) found among pregnant women in Africa and 52.5% among South East Asia. Also this report revealed that sub-Saharan Africa is the most affected region, with anemia prevalence among pregnant women estimated to be 17.2 million, which corresponds to approximately 30% of total global cases [7].

Like other developing countries the magnitude of problem associated with anemia is unquestionably high in Ethiopia. In Ethiopia, anemia is the severe problem affecting 62.7% of pregnant mothers and 52.3% non-pregnant women. According to the Ethiopian Demographic and Health Survey (EDHS) report, 17% of reproductive age women are estimated to be anemic and 22% of the pregnant women are anemic [8]. Different studies showed that the prevalence of anemia is varied in different regions of the country. For instance, prevalence rates of 31.6% in Sidama [9] and 39.94% in woliyata sodo [10] were recorded in recent years. A higher rate which is 61.6% has also been reported in pregnant women in Boditii health center [11].

Maternal mortality is the prime health indicator in any society. Therefore, health service in a country should lower the incidence of anemia to improve the health status of the community. It is fact that the availability of local information on the magnitude and associated factors has a major role in the management and control of anemia in pregnancy contributing to reduction in maternal morbidity and mortality. Despite the wider scope of the problem, little research data has been explored about severity of anemia at ANC in this study area, and those previous researches used hemoglobin level determination from client chart which limits its reliability except this study determined the hemoglobin level of each client in spite of recorded previous hemoglobin level.

Therefore, this study aimed at determining prevalence of anemia and assessing associated factors among pregnant women attending antenatal care at Mizan-Tepi University teaching hospital. The findings of this study would help to guide the antenatal care service providers and other concerned stakeholders to work more towards alleviating the

problem. Also it might be used as a base line data for other researchers who are interested on this area.

## Objectives

### General objectives

- To Determine prevalence and determinants of anemia among pregnant women attending Antenatal Care (ANC) in Mizan-Tepi University teaching Hospital, South West Ethiopia.

### Specify objectives

- To determine prevalence of anemia among pregnant women following ANC in Mizan-Tepi Teaching hospital, Bench Maji Zone, South West Ethiopia.
- To identify factors associated with anemia among pregnant women's attending ANC at Mizan-Tepi University Teaching hospital, Bench Maji Zone, South West Ethiopia.

## Materials and Methods

### Study area and period

The study was conducted at antenatal care (ANC) departments of Mizan-Tepi university teaching hospital (MTUTH), located in Bench Maji zone, South West Ethiopia from April 3 to May 3, 2017. Mizan-Tepi University teaching hospital is one of the pioneer hospitals in Bench Maji zone, with capital of Mizan Teferi (also called Mizan Aman) town, found in Aman sub town kebele 02 and landed on 9,7560 m<sup>2</sup>. The capital of the zone is located at a distance of 574 km far from Addis Ababa, South West Ethiopia. Currently the hospital is serving many peoples who live in several zones of SNNPs and Gambella states with approximate catchment population of 2 million peoples.

### Study design

Institutional based cross-sectional study was conducted among pregnant mother attending antenatal care (ANC) department of Mizan-Tepi university teaching hospital.

### Population

**Source of population:** The source population for this study was all pregnant women attending antenatal care (ANC) department at Mizan-Tepi University teaching hospital (MTUTH).

**Study population:** All pregnant women attending antenatal care (ANC) service at Mizan-Tepi university teaching hospital that fulfill the inclusion criteria during the data collection period was considered as study participants.

## Eligibility criteria

**Inclusion criteria:** All pregnant women who came for antenatal care services during the study period were included in the study.

**Exclusion criteria:** Seriously ill patient due to other medical condition, unable to respond, mentally ill pregnant women and pregnant women with repeated visits were excluded during study time.

