ASSESSMENT OF RISK FACTORS FOR ANEMIA AMONG PREGNANT MOTHERS ATTENDING JUSH ANC CLINIC: INSTITUTIONAL BASED CASE CONTROL STUDY, JIMMA ZONE, SOUTHWEST ETHIOPIA

BY

Tilaye Workneh (BSc)

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JIMMA UNIVERSITY

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DEPARTMENT OF EPIDEMIOLOGY

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Tilaye Workneh (BSc)

ADVISORS: Ato Chernet Hailu (RN, DMCH, BSN, MPH)

Ato Tariku Dejene (BSc, MSc)

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ABSTRACT

Background: Anemia refers to a condition in which the hemoglobin content of the blood is lower than normal as a result of a deficiency of one or more essential nutrients, heavy blood loss, parasitic infections such as hookworm infestations, acute and chronic infections, and congenital hemolytic diseases. Anaemia in pregnancy is a major public health problem in developing countries. It is associated with an increased risk of maternal and perinatal morbidity and mortality. The control of anaemia in women of childbearing age is essential to prevent low birth weight and perinatal and maternal mortality. In order to design an intervention for treatment and prevention of anaemia in pregnancy, a study assessing risk factors for anemia has paramount importance.

Objective: The objective of this study was to assess risk factors of anemia among pregnant women attending antenatal care clinic in Jimma University Specialized Hospital (JUSH), South-west Ethiopia.

Methods: A case control study was carried out among pregnant women who came for routine antenatal care follow up for booking visit to Jimma University Specialized Hospital, Jimma town, southwestern Ethiopia from February 25 to April 10, 2011. A total of 234 pregnant women, 117 cases and 117 controls who came for booking visit were enrolled in this study using purposive sampling method to avoid information bias obtained from repeated ANC client that they might obtained from health professionals counseling and education.

Result: A total of 234 pregnant women attending antenatal clinic in JUSH for booking visit were included in the study, i.e.117 cases and 117 controls. The mean age of cases and controls were 24.37 ($\pm$4.21SD) and 23.7 ($\pm$3.94SD) years respectively. The risk factors for anaemia were birth interval from index pregnancy <2years (OR=9.6, 95%CI 3.67 – 13.17), history of excess menses prior to index pregnancy (OR= 9.7, 95%CI 2.51 – 12.46), lack of regular shoe wearing habit (OR= 2.2, 95%CI 1.43 – 5.13), Hookworm infection (OR=2.1 95%CI 1.02 – 4.22), and habit of drinking coffee/tea on daily basis compared to those never drink (OR=7.4 95%CI 2.17 – 14.05).

Conclusion and recommendation: The prevalence of anemia was high in those who were hook worm infected, lack of regular shoe wearing habit, had excess menstrual bleeding before the index pregnancy and those who had less than two years birth intervals between the current pregnancies and the last child they bear and those who had coffee/tea drinking habit immediately after meal daily. Intake of animal foods, vegetables, fruits and other enhancers of non-hem iron absorption among cases and controls were low. Practice of additional meal during pregnancy was also low. To reduce anemia in pregnancy, in conjunction with other strategies, due emphasis should be given in improving the knowledge and practice of pregnant mothers on prevention of infection like hookworm, family planning and birth spacing, and improved feeding habit.

Key words: *Anaemia, Pregnancy, Risk factors, Hemoglobin*

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ACRONYMS AND ABBREVIATION

ANC - Antenatal care

AOR – Adjusted odd ratio

APH - Antepartum haemorrhage

DHS - Demographic and Health Survey

JUSH - Jimma University Specialized hospital

Hb – Haemoglobin

HEW – Health Extension Worker

HIV – Human Immune Virus

IDA - Iron Deficiency Anemia

ID - Iron Deficiency

MCH – Maternal and child health

MDG - Millennium development goal

MOH – Ministry Of Health

OR – Odd ratio

PMTCT - Prevention of mother to child transmission of HIV

PPH - Postpartum haemorrhage

PW – Pregnant women

WHO - World health organization

CHAPTER ONE

1.1. Background Information

Anemia refers to a condition in which the hemoglobin content of the blood is lower than normal as a result of a deficiency of one or more essential nutrients, heavy blood loss, parasitic infections such as hookworm infestations, acute and chronic infections, and congenital hemolytic diseases. At least half of anemia worldwide is due to iron deficiency. Iron deficiency is due primarily to a lack of bio-available dietary iron or increased requirements in childhood and pregnancy (1).

