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Original Research

Prevalence of anemia and associated risk factors among pregnant women attending antenatal care in Azezo Health Center Gondar town, Northwest Ethiopia

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Abstract

Objective: Anemia is a global public health problem affecting both developing and developed countries; approximately 1.3 billion individuals suffer from it. Pregnant women are the most vulnerable groups to anemia. The aim of this study was to assess the prevalence and risk factors for anemia in pregnant women attending antenatal care in Azezo Health Center, Gondar town, Northwest Ethiopia.

Methods: A cross-sectional study was conducted at Azezo Health Center from February to May 2011. Red blood cell morphology, Hgb level determination and intestinal parasites were assessed following the standard procedures. Socio-demographic data was collected by using a structured questionnaire. The data entered and analyzed by using the SPSS version 16.0 statistical software. P<0.05 was considered as statistically significant.

Results: Among the 384 study participants, the prevalence of anemia was 83 (21.6%). Over half (64.8%) of the pregnant women attended antenatal care in the second trimester (between 13 and 28 weeks of gestation). Majority, 373 (97.1%) of the pregnant women had normocytic normo chromic red cell morphology. The majority of anemic cases 49 % (41/83) were of the mild type (Hgb 10.0–10.9g/d1) followed by 46% cases of moderate anemia (7–9.9g/dl) and 5% severe anemia (Hgb< 7g/ dl). Pregnant women with age>34, rural residence, history of malaria attack, hookworm infection and absence of iron supplements are significantly associated with increased risk of anemia. The most prevalent intestinal parasite among pregnant women was hookworm 18 (4.7%).

Conclusions: In the present study, the prevalence of anemia was low when compared with the previous studies carried out in different countries including Ethiopia. More should be done in respect to the importance of regular visit to maternal care centers and health education promotion programs to succeed more.

INTRODUCTION

Anemia is defined as a condition in which there is less than the normal hemoglobin (Hgb) level in the body, which decreases oxygen-carrying capacity of red blood cells to tissues. World Health Organization (WHO) definitions for anemia differ by age, sex and pregnancy status as follows: children 6 months to 5 year anemia is defined as a Hgb level <11g/dl, children 5–11 years Hgb < 11.5 g/dl, adult males Hgb < 13 g/dl; non-pregnant women Hgb <12g/dl and pregnant women Hgb < 11g/dl [1]. Anemia could be classified as mild, moderate and severe. The Hgb level for each class of anemia in pregnancy are 10.0–10.9g/d1 (mild), 7–9.9g/dl (moderate) and <7g/ dl (severe) [2].

Anemia in pregnant women is often caused by iron deficiency, which is the most common nutrient deficiency in the world. It has been estimated that, in developing countries, half of the population (mainly children and women of reproductive age) is affected by anemia [3]. Anemia also could be caused due to

increased hemolysis, diminished erythropoesis and blood loss [4]. Among the other causes of anemia, heavy blood loss because of menstruation or parasitic infections can lower blood hemoglobin (Hgb) concentration. Acute and chronic infections, including malaria and HIV can also lower blood Hgb concentration. The presence of other micronutrient deficiencies can also increases the risk of anemia. Furthermore, the impact of haemoglobinopathies on anemia prevalence needs to be considered within some populations [1].

Anemia is also considered as an indicator of both poor nutrition and health status. The most dramatic health effects of anemia, increased risk of maternal and child mortality due to severe anemia, have been well documented [1, 5, 6]. Patients with anemia have similar clinical symptoms irrespective of the cause. Fatigue, breathlessness, dizziness and headache are some of the common complaints. Examination of a stained blood smear using a microscope for morphology of red blood cell is helpful in diagnosing anemia in areas where automated analysis is less accessible [7]. Packed cell volume (PCV) of less than 33.0% is regarded as anemic by World Health Organization (WHO) [5]. Haemoglobin concentration is the most reliable indicator of anemia at the population level. Measuring Hgb concentration is relatively easy and inexpensive, and this measurement is frequently used as a proxy indicator of iron deficiency [7]. In settings where iron deficiency is the most frequent cause, additional iron intake is usually provided through iron supplements to vulnerable groups; in particular pregnant women and young children. Food based approaches to increase iron intake through food fortification and dietary diversification are important, sustainable strategies for preventing iron deficiency anemia in the general population. In settings where iron deficiency is not the only cause of anemia, approaches that combine iron interventions with other measures are needed. Strategies should include addressing other causes of anemia, and should be built into the primary health care system and existing programs [8, 9].