## Sample size determination

The sample size was computed using the general formula for a single population proportion. It was calculated by considering 41.2% prevalence of anemia among pregnant women (12), 5% margin of error and 95% confidence interval (CI). Accordingly, the final sample size would be 381. Sample size is calculated by using single population proportion formulas as follows:

$$N = (Z_{\alpha/2})^2 \left( \frac{P(1-P)}{d^2} \right)$$

Where, N=sample size, P=estimated prevalence of anemia in the study population is 41.2%,  $d^2$ =margin of error and  $Z_{\alpha/2}$ =the value of standard normal distribution corresponding to a significant level of alpha.

$$N = (1.96)^2 \left( \frac{0.412(1-0.412)}{0.05^2} \right)$$

$$N = (1.96)^2 \left( \frac{0.412(0.588)}{0.05^2} \right)$$

$$N = 372$$

By Adding 10% Non-respondent rate

$$= 372 * 10\% + 372 = 410$$

$$N=410$$

Since the total population was found to be less than 10,000 the following correction formula is used:

$$Nf = N$$

$$1 + N/n1$$

ni = Average numbers of pregnant women attending MCH clinic of MTUTH in one month =1210

$$Nf = 410/1 + 410/1210 = 306$$

Therefore, the final sample size calculated for this study was 306 women's.

## Sampling method

Systematic random sampling technique was used to select the appropriate study unit. Every second pregnant women attending ANC department during study period was selected for assessment.

## Data collection tools and technique

The data was collected using questionnaire, physical examination and laboratory investigation. The interview and physical examination was conducted at antenatal care (ANC) department of Mizan-Tepi University Teaching Hospital by Graduate class students of public health students. The hemoglobin level was determined using Sahli hemoglobin meter. Microscope was used for stool examination; and all laboratory investigations were done by laboratory technician as part of their routine activity.

## Data quality control

The collected data was reviewed and checked for completeness by investigators. The supervisors made close follow up and assistance during the process of data collection. Prior to data collection time training was given both for data collectors and supervisors using manual developed for this purpose.

## Study variables

**Dependent variable:** Magnitude of anemia.

**Independent variables:**

- Socio-demographic factors (age, marital status, educational status, residence, occupation, income)
- Gestational period
- Parity
- Nutritional status
- Multiple pregnancies
- History of malaria
- History of abortion

## Operational definitions

- **Anemia in pregnancy:** Hemoglobin level below 11 g/dl during first and second trimester and 10.5 during second trimester pregnancy.
- **Mild anemia:** Hemoglobin level from 10-10.9 g/dl.
- **Moderate anemia:** Hemoglobin level from 7-9.9 g/d.
- **Severe anemia:** Hemoglobin level from 7 g/dl.
- **Pregnant woman:** A woman whose pregnancy was confirmed by HCG test or abdominal examination and fetoscope at the study health center.
- **Last menstrual period (LMP):** The first date of the last menstrual period Parity- The number of births the mother experienced after 28 weeks whatever the status of the newborn is.
- **Abortion:** The process of expulsion of conceptus tissue before 28 weeks of gestation.

## Data processing and analysis

Data was entered, cleaned and checked using Epi Info version 3.5.3 and analyzed using SPSS version 20 statistical software. Categorical variables were summarized as numbers

and percentages, whereas normally distributed continuous was presented as means and standard deviations by descriptive statistics. To identify factors associated with the outcome variable (anemia), a bivariate logistic regression analysis was performed for each independent variable and crude odds ratio (COR) with 95% confidence intervals was obtained. The strength of statistical association was measured by adjusted odds ratios (AOR) and 95% confidence intervals. Value <0.05 was considered statistically significant. Finally, the result was presented using tables and graph.

## Ethical consideration

Prior to data collection an official written letter from MTU public health department was submitted to the responsible hospital administration office. Subjects were informed about the objective of the study and verbal consent was made with the right not to participate in the study. Honesty and confidentiality was maintained through.

## Results

A total of 306 pregnant women attending antenatal care were included in this study. Fortunately, due to the availability of all respondents during data collection time the response rate was 100%. Majority, 142(46.4%), of the study participants were found in the age group of 20-24. All most all 298(97.4%) of the respondents were married and most, 141(46.1%), of them were protestant followers, followed by orthodox 28(38.9%). Majority, 107(35%), of the respondents were attended elementary school. Bench ethnicity was the most widely distributed group in this study area with frequency of 140 (45.8%) (Table 1).

**Table 1** Socio-demographic characters of pregnant women attending Antenatal care (ANC) at Mizan Teppi University Teaching Hospital, Bench Maji zone, South West Ethiopia, 2017.