There are a variety of causes of anemia, related to both individual and environmental factors. Nutritional deficiencies (folate, vitamin B12, and vitamin A) are also risk factors for anemia, as are diets rich in phytate and poor in animal products (2). Approximately 50% of women and children in less developed countries are anemic, and 60% of anemic women in the world reside in South Asia. The relative contributions of these causes of anemia and iron deficiency vary by sex, age and population and are not well described in many populations (3).

Nutritional anemias, including especially iron deficiency anemia, are currently the greatest global nutritional problem, mainly affecting women and children with representation a significant constraint for many nations' chances of improved public health and economic development. The diets of the poor are characterized more by poor quality than quantity, although the latter is often the case in many chronic and especially acute, emergency situations. The diets of the poor have a low energy density and poor availability of important micronutrients, for example, iron, vitamin A and zinc (4).

WHO estimates that 35% to 75% (56% on average) of pregnant women in developing countries and 18% of those in industrialized countries are anaemic. In 1995, the WHO projected the average prevalence of anemia in pregnant women to be about 52% in Africa. The prevalence rate of anaemia is higher in developing country than in industrialized countries but in the later still reach level of public health significance (above 10%) in pregnant women. The most affected group in approximate descending order are pregnant women, preschool aged children, low birth weight infants, other women, the elderly, school age children and adult men. In developing country the prevalence rate in pregnant women is commonly in the range of 40% to 60%; among the women 20% to 40%; and in school age children and adult men, around 20%. Around half of those with anaemia are suffering iron deficiency anaemia (5).

In Ethiopia, the magnitude and importance of iron deficiency anaemia as a public health problem is still disputed. Some studies reported iron deficiency anaemia rates of less than 18%, while others have reported rates of 25% and above. In several developing countries the intake of iron from diet is more than adequate. For example, in parts of Ethiopia, the daily intake of iron is estimated to be between 180 and 500 mg per day which is 10–20 times the suggested daily requirement. This presumed high intake is attributed to consumption of a staple cereal, teff or *Eragrostis teff* (90 mg of iron per 100 g of teff), and partly due to its contamination with iron-rich clay soil. In spite of this high intake of iron, some studies have reported a high prevalence of anaemia, even in teff-consuming communities. Therefore, the cause of iron deficiency in Ethiopia may not be the inadequate dietary intake of iron. Other factors, ultimately related to poverty and underdevelopment, might also play a role in iron deficiency anaemia. In such communities with an already high intake of iron, the conventional supplementation of iron might not be effective or might even be harmful (6).

An organized approach to the diagnosis of anemia is very much essential. The Complete Blood Count (CBC) is the most commonly ordered blood test. The measured values of the CBC include the total counts for red blood cells (RBCs), platelets, and white blood cells (WBCs) and the volumes of RBCs, platelets, WBCs, and hemoglobin. The calculated values include the hematocrit, Mean Corpuscular Volume (MCV), Mean Corpuscular Hemoglobin (MCH), Mean Corpuscular Hemoglobin Concentration (MCHC), and red cell distribution width (7).

The etiology of anaemia in Ethiopia is not well established and the information available is limited in representativeness of the whole country. Various researchers came up with different conclusions despite the problem being among the ten top morbidities reported by most health institutions in the country (8). Therefore, important risk factors have to be identified and their role in causing anaemia was evaluated in order to design an intervention for treatment and prevention of anaemia in pregnant women.

1.2. Statement of the problem

Anaemia is an important health issue in the developing world. Severe anaemia is related to mortality and mild anaemia increases health risk and reduces productivity. Anaemia is especially dangerous in pregnant women in that it causes cardiac failure, haemorrhage and infection. In India, 19% of maternal deaths were related to anaemia. Maternal anaemia increases intrauterine growth retardation and pre-term delivery. Anaemia is also an important indicator for choosing medication. For example anaemic women should be strict to the use of intrauterine device due to blood loss side effect (9).

Anaemia has been shown to affect cognitive development, shorten attention span, and cause irritability, fatigue, difficulty with concentration, lethargy, increased mortality, and susceptibility to infection. Consequently, anemic children tend to perform poorly on vocabulary, reading and other tests. However, with appropriate preventive programs, many cases of anaemia, including iron deficiency anaemia, can be prevented in children (10).