It is estimated that approximately 1.3 billion individuals in the world suffer from anemia, making it one of the most important public health issues on the international agenda [10, 11]. The knowledge of the prevalence of anemia in pregnant women is fundamental for the planning and execution of effective interventions by health authorities [12]. Prevalence of anemia among pregnant women in developing countries at average reported as 56% with a range of 35% to 100% among various region of the world. It is more common in developing countries because of poor nutritional status and high prevalence parasitic infestation [13]. Several studies indicated the association of anemia with maternal morbidity and mortality [1, 14]. It has been reported that close to 500,000 maternal deaths occur every year, vast majority of them taking place in developing world [1, 15].

Worldwide, anemia contributes to 20% of all maternal deaths. Anemia in pregnancy also leads to premature births, low birth weight, fetal impairment and infant deaths. The reduction in women's productivity places an economic burden on the families, communities and the societies. Recently, mental impairment in children who were anemic in the very beginning of their life has been reported. All of those showed the necessity of special control program for anemia in vulnerable population [16, 17]. Given the multi-factorial nature of this disease, correcting anemia often requires an integrated approach. In order to effectively combat anemia, the contributing factors must be identified and addressed [10, 11].

In Ethiopia anemia is one of the serious health problems among pregnant women. Prevalence rates of 40.5% in the general population and 47.2% in the children were reported from southwest Ethiopia [18]. Higher rates about 57% have also been reported in pregnant women in Jimma [19]. The availability of local prevalence statistics has a major role in the management and control of anemia in pregnancy. However, it was not adequately done in the study area. Therefore, this study aimed to assess the prevalence and associated risk factors anemia among pregnant women Azezo, Northwest Ethiopia.

MATERIALS AND METHODS

Study design, area, and period

A cross sectional study was conducted at Azezo Health Center from February to May 2011. Azezo is found in Gondar town, Northwest Ethiopia. There is high prevalence of intestinal parasites and malaria in the study area.

Study population

The study participants were pregnant women who visited Azezo Health Center for antenatal care. Those pregnant that fulfill the inclusion criteria were enrolled in the study. Each participants were recruited only once on their first visit during the study period.

Sample size and sampling procedures

Considering 95% confidence interval, 5% margin of error and 50% proportion 384 patients was included in the study. Those women who self reported to the health center were included until the required sample size was obtained.

Inclusion and exclusion criteria

Pregnant women, who were greater than 18 year old, gave informed consent and sufficient sample was included in the study. Those pregnant women who were received medication for helminthes for the last 3 weeks and those who were seriously sick (unable to gave socio demographic data) at time of data collection were excluded from the study.

Socio-demographic data collection procedures

Socio-demographic information like age, marital status, educational status, residence and occupation and other relevant possible risk factors like number of children, parasitic infections, gestational period, history of malaria attack, pregnancy gap and iron supplement of the study participants were collected by using structured and pre-tested questionnaire.

Specimen collection and processing

By using heparinized capillary tube, blood sample was taken from the study participants, a drop of blood was placed on a clean slide and thick and thin smear was prepared. After being air- dried, labeled with identification number, the thin smear portion of the slide was fixed with methanol alcohol and the whole smear was stained with giemsa solution based on the standard operational procedures (SOPs). Using light microscope, examination of the smear was done with high power magnification (40 x objectives) and oil immersion (100 x objectives) to investigate malaria parasite and type of anemia based on the morphology of red blood cell. The blood for hematocrit/ Packed cell volume (PCV) measurement was also taken simultaneously using another heparinized hematocrit tube and three- fourth was filled. The capillary tube after being sealed at one end was centrifuged in the microhematocrit centrifuge at 10,000g for 5 minutes. Then, the result was read using hematocrit reader. For Hgb determination Sahli-Hellige method was used. Using micropipette, 20 µL of blood was taken and poured into a tube containing 0.1mol/l HCl. After 10 minutes, distilled water was added drop by drop, followed by mixing until the color of the solution matched the color of the glass standard positioned alongside the dilution tube. The concentration of hemoglobin was read from the graduated scale on the dilution tube.