Variable	Category	Frequency	Percent (%)
Age of respondents	15-19	49	16
	20-24	142	46.4
	25-29	78	25.5
	30-34	28	9.2
	35-39	9	2.9
Marital status	Married	298	97.4
	Single	8	2.6
	Orthodox	111	36.3
Religion	Muslim	53	17.3
	Protestant	141	46.1
	Other	1	0.3
	Bench	140	45.8

Ethnicity	Amhara	84	27.5
	Kaffa	27	8.8
	Oromo	41	13.4
	Other	14	4.6
Income status	<1000	126	41.2
	1000-5000	155	50.7
	≥ 5000	25	8.2
Occupation	Government employee	42	13.7
	Merchant	47	15.4
	Maid	4	1.3
	Student	42	13.7
	House wife	168	54.9
	Bartender	3	1
Educational level	Illiterate	49	16
	Literate	13	4.2
	Elementary	107	35
	Secondary school	85	27.8
	College or University	52	17

## Clinical and reproductive characteristics of respondents

More than half, 165(52.9%) of respondents had birth for the first time. Among respondents with Multigravida most of them had 2 and 3 parity, with frequency of 47(33.3%) and 48(34.0%) respectively. Majority, 99(70.2%), of women with Multigravida gave birth within interval of more than two years. Around half of respondents, 144(47.1%) of the women were in the third trimester (gestational age 30-32 weeks), while 115(37.6%) of them were in the second trimester (gestational age 24-28 weeks) (Table 2).

**Table 2** Clinical and reproductive history of pregnant women attending Antenatal care (ANC) at Mizan Teppi University Teaching Hospital, Bench Maji zone, South West Ethiopia, 2017.

Variable	Category	Frequency	Percent (%)
Gravidity	Primigravida	165	52.9
	Multigravida	141	46.1
	2	47	33.3
Number of Parity (for Multigravida) (n=141)	3	48	34
	4	28	18.9
	5	15	10.6
	>5	3	2.1
	Birth interval (n=141)	<2 years	42

	≥ 2 years	99	70.2
Gestational age	1st trimester	9	2.9
	2nd trimester	115	37.6
	3rd trimester	144	47.1
	4th trimester	38	12.4
ANC follow up during previous pregnancy (n=141)	Yes	116	82.3
	No	25	17.7
Reason not to following ANC (n=25)	No awareness	19	76
	Not willing	6	24
Chronic illness in previous pregnancy (n=141)	Yes	10	7.1
	No	131	92.9
Current disease	Yes	21	6.9
	No	285	93.1
Have information about anemia	Yes	97	31.7
	No	209	68.3
Listed causes of anemia (n=97)	Bleed loss	32	10.5
	Nutrition	62	20.3
	Disease	2	0.7
	Other	1	0.3
Use one of contraceptive methods	Yes	243	79.4
	No	63	20.6
Iron supplementation on current pregnancy	Yes	164	53.6
	No	142	46.4

Majority, 116(82.3%) of respondents had followed ANC service in their previous pregnancies. Only 10(7.1%) of pregnant mothers had history of chronic illnesses during their previous pregnancies, while 21(6.9%) of all pregnant mothers had disease currently. Majority, 209(68.3%), pregnant women were not aware of anemia. About 243(79.4%) of them used contraceptive methods previously and currently more than half, 164(53.6%), of pregnant women's had took iron supplementation (Table 2).

### Laboratory findings

Hematocrit level of pregnant women's attended ANC in Mizan-Tepi University teaching hospital was checked. Accordingly, majority 234(76.5%) of them had hematocrit level of below 33% ( $\geq 33\%$ ). The result from stool examination revealed that about 70(22.9%) of them were found to be positive for different parasites. Of those pregnant women who were positive for parasites about 19(27.1%) of them took medication. About 42(13.7%) of studied pregnant women had history of excessive menstrual bleeding. Most, 58(19%) of

respondents had history of malaria attack in the past 12 months (Table 3).

**Table 3** Laboratory result of pregnant women attending Antenatal care (ANC) at Mizan-Teppi University Teaching Hospital, Bench Maji zone, South West Ethiopia, 2017.