In many tropical regions, anemia, iron deficiency, malaria and multiple helminth infections coexist and are interrelated. Sub-Saharan Africa epitomizes this situation, although similar situations exist in equatorial South America, and South and Southeast Asia. In these communities, anemia is typically prevalent and severe, especially in pregnant women and young children, and may be an important cause of mortality (11).

Anemia (Hb level < 11g/dL) remains one of the most intractable public health problems in malaria-endemic countries of Africa. It affects more than half of all pregnant women and children less than five years old, and has serious consequences since severe anemia (Hb < 5g/dL) is associated with an increased risk of death. The insidious nature of its presentation means, however, that mild-to-moderate degree of anemia frequently remain undetected and untreated by health care workers in the community, while blood transfusion for severe anemia may be prescribed on the basis of inaccurate hemoglobin measurement, thus exposing the patient unnecessarily to the risk of infection with HIV and other blood-borne pathogens. Infection with hookworm and other intestinal helminthes causes gastrointestinal blood loss, malabsorption, and inhibition of appetite, thereby exacerbating micronutrient deficiencies and maternal anemia with decreased fetal growth and weight gain (12).

Given the fact that Ethiopia is among the poorest country in Africa with high rates of food insecurity and malnutrition one may assume problems with iron deficiency anemia. Although Ethiopia has a wide range of agro-climatic conditions and grows a variety of cereals, root crops and vegetables, some of these are not fully utilized. There appears to be dependency on a single food crop by region although the specific crop varies in the different regions. The lack of dietary diversity results in a shortage of minerals and vitamins (13, 14).

Anaemia is a major factor in women's health, especially reproductive health in developing countries. Severe anaemia during pregnancy is an important contributor to maternal mortality, as well as to the low birth weight which is in turn an important risk factor for infant mortality. Even moderate anaemia makes women less able to work and care for their children (15).

Strong evidence links anemia not only to health problem but also development problem. Anemia increases risk for maternal and child mortality and has negative consequences on the cognitive and physical development of children, and also has negative impact on work productivity in adults which affect economical activity. Overall, about 20% of maternal and perinatal mortality in developing countries can be attributed to anemia. Iron deficiency with/without anemia reduces work productivity in adults and limits cognitive development in children, thus limiting their achievement in school and ultimately reducing investment benefits in education (16, 17).

Anemia during pregnancy has devastating consequences to both the mother and the baby. In the baby, it causes symmetric intrauterine growth retardation; premature delivery and the surviving infants will have low weight and suffer from the longterm consequences including poor physical growth and intellectual development (16).

Studies to define the effect of maternal anaemia on the foetus indicate that different types of decompensation occur with varying degrees of anaemia. Most of the studies suggest that a fall in maternal haemoglobin below 11.0 g/d1 is associated with a significant rise in perinatal mortality rate. There is usually a 2 to 3-fold increase in perinatal mortality rate when maternal haemoglobin levels fall below 8.0 g/d1 and 8-10 fold increase when maternal haemoglobin levels fall below 5.0 g/dl. A significant fall in birth weight due to increase in prematurity rate and intrauterine growth retardation has been reported when maternal haemoglobin levels were below 8.0 g/dl (18).

Women with iron deficiency anemia may be asymptomatic, however is more susceptible to infection, may tire easily, with increased chance of preeclampsia and postpartum hemorrhage, and tolerates poorly even minimal blood loss during birth. Healing of an episiotomy or an incision usually delayed and if the anemia is severe (Hb less than 6g/dL), cardiac failure may ensue. On the other hand, there is evidence of increased risk of low birth weight (birth weight less than 2.500g)**.** Anaemic mothers had poor anesthetic resistance and increased operative risks. Anaemia also lowers resistance to infection and wounds may fail to heal promptly after surgery, or may break down altogether (19).

In contexts of most developing countries, it has been difficult to elucidate the relative contributions of nutritional factors, malaria, and helminth infections to anemia for several reasons. Though randomized trials are highly efficacious study design in demonstrating causal relationships, it is difficult to conduct for ethical and other reasons to investigate factors associated with anaemia in pregnant mother. The independent contributions of underlying factors were not well investigated in Ethiopian context. Although the immediate causes of anemia among pregnant women are known (such as malnutrition and infections), the impact of other factors like socioeconomic determinants is not well explored, and the interrelationship between such contextual and individual factors remains under-studied. Thus, this study attempted to explore factors associated with anemia in pregnant women.