Stool samples were collected by using a clean and labeled container from the study participants. A portion of the stool was processed with direct microscopic technique detect intestinal parasites immediately. Two trained medical laboratory technologists examined the samples microscopically first with 10x and then with 40x objective for detection of helminthes eggs, larvae and cysts of protozoan parasites. The remaining part of the samples was emulsified in a 10% formalin solution. Stool examinations were done using formal ether concentration technique, which is considered the most sensitive for most intestinal helminthes.

Data Analysis

The data was cleaned, edited, checked for completeness before entering into a computer. After overall data arrangement, analysis was carried out using SPSS version 16 statistical software. Descriptive statistics were used to give a clear picture of dependent and independent variables. The frequency distributions of the variables were worked out. Frequency tables and charts were used to present the summarized data. Logistic regression analysis had been used to check for association between dependent and independent variables. In all cases P-value, less than 0.05 was considered statistically significant.

Ethical Consideration

The study was approved by the ethical review committee of the school of biomedical and laboratory sciences, University of Gondar. Individual consent was obtained before the questionnaires were administered, and before stool and blood were collected. The consent form was read in the local language and a copy was given to the women upon request. Participants were informed of the general purpose, possible risks, and benefits of the study. To ensure confidentiality, participants' data was linked to a code number.

RESULT

Socio-demographic characteristics

A total of 384 pregnant women were included in the study. The mean age of the study participants was 26.4 ± 0.12 year. The ages of participants ranged from 18 to 40 years. The overall prevalence of anemia (Hgb<11g/dl) was 83 (21.6%). Out of 384 participants, 112 (29.2%) lived in rural areas and the rest 272 (70.8%) were urban dwellers. Half, (50.5%) of the study participants were housewife followed by 25.8% farmers, 15.1% governmental employee and 8.6% private workers (**Table 1**).

Obstetric and medical history

Majority, 248 (64.5%) of the women were in the third trimester (gestational age greater than 28 weeks), while 96 (25%) of the pregnant women were in their second trimester (between 13 and 28 weeks of gestation). Forty (10.5%) of the participants were in the first trimester (gestational age less than 13 weeks). Women without a previous pregnancy (no child) were 25.5%. More than a quarter (27.3%) of the participants had one child one and 28.9% had two children. Nearly half, 167(43.5%) of the pregnant women were on iron supplement at the time of the study.

Laboratory findings

Among 384 study participants, 83(21%) were anemic (hematocrit level <33%, hemoglobin level <11gm/dl). Most 373(97.1%) of pregnant women had normocytic normochromic red cell morphology. Nine (2.3%) of them had macrocytic hypochromic red cell morphology and only 2 (0.5%) had macrocytic normochromic red cell morphology. Hookworm 18 (4.7%), *Ascaris lumbricoides* 11(2.9%), *Entameoaba histolytica* 11(2.9%), *Taenia* species 4 (1%) and *Hymenolepis nana* 2(0.5%), and *Schistosoma mansoni* 2(0.5%) were among intestinal parasites detected in the pregnant women (**Table 2**). The majority of anemic cases 49 % (41/83) showed mild type of anemia followed by moderate 46% (38/83) and 5% (4/83) severe anemia (**Fig 1**).

Association of sociodemographic factors and anemia

Logistic regression was carried out to assess possible relationship between anemia and socio demographic characteristics. Anemia was significantly associated with age groups ranged from 26-34 years old [AOR=2.21, 95% CI= 1.24 - 3.96, p=0.001] and age groups greater than 34 years old [AOR=2.72, 95% CI= 1.12- 6.43]. Rural residence were significantly associated with reduced anemic cases [AOR=0.25, 95% CI= 0.12-0.49] (**Table 3**).