Variable	Category	Frequency	Percent (%)
Hematocrit level	≥ 33%	234	76.5
	30-32.9	43	14.1
	21-29.9	24	7.8
	≤ 21	5	1.6
Stool examination	+ve for parasite	70	22.9
	-ve for parasite	236	77.1
Take medication for parasite	Yes	19	27.1
	No	51	72.9
Had excessive ministerial bleeding	Yes	42	13.7
	No	264	86.3
Is ministerial bleeding regular	Yes	253	82.4
	No	54	17.6
Malarial attack within 12 month	Yes	58	19
	No	248	81

### Nutritional habits of respondents

More than half of the pregnant women 162(52.9%) eat meat less than once per week. Majority of women 282(92.2%) had the habit of eating fruits and Vegetables after meal at least once per day. About 134(43.8%) of the study subjects had the habit of drinking tea immediately after meal less than once per day. Two hundred twenty seven (74.2%) of the study subjects had the habit of drinking coffee immediately after meal at least Once per day (Table 4).

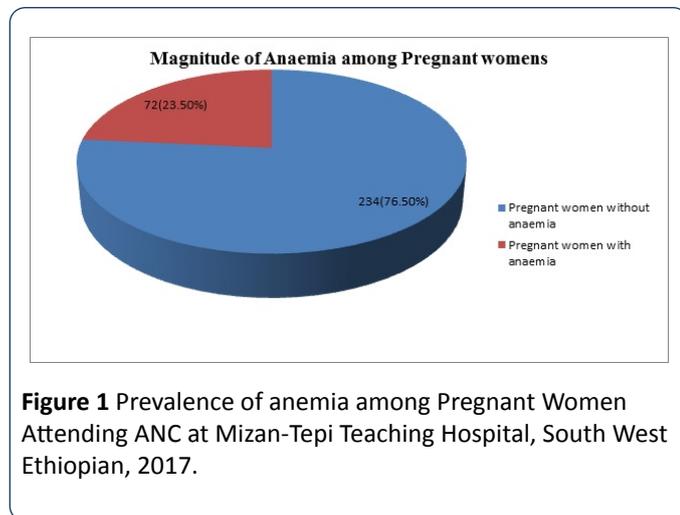
**Table 4** Dietary characteristics plus other maternal habits of pregnant women attending (ANC) at Mizan-Tepi University Teaching Hospital, South West Ethiopia, 2017.

Variable	Category	Frequency	Percent (%)
Eat meat per week	At least once per week	144	47.1
	Less than once per week	162	52.9
Fruit and vegetable per Day	At least once per day	282	92.2
Did you drink tea immediately after meal	At least once per day	95	31
	Less than once per day	134	43.8
	Never	76	24.8

Did you drink coffee after meal	At least once per day	227	74.2
	Less than once per day	72	23.5
	Never	7	2.3
Do you chew chat	Everyday	3	1
	Occasionally	3	1
	Never	300	98

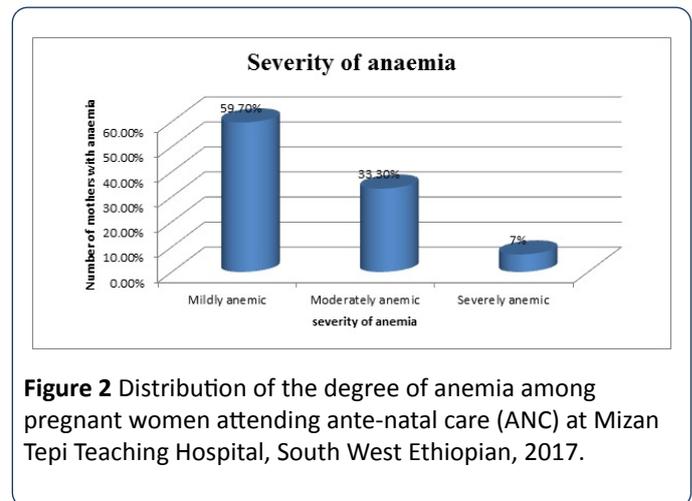
### Prevalence and severity of anemia among respondents

**Prevalence of anemia:** The overall prevalence of anemia using a cut off level of hemoglobin <11 g/dl (<33% Haematocrit) was 23.5% (72/306) (Figure 1).