CHAPTER TWO

2.1. LITERATURE REVIEW

Anaemia is a global problem. Iron deficiency is the most widespread micronutrient and overall nutritional deficiency. As stated by the WHO, "the numbers are staggering: 2 billion people – over 30% of the world's population – are anemic with about 1 billion suffering from iron deficiency anemia. In many developing countries one out of two pregnant woman and more than one out of every three preschool children are estimated to be anemic" (20). In countries where meat consumption is low, such as India and many in sub-Saharan Africa, up to 90% of women are or become anemic during pregnancy (21).

The highest prevalence for all 3 groups is in Africa, but the greatest number of people affected is in Asia. In Asia 58% of preschool aged children, 56.1% of pregnant women and 68% of non-pregnant women are anemic. Countries with a severe public health problem were Africa, Asia and Latin America and the Caribbean. Africa and Asia are the most affected and as these regions are also the poorest, it may reflect the link between anemia and development (22, 23).

Anemia in pregnancy is related to different socio-demographic, dietary and economic factors. The commonest cause of anemia during pregnancy includes iron and foliated deficiency aggravated by short birth intervals, and parasitic infections. Different dietary factors affect the bioavailability of iron from food. The influence of ascorbic acid is most substantial in inhibitory food, which means food that contains the main inhibitors of nonhaem iron absorption, Phytate and polyphenoles. (24).

Anaemia is the end result of severe nutrient deficiency of one or more haematopoietic factors usually iron, less frequently folate or vitamin B_{12}. Hemoglobin concentration, by which anaemia is diagnosed, is a relatively insensitive index of milder degrees of nutrient depletion, so that by the time a woman becomes anaemic she is already suffering from a marked degree of nutrient deficiency. Because a low haemoglobin content of blood is more easily detected than the underlying deficiencies, it has come to be used as an index of haematopoietic status (4, 33).

The overall cause of nutritional anaemia are low nutrient intake, poor absorption or utilization and increased nutrient loss and/or demands. In many developing countries nutrient intake is low simply because food intake is low. In addition to those who actually go hungry there are millions more who suffer a lack of specific nutrients in their diet. Important differences in haemoglobin value

may frequently be found at different social and income levels, pointing to dietary shortcoming related to cost, as well as dietary and cooking habits (33).

Women in reproductive age have a particularly high demand for haematopoitic nutrients. When not pregnant or lactating, regular menstrual losses constitute a continuing drain of nutrients which have to be replaced. On average a healthy woman loses 25 to 30 ml of blood each month. This is equivalent to an average daily blood loss of 0.5mg of iron. A FAO/WHO expert group has calculated that non-pregnant women require a daily absorption of 2.4mg of iron compared to 1.1mg required by an adult man. Nutrient requirement in pregnancy are much greater. The total iron need during the whole of pregnancy is estimated at about 1000mg. The daily requirements for iron, as well as folate, are six times greater for women in the last trimester of pregnancy than for a non-pregnant woman. This need cannot be met by diet alone, but is derived at least partly from maternal reserves. In a well nourished woman about half the total requirement of iron may come from iron stores. When these reserves are already low due to malnutrition and/or frequent pregnancies anaemia will results. It has been estimated that even when food intake is adequate it may take two years to replenish body iron stores after pregnancy (5, 37).

In malaria infection red blood cell are rapidly destroyed, and at a rate faster than the body can replace them. In the case of bacterial infections normal bone marrow function is suppressed so that even if the relevant nutrients are all present in the body their conversion to haemoglobin cannot take place until the infection is brought under control. In the course of blood loss from the causes mentioned above, red corpuscles and hence haemoglobin are lost. If the haemorrhage is very heavy, the haemoglobin concentration will fall and will remain low until the lost red cells are replaced (5).

Studies carried out in India have shown that iron deficiency is the major cause of anaemia followed by folate deficiency. In recent years, the contribution of B12 deficiency has been highlighted. In India, the prevalence of anaemia is high because of(*i*) low dietary intake, poor iron (less than 20 mg/day) and folic acid intake (less than 70 mg/day); (*ii*) poor bioavailability of iron (3-4% only) in phytate and fiber -rich Indian diet; and (*iii*) chronic blood loss due to infection such as malaria and hookworm infestations (25).