Association between clinical conditions and anemia

Anemia was significantly associated with history of malaria attack [AOR=13.28, 95% CI= 3.54-49.72], and infections with hookworm [AOR=13.21, 95% CI= 3.62 - 48.28] *Ascaris lumbricoids* [AOR=8.98, 95% CI = 2.08 - 38.75], *S. mansoni* [AOR=3.53, 95% CI= 0.21-60.6], *Giardia intestinalis* [AOR=9.58, 95% CI= 1.5 - 61.4], and *Entamoeba histolytica/dispar* [AOR=10.06, 95% CI= 2.17- 46.60]. However, iron supplement was protective of anemia [AOR=0.140, 95% CI= 0.051-0.383] (**Table 3**).

Table 1. Distribution of pregnant mothers by their sociodemographic characteristics (N=384) in Azezo Health Center (AHC), Northwest Ethiopia, February to May 2011.

Characteristics	Number	Percentage
Age Range		
18-25	190	49.5
26-34	156	40.6
>34	38	9.9
Residence		
Urban	272	70.8
Rural	112	29.2
Occupation		
Farmer	99	25.8
Housewife	194	50.5
Private	33	8.6
Governmental Employee	58	15.1
Monthly Income		
200-500	59	15.4
501-800	167	42.4
>800	162	42.2
Educational Status		
Illiterate	127	33.0
1-8	123	32.0
9-12	76	19.8
>12	58	15.1
Religion		
Orthodox	352	91.7
Muslim	23	6.0
Protestant	9	2.3
Ethnicity		
Amhara	342	89.0
Tigray	29	7.6
Kimant	4	1.0
Oromo	9	2.4

Table2. Laboratory findings of pregnant women attending Azezo Health Center (N=384), Northwest Ethiopia, February to May 2011.

Hematocrit value (Hgb value)	Number of cases	Percentage of cases
Anemic <33% (<11gm/dl)	83	21
Not-anemic>33% (>11gm/dl)	301	78.4
Red blood cell examination		
Normocytic Normochromic	373	97.1
Microcytic-Hypochromic	9	2.3
Macrocytic-Normochromic	2	0.5
Stool examination		
Hookworm	18	4.7
Ascaris lumbricoides	11	2.9
Entamoeba histolytica/dispar	11	2.9
Giardia intestinalis	7	1.8
Hymenolepis nana	2	0.5
Schistosoma mansoni	2	0.5
Taenia species	4	1
No ova or parasite	329	85.7

Table3. Effects of different risk factors on the prevalence of anemia among pregnant women attending Azezo Health Center (N=384), Northwest Ethiopia, February to May 2011.

Variables	Anemia		Crudes OR(95%CI)	Adjusted OR(95%CI)
	Positive	Negative		
Number of children				
None	9(9.2%)	89(90.8%)	1	
1 child	13(12.4%)	92(87.6%)	1.397(0.569-3.432)	
2 children	34(30.6%)	77(69.4%)	4.367(1.971-9.675	
3 children	12(29.3%)	29(70.7%)	4.092 (1.566-10.692)	
>3 children	15(51.7%)	14(48.3%)	10.595 (3.897-28.808)	
Pregnancy gap				
2 years	67(27.6%)	176(72.4%)	1	
3 years	13(12.3%)	93(87.7%)	3.835(1.135,12.957)	
>3 years	3(8.6%)	32(91.4%)	1.875(0.513,6.863)	
History of malaria				
Negative	65(18.0%)	297(82.0%)	1	
positive	18(81.8%)	4(18.2%)	20.562(6.73-62.777)	13.280 (3.54749.721)
Iron supplement				
No	76(35.0%)	141(65.0%	1	1.140(0.051,1.383)
Yes	7(4.2%)	160(95.8%)	1.081(0.36-1.182)	
Trimester				
First	3(7.5%)	37(92.5%)	1	
Second	16(16.7%)	80(83.3%)	2.467(0.677,8.990)	
Third	64(25.8%)	184(74.2%)	4.290(1.279,14.393)	
Intestinal parasite				
No ova or parasite	43(13.1%)	286(86.9%)	1	
Hook Worm	14(77.8%)	4(22.2%)	23.279(7.323,74.000)	13.214(3.616,48.280)
A. lumbricoides	8(72.7%)	3(27.3%)	17.736(4.529,69.456)	8.978(2.080,38.754)
S. mansoni	1(50%)	1(50%)	6.651(0.408,108.318)	3.525(0.205,60.600)
G. intestinalis	5(71.4%)	2(28.6%)	16.628(3.127,88.407)	9.582(1.497,61.350)
E. histolytica/dispar	8(72.7%)	3(27.3%)	17.736(4.529,69.456)	10.058(2.171,46.595