**Figure 1** Prevalence of anemia among Pregnant Women Attending ANC at Mizan-Tepi Teaching Hospital, South West Ethiopian, 2017.

**Severity of anemia among pregnant women who were anemic:** Out of all anemic pregnant women about 59.7% (43/72) were mildly anemic, 33.3% (24/72) were moderately anemic and 7% (5/72) were severe (Figure 2).



**Figure 2** Distribution of the degree of anemia among pregnant women attending ante-natal care (ANC) at Mizan Tepi Teaching Hospital, South West Ethiopian, 2017.

### Predicting factors of anemia among pregnant women's

According to bivariate analysis result, family monthly income, maternal age, educational level, parity, gestational age, excessive menstrual bleeding, regular menstrual bleeding, abortion, meat per week, chronic previous diseases, knowledge about anemia, acute malarial attack, tea after meal and ANC follow up of pregnant women were significantly associated with maternal anemia. After controlling the effect of confounding factors multiple logistic regression analysis revealed that previous chronic diseases with (AOR=6.695 CI [1.5, 29.8]), knowledge about anemia (AOR=0.216, CI [0.090-0.516]), excessive menstrual bleeding (AOR=3.361, CI [1.375, 8.217]), history of malaria attack (AOR=7.936, CI: [3.807,16.546]) and history of abortion (AOR=4.562, CI:[2.212, 9.412]) had significant association with anemia (Table 5).

**Table 5** Multivariate logistic regression analysis of factors influencing anemia in pregnancy among pregnant women attending ante-natal care (ANC) service in Mizan Tepi University Teaching Hospital, South West Ethiopia, 2017.

Variable	Category	Anemia		COR (95%)	AOR (95%)
		Yes	No		
Chronic disease	Yes	17 (23.6%)	6 (8.3%)	1	1
	No	6 (8.3%)	41 (56.9%)	3.293(0.881-12.301)	6.695(1.504-29.802)
Knowledge about Anemia	Yes	87 (37.2%)	10 (13.9%)	0.273(0.133-0.559)	0.216(0.090-0.516)
	No	147 (62.8%)	147 (62.8%)	1	
Excessive ministerial Bleeding	Yes	23(9.8%)	19(26.4%)	3.289(1.669-6.480)	3.361(1.375-8.217)
	No	211(90.2%)	53(73.6%)	1	1
	No	34(47.2%)	38(52.8%)	1	1
Acute malaria attack	Yes	24(10.3%)	34(47.2%)	7.829(4.184-14.647)	7.936(3.807-16.546)
	No	34(47.2%)	38(52.8%)		
Had history of abortion	Yes	31(13.2%)	32(44.4%)	5.239(2.878-9.537)	4.562(2.212-9.412)

No	203(86.8%)	40(55.6%)	1	1
Note 1=Reference group				

## Discussion

This study was conducted with intention of assessing magnitude of anemia and identifying its determinants. To describe the prevalence of anemia, WHO criteria to diagnose anemia among pregnant women was used. According to finding from this study the prevalence of anemia among studied pregnant women attending Anti natal care (ANC) was 23.5% [12]. This finding was found to be coherent with the results obtained in Gonder [13], Tikur Anbesa specialized hospital [14] and Nigeria [15] where the prevalence of anemia was 23.2%, 21.3% and 23.2% respectively. However, this result was lower than findings found in Boditti health center with the prevalence of 60% [11] and Kenya where the prevalence of anemia were 57.0% [16]. The reason for this discrepancy might be attributed to difference in methodology including sampling technique among these studies. Also in the previous studies, only mothers those in their first visit were tested before they took any medication or healthy education in the antenatal clinic. The prevalence of anemia in this study was higher than study done in Uganda (15.3%). This difference may be attributed to advancements in the quality of Anti-natal care (ANC) and living conditions in Uganda [17].

Based up on criteria of classifying degree of anemia by WHO, out of all anemic pregnant women about 59.7% (43/72) were mildly anemic, 33.3% (24/72) were moderately anemic and the rest 7% (5/72) were severely anemic. This finding was higher than a result obtained in India where the proportion of anemic women who were mild, moderate and severe was 27%, 33% and 3% respectively [18]. This might be resulted due to variations in utilization of antenatal care in different study settings.