A case control study to evaluate HIV/AIDS as risk factor for anemia in the context of pregnancy in Kenya showed that, despite the high requirements for most nutrients such as iron in pregnancy, the women in this study continued with the same eating habits as practiced before pregnancy. Food was mainly taken in three meals per day, distributed in breakfast, lunch and dinner. The habit of consumption of tea and/or coffee with or immediately after meal was common. Most women, 77.2% of seronegative and 78.9% of seropositive had consumed tea or coffee with or immediately after meal. A meal that they used predominantly was cereal/ legumes-based which has high phytate that can affect iron absorption. Food beliefs and practices among female, especially since she was childhood, adolescence, and pregnancy were barrier for women to get enough nutrients. The work load both domestic and economic work, number of pregnancy, socio-economic status of family besides reproductive health aspect such as family planning practices, child rearing may contribute for pregnant women to prone of anemia compared to non pregnant women. Women responsibilities in domestic and economic context and the inferiority of women role in decision making process within domestic and reproductive health aspect were very obvious factors determine of anemia (26).

The consequences of Intestinal worms for health and development are enormous. Apart from permanent organ damage, worm infections cause anaemia, poor physical growth, poor intellectual development and impaired cognitive function. The impact of inadequate nutrient intake is amplified by worm and malaria infections which interfere with nutrient uptake and are a major cause of anaemia. In anaemic women, the risk of dying during pregnancy or child birth is up to 3.5 times higher than in non-anaemic women. Malaria on the other hand, may result in a range of adverse pregnancy outcomes including low birth weight, anaemia, spontaneous abortion and neonatal and maternal deaths. In areas of Africa with stable malaria transmission, malaria infection during pregnancy is estimated to cause 400,000 cases of severe maternal anaemia and from 75,000 - 200,000 infant deaths each year (18, 27).

Human hookworm infection has long been recognized among the major causes of anaemia in poor communities, but understanding of the benefits of the management of hookworm infection in pregnancy has lagged behind the other major causes of maternal anaemia. Low coverage of antihelmintic treatment in maternal health programmes in many countries has been the result (28).

Various studies conducted in Pakistan documented prevalence of anaemia between 43 to 76%. Factors leading to anaemia in obstetric cases are multiparity and blood loss in antepartum, intra partum and postpartum period. Lactation, malnutrition and mal-absorption are the additional factors (29).

Prevalence of anaemia can be as high as 61% in developing countries. Studies in Nigeria have shown that malaria is still a major problem among pregnant women. In pregnancy, anaemia has a significant impact on the health of the foetus as well as that of the mother. 20% of maternal deaths in Africa have been attributed to anaemia (30).

The prevalence of anaemia in pregnant women in Vietnam varies by area, from 32% and 39% in the plain areas to 41% in the mountainous areas of the Central Coast and 60% in the Centre Highland. The prevalence of anaemia in non pregnant women ranges from 8% to 24%. Factors related to anaemia in PW include pregnancy during the third trimester, having four or more pregnancies, illness, low iron intake and Hookworm (31).

A study from Malawi and Tanzania showed that 60% of iron-deficient women had other deficiencies as well, and many had signs of inflammation. It was identified complex, multiple causes such as iron deficiency, malaria, hookworms, and other infections as major causes of anemia (32).

During pregnancy all women need more food, a varied diet, and micronutrient supplements. When energy and other nutrient intake do not increase, the body's own reserves are used, leaving a pregnant woman weakened. Energy needs increase in the second and particularly the third trimester of pregnancy (33).

Hookworm intensity was significantly associated with haemoglobin level; for each 1,000 egg increase, haemoglobin was reduced by 2.4 g/L. Living in different ecological zones, eating <1 serving of meat/ week, and farming were significantly associated with anaemia in women and children. Other risk factors in women included having >3 children and having a child <24 months old (32). All these risk factors are influenced by social factors and the more important factors are poverty and illiteracy. There are multiple pathways through which social factors influence health, and pathophysiological mechanisms involve homeostatic and allostatic changes in response to stress, neuroendocrine changes and altered autonomic functions, and abnormal inflammatory and immune responses (35).

Asian diets appeared to differ in containing meat less often as a source of iron, while pulses and chapattis provided more phytate and fiber. It is suggested that dietary intakes of phytate and fiber are important in causing lower ferritin levels by reducing iron absorption (36).