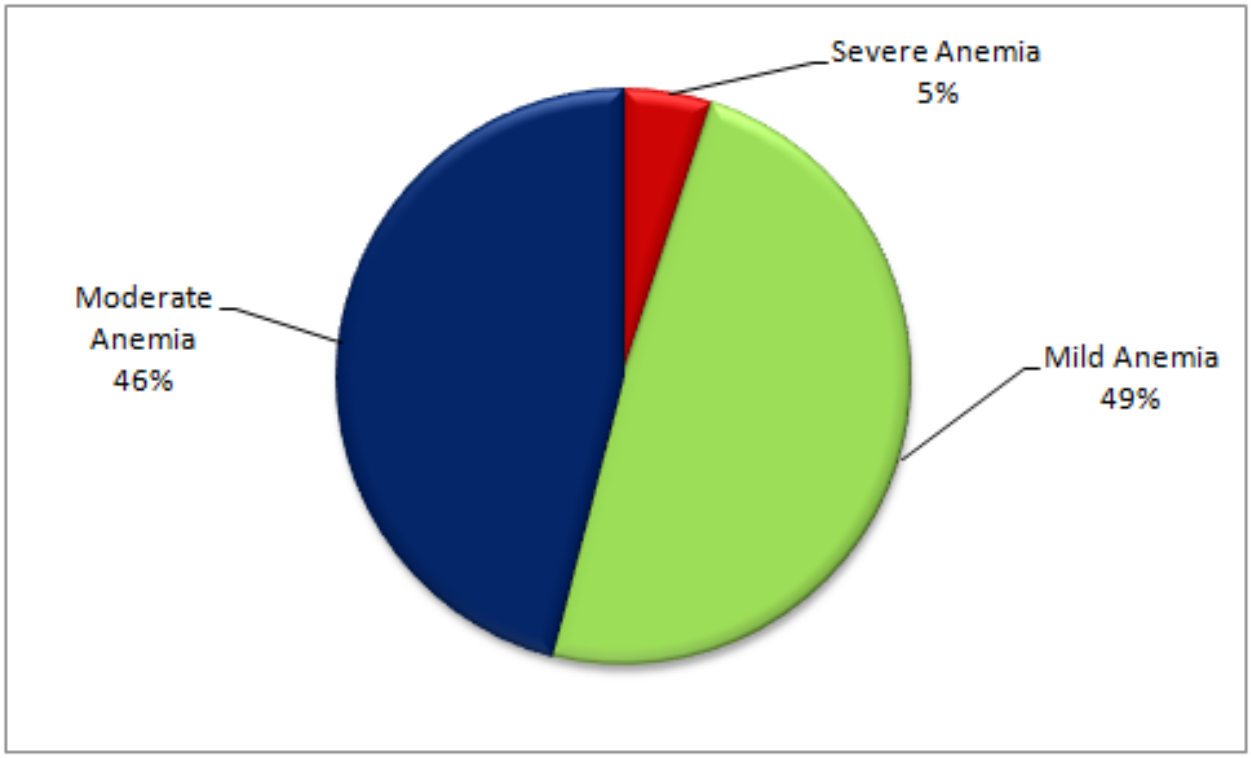

Figure 1. Shows the distribution of the degree of anemia among pregnant women attending Azezo Health Centre (N=384), North West Ethiopia, February to May 2011.