Multiple logistic regression analysis revealed that history of previous chronic diseases (AOR=6.695 CI [1.5, 29.8]), knowledge about anemia (AOR=0.216, CI [0.090-0.516]), excessive menstrual bleeding (AOR=3.361, CI [1.375, 8.217]) and (AOR=7.936, CI: [3.807, 16.546]) had significant association with anemia.

The prevalence of anemia was seen to be increased with the number of abortion where the probability of being anemic among women's who had history of abortion was 5 times more likely to be higher than who had no history of abortion (AOR=4.6 CI [2, 21-9.41]). This could be resulted because abortion exposes women to loss of more blood and might expose them to periods of hemorrhage which depletes body stores of iron that leads to extra requirement of iron than usual [19].

Having history of malaria revealed to have a significant association with prevalence of anemia. Accordingly, the magnitude of anemia among studied women's increased with previous history of malarial attack compared with those having no attack of malaria. Women who had history of abortion were

8 times more likely to be anemic as compared to those having no attack of malaria (AOR=7.94, CI {3.81,16.55}). This is may be due to malaria causes anemia by destroying red blood cells at a rate faster than body can replace them.

In this study pregnant women with a history of heavy menstrual cycle were 3 times more likely to be anemic than those who had normal menstruation flow (AOR=3.4, CI {1.375, 8.217}). This is may be due to iron reserves are already low by bleeding.

Also this study found that the prevalence of anemia was higher in women who didn't have good knowledge about anemia than who have good knowledge (AOR=0.216, CI {0.09-0.516}). This was might be due to possibility of a woman who have good knowledge to follow antenatal care (ANC) appropriately and take prophylactic or therapeutic iron or folic acid and get health education during ANC follow up.

Based on the finding of this study the prevalence of anemia increased in women with previous chronic diseases 7 times more likely to be anemic as compared to the normal one with (AOR=6.695 CI {1.5 ,29.8}). This was may be due to iron reserves are already low among those groups.

## Strength and limitation of the study

**Strength of the study:** In this study we determined the hemoglobin level of each client in spite of recorded previous hemoglobin level which gives good reliability.

**Limitation of the study:** The findings of this study should be interpreted with caution due to the following limitations of the study.

First, cross sectional nature of the study limits measuring the cause and effect relationship due to the cross sectional study design used, whether anemia preceded the predisposing factors or the vice versa could not be verified in this study.

Second, there was both social desirability and re call bias while subjects were requested to give dietary information and monthly income. Inclusion of patients with severe anemia may potentially higher the prevalence in the study groups.

## Conclusion and Recommendation

The overall prevalence of anemia in this study using a cut off level of hemoglobin<11 g/dl (<33% hematocrit) was 23.5% and the majority of them were of the mild type (Hemoglobin: 10-10.9 g/dl). The present study has shown a statistically significant association between anemia and malarial attack, chronic diseases, abortion, excessive menstrual bleeding and knowledge about anemia. This finding emphasizes the need for continuing strengthening of interventions on factors associated with anemia. Based on the result of this study the following are recommended during pregnancy at health

institutions during ANC follow up to women in child bearing age in general and pregnant women in particular.

Awareness creation should be promoted through the strengthened health education on risk factors like avoiding malaria attacks, abortion, excessive menstrual bleeding and chronic diseases. Similarly it would be better if concerned stakeholders work on increasing the knowledge of pregnant women about anemia and its consequence as well preventive methods which might be a stepping stone to reduce the prevalence of anemia among pregnant mothers.

Further research on risk factors of anemia, which include micronutrient deficiencies, as well as laboratory studies, should be conducted to identify the root cause of the underlying problems in the pregnant mothers so as to guide the health care provider to alleviate the existing problems.

## Competing Interest

The authors declare that there is no competing interest regarding the publication of this research paper.

## Acknowledgement

Our heartfelt thanks go to Mizan Tepi University College of Health Science for the provision of full support for the accomplishment of this research. We would like to thank the Mizan Tepi University Teaching Hospital, Bench Maji Zone Health Department, and Mizan Aman Health Unit for their cooperation during the process of data collection.