Hunger and malnutrition are devastating problems, particularly for the poor and unprivileged. According to the study by the Ethiopian Ministry of Economic Development and Cooperation, 50% of the Ethiopian population are living below the food poverty line and cannot meet their daily minimum nutritional requirement of 2200 calories (MOPED, 1999). Women in the reproductive age group and children are most vulnerable to malnutrition due to low dietary intakes, inequitable distribution of food within the household, improper food storage and preparation, dietary taboos, infectious diseases, and care (38, 39).

In Ethiopia, anemia is the most frequent morbidity among pregnant women with the prevalence ranging from 23% to 66.5%. There is an urban rural deferential in the prevalence of anemia. As indicated by studies in Asendabo and Mettu, anemia among pregnant women was consistently higher in the rural women compared to the urban counterparts (40, 41).

A cross-sectional study done in Jimma university specialized hospital showed that severe anemia was identified in 9(5.4%), and the rest had moderate and mild anemia, 31(18.5%), and 24 (14.3%), respectively. Prevalence of anemia among rural women was slightly higher than urban i.e, 19/49(38.8%) and 45/119(37.8%), respectively. The prevalence of anemia was 40%, 34.8% and 39.5%, for the first, second and third trimesters, but the difference was not statistically significant (P> 0.05) (37).

Most study conducted in Ethiopia in this area of problem focused to determine the prevalence of anaemia among pregnant women and other age group. The risk factors were not emphasized well. Analytical study design is important to study those risk factors associated to anaemia among pregnant women. Thus, this study attempted to explore the possible risk factors for anaemia using case control study among pregnant mother attending Jimma University Specialized Hospital ANC clinic, Jimma zone, South-West Ethiopia

2.2. Significance of the study

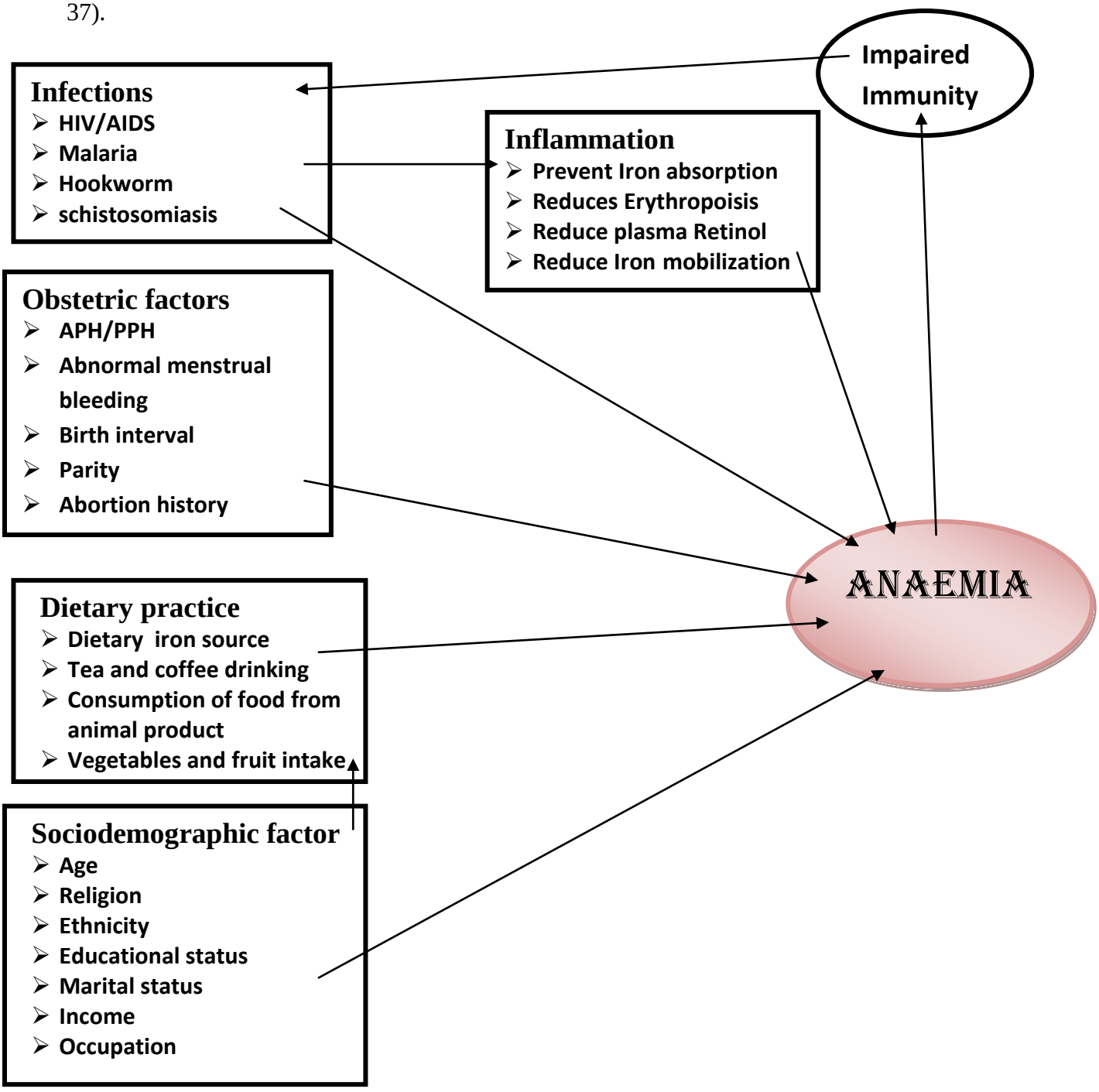
The occurrence of anaemia among pregnant women is a significant health problem worldwide. Ethiopia is not immune to this problem. Since anaemia had no immediate consequence on an individual, the victims tolerate/ignore the problem for long time. The victims also did not know whether they are anaemic and the risk factors contributing to anaemia because of low educational level of mothers in developing country like Ethiopia. And also pregnant mothers did not give priority to health since most of them engaged in different works like preparing food for the whole family in addition to other works which means they are busy throughout the day. Especially in pregnant mothers where the iron need is twice that of non pregnant mothers, anaemia had devastating consequences. Therefore identification of the risk factors contributing to anaemia in pregnant mothers had paramount importance to plan for anaemia prevention and control method which further contribute to decrease maternal mortality (1, 3).