DISCUSSION

The current study attempted to asses anemia prevalence and associated risk factors in pregnant women. The overall prevalence of anemia was 22%, which is low compared to other similar studies [20, 21, 22, 24-36]. The findings of this study was not in line with WHO 2005 report, which stated that the highest proportion of individuals affected by anemia were in Africa in both pregnant and non-pregnant women of childbearing age [22, 23, 24]. It was also lower when compared with the prevalence of anemia reported in China 58.6% [21]. The lower the prevalence of anemia in the current study might be due differences in study area and administration of iron supplement in health centers which is helpful in combating anemia during pregnancy.

In this study, the majority of anemic cases 49 %(41/83) were of the mild type (Hgb 10.0-10.9g/d1) followed by 46% cases of moderate anemia (7-9.9g/dl) and 5% severe anemia (Hgb< 7g/ dl). A similar condition was observed in Pakistan in which majority of the cases had mild anemia (75.0%), moderate anemia (14.8%) and severe anemia (0.7%) [25]. Similarly, report from India in 2010 also showed the majority (50.9%) demonstrated moderate anemia and followed by mild (30.17%) and severe anemia (18.9%), respectively [24, 23]. In this study, insignificant association between anemia and number of children was observed. This finding corroborates previous reports in Eastern Sudan, Nigeria and Zaire [29, 35, 36] and contrary to a report for the high land of Tanzania [34].

It was expected that anemia in pregnancy would tend to increase with rising number of children owing to repeated drain on the iron reserves. In fact, multiparity, especially when the pregnancies have occurred in quick succession is traditionally regarded as a cause of anemia in pregnancy. However, this study found no consistent relationship between rising number of children and the incidence of anemia. Perhaps, following the experience gained from the first pregnancy and the consequent increased awareness and good diet, as well as increased interaction with other pregnant women at the antenatal clinic, might neutralize its effect. This study also failed to observe any relationship between prevalence of anemia and increasing gestational age, implying that all pregnant women were prone to anemia throughout the gestational period, thus early booking for antenatal care would serve as an important preventive measure in pregnancy. The same result was observed in a study conducted in India [23].

The presence of parasitic infections, particularly hookworm was significantly associated with anemia in pregnant women (AOR= 13.21, 95% CI 3.61- 48.28) [34]. Similarly, anemia was significantly associated with history of malaria attack and the association was retained even when the variable was adjusted for its confounding effect in the logistic regression models. The finding is consistent with study conducted in Jimma [30].

The study also found higher anemia with increasing maternal age, rural residence, housewives, low-income level (200-500Birr/month) and illiteracy. The odds of anemia was 2.72 times higher for maternal age >34 as compared to age 18-25. The risk of anemia was 2.42 times higher among housewives as compared to governmental employee, 2.8 higher for income level 200-500 birr /month as compared to >800 birr/month and 8.8 higher for illiterate pregnant women as compared to those women with > 12 educational level. A study conducted in India also reported similar result [23]. Another study conducted in China showed the level of education was statistically associated with anemia ($p = 0.005$) [21].

Iron-deficiency anemia was the most prevalent nutritional deficiency problem affecting pregnant women [31]. The current study also found significant association between iron supplement and anemia (AOR=1.140, 95%CI= 0.051-1.383). Iron deficiencies may develop during pregnancy because of the increased iron requirements to supply the expanding blood volume of the mother and the rapidly growing fetus and placenta. The high prevalence of anemia in pregnancy in sub-Saharan African women is might be due to the fact that women may enter pregnancy with seriously depleted iron stores [32]. When pre-pregnancy iron stores are low, the amount of iron required during the last half of pregnancy cannot easily be met by diet and the risk of iron deficiency anemia could be high, especially toward the end of pregnancy [33]. Since most pregnant women in the study attend antenatal care late in pregnancy, a high prevalence of anemia due to iron deficiency is likely.

In conclusion, the overall prevalence of anemia was low in our study, which might be due to the undergoing strategy concerning primary health care in Ethiopia, seems well planned and practiced. Sociodemographic variables like maternal age, economic status, and parasitic infection and Iron supplement were seen to be factor contributing to maternal anemia. The extent of iron deficiency anemia and the effects on maternal and neonatal health are uncertain in this study. Nutrition, health education and iron supplementation are encouraged during antenatal care. The effectiveness of such interventions should be evaluated.

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COMPETING INTERESTS

The authors declare that they have no competing interests

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