## References

- World Health Organization (2014) Essential nutrition actions—improving maternal, newborn, infant and young child health and nutrition. WHO, Geneva.
- Karaoglu L, Pehlivan E, Egri M, Deprem C, Gunes G, et al. (2010) The prevalence of nutritional anemia in pregnancy in an East Anatolian Province, Turkey. *BMC Public Health* 10: 329.
- Akhtar M, Hassan I (2012) Severe anaemia during late pregnancy. *Case Rep Obstet Gynecol* 2012: 1-3.
- Balarajan Y, Ramakrishnan U, Ozaltin E, Shankar AH, Subramanian SV (2011) Anaemia in low-income and middle income countries. *Lancet* 378: 2123-2135.
- Salhan S, Tripathi V, Singh R, Gaikwad HS (2012) Evaluation of haematological parameters in partial exchange and packed cell transfusion in treatment of severe anaemia in pregnancy. *Anemia* 2012: 608-658.
- McLean E, Cogswell M, Egli I, Wojdyla D, de Benoist B (2008) Worldwide prevalence of anaemia 1993-2005: WHO global database on anaemia.
- World Health Organization (2008) Worldwide prevalence of anemia, WHO Vitamin and Mineral Nutrition Information System, 1993-2005. *Public Health Nutr* 12: 444-454.
- Gebremedhin S, Enkuselassie F (2005) Correlates of anemia among women of reproductive age in Ethiopia: Evidence from Ethiopian DHS. *Ethiopian J Health Dev* 25: 22-23.
- Gebremedhin S, Fikre E (2014) Prevalence and correlates of maternal anemia in rural Sidama, Southern Ethiopia. *Afr J Reprod Health* 18: 44-53.
- Gedefaw L, Ayele A, Asres Y, Mossie A (2015) Anemia and associated factors among pregnant women attending antenatal care clinic in wolayita sodo town, southern ethiopia. *Ethiop J Health Sci* 25: 155-162.
- Lelissa D, Yilma M, Shewalem W, Abraha A, Worku M (2015) Prevalence of anemia among women receiving antenatal care at boditii health center, Southern Ethiopia. *Clin Med Res* 4: 79-86.
- Sisay D (2016) Prevalence and associated factors of anemia among pregnant women attending antenatal care at Mizan-Tepi Teaching Hospital, Southern Ethiopia, 2016. Addis Ababa University.
- Melku M, Addis Z, Alem M, Enawgaw B (2014) Prevalence and predictors of maternal anemia during pregnancy in Gondar, Northwest Ethiopia: An institutional based cross-sectional study. *Anemia* 2014: 1-9.
- Jufar AH, Zewde T (2014) Prevalence of anemia among pregnant women attending antenatal care at Tkur Anbessa specialized hospital, Addis Ababa, Ethiopia. *J Hematol Thromb* 2: 1-5.
- Buseri FI, Uko EK, Jeremiah ZA, Usanga EA (2008) Prevalence and risk factors of anaemia among pregnant women in Nigeria. *Open Hematol J* 2: 14-19.
- Okube OT, Mirie W, Odhiambo E, Sabina W, Habtu M (2016) Prevalence and factors associated with anaemia among pregnant women attending antenatal clinic in the second and third trimesters at pumwani maternity hospital Kenya. *Open J Obstet Gynecol* 6: 16-27.
- Obai G, Odongo P, Wanyama R (2016) Prevalence of anaemia and associated risk factors among pregnant women attending antenatal care in Gulu and Hoima Regional Hospitals in Uganda: A cross sectional study. *BMC Pregnancy Childbirth* 16: 76.
- Sharma P (2013) Prevalence of anemia and socio-demographic factors associated with anemia among pregnant women attending antenatal Hospital in Jaipur City, India. *IOSR J Pharm Bio Sci* 6: 1-5.
- Tadesse SE, Seid O, Mariam YG, Fekadu A, Wasihun Y, et al. (2017) Determinants of anemia among pregnant mothers attending antenatal care in Dessie town health facilities, northern central Ethiopia, unmatched case-control study. *PLoS ONE* 12: e0173173.