This study was focused on assessing the risk factors of anaemia among pregnant women in our country particularly in the study area, because in developing countries like ours where multifactorial causes of anaemia leads to maternal morbidity and mortality. Identification of those factors is important to plan and take appropriate measure to decrease the problem. To achieve MDG 5, reducing maternal mortality related to anaemia plays its own role, which needs identification of risk factors of anaemia in pregnant women.

Furthermore, the finding of the study may supply information for further research.

2.3. Conceptual Framework of the study

This conceptual framework was developed after a revision of pertinent literatures in similar topic (32,35, 37).



CHAPTER THREE

OBJECTIVE

3.1. General Objective

- To determine risk factors for anaemia among pregnant mothers attending ANC clinic at JUSH from February 25 to April 15, 2011.

3.2. Specific Objectives

The specific objectives of this study:

- To identify the sociodemographic factors that increases the occurrence of anaemia in pregnancy.
- To determine the contribution of obstetric factors like parity, abortion, birth spacing and excess menstrual bleeding on anaemia in pregnancy.
- To identify parasitic and chronic infection that increases the prevalence of anaemia in pregnant women.
- To determine the association of dietary habit of a woman and occurrence of anaemia in pregnancy.

CHAPTER- FOUR
METHOD AND MATERIAL

4.1. Study area and period

This study was conducted in Jimma University specialized Hospital antenatal clinic in Jimma town, Oromia region; 356km from Addis Ababa towards the south-western part of Ethiopia. As the information from hospital administration, the hospital has 426 beds for inpatient services and 558 total staff; 65 Doctors, 215 nurses, 8 midwifery, 20 laboratory staffs, 16 pharmacy staffs, and 183 administrative staffs. The hospital provides preventive, curative and diagnostic services to Jimma town and for surrounding and serves as referral centre to the south-western part of Ethiopia. The hospital offers a range of services, including maternity care (antenatal, labour, postnatal), gynecological care (outpatient and inpatient care, post abortion care), neo-natal and follow up care for premature infants, voluntary counseling and testing of women. The affiliated clinic provides antenatal care, including prevention of mother to child transmission of HIV (PMTCT), delivery service, and postnatal care, among other primary health care services. ANC clinic had 7 consultants, 2 medical doctors, 1midwifery and 5 nurses allocated to provide comprehensive antenatal care. This study was conducted in JUSH from February 25 to April 10, 2011.

4.2. Study design

Unmatched case-control study design was employed to determine risk factors for anaemia among pregnant mothers attending ANC clinic at JUSH.

4.3. Population

4.3.1. Source population

All pregnant mothers who attend ANC clinic at JUSH for routine follow up.

4.3.2. Study population

Pregnant mothers who attend ANC clinic at JUSH for booking/first visit during the study period and obtained by purposive sampling method. Those repeated ANC client may give biased information because of the counseling and education provided by health professionals during previous visit.

Cases: Pregnant women came JUSH antenatal clinic for their booking visit and who had blood Hb levels of less than 11 g/dL (according to the WHO definition of anaemia in pregnancy) (3).

Controls: Pregnant women attending JUSH antenatal clinic for their for booking visit and who had blood Hb levels of greater than or equal to 11 g/dL (according to the WHO definition of anaemia in pregnancy).

4.4. Inclusion and Exclusion Criteria

Inclusion Criteria

- Pregnant mother who had come for ANC for booking visit.
- Those pregnant women age 15 to 49 years old.

Exclusion criteria

- Those mothers who are not sure of pregnancy
- Those who refuse to participate and/or seriously ill
- Those who are unable to communicate for different reasons
- Patients who were referred from other institutions were not included in this study as cases or controls.

4.5. Sample size determination and Sampling Technique

Sample size was determined using Epi-info version 6.04 statistical package considering

- $r= n_1/n_{2=}$ population allocation ratio = 1 (the number of case and control is equal in this study).
- In this study HIV infection was the variable which give maximum sample size, thus used to calculate the sample size with an estimated exposure among cases 56% and 37% among controls (43) with 5% marginal error and 95% confidence interval. Accordingly a total of 234 participants were employed in this study, 117 cases and 117 controls.

One hundred seventeen consecutive pregnant women who had anaemia (Hb <11mg/dl) at their booking visit was selected by purposive sampling method as case. For each case the next non-anaemic (Hb $\geq$11g/dl) pregnant mother who came for booking visit was selected as control.

4.6. Data collection

4.6.1. Data collection instrument

Questionnaire was adopted from similar study and modified to the context of study area after reviewing relevant literatures (37, 43). It includes basic demographic details and risk factors associated with anaemia. The questionnaire was prepared originally in English and then translated to Afan Oromo/Amharic by English teachers qualified with degree and who can speak Afan Oromo and Amharic. Back translation to English to check its consistency was done by another English teacher qualified with degree and who can speak both Afan Oromo and Amharic. The questionnaire was administered in Afan Oromo/Amharic. Laboratory reporting format was used to collect data on intestinal parasite infection and hemoglobin measurement. The details of the procedures were indicated on the annex part.

Stool examination: Parasite burden was determined by examination of stool specimens obtained from each study participant. The stool specimens was examined in duplicate for Schistosomiasis, Ascaris lumbricoides, Trichuris trichiura, and hookworm using a method that enhance the chance of detecting organisms, concentration method(Formol-ether Concentration method) (44) whereby protozoal content of the specimen is concentrated in to a small volume easily searched by microscopy. During stool examination the presence of double infestation for the Helimenithiasis was checked thoroughly.

Hemoglobin Determination: For each study participant hemoglobin level was determined by using Sahli Hailliege method. This method is preferred because it is easy and the result is rapid to take for the participants. The result was recorded on the format prepared for this purpose.

4.6.2. Data collection method

At the booking visit the nursing staff takes down relevant histories, conduct examination and records the finding both on antenatal records and in the clinic register, then the client was interviewed using semi-structured questionnaire after verbal consent was asked. Then the client was sent to the laboratory with a request of identification number given for research purpose. Hemoglobin measurement and intestinal parasite investigation was done in the laboratory. The result of the client was registered on format prepared in separate column for hemoglobin and intestinal parasites.

4.6.3. Data collectors

Two ANC staff nurses who can speak Afan Oromo and Amharic was selected and trained for data collection. The responsibility of the data collectors was to fill questionnaires after obtaining verbal consent from the subjects. Two laboratory technicians qualified with diploma was recruited to investigate intestinal parasite and hemoglobin measurement. One supervisor recruited from Jimma town health office MCH department was trained to assist and facilitate the data collection procedure. Data collection was done at one corner of the ANC unit after a woman has completed the antenatal follow up examination.

4.7. Study variables

4.7.1. Independent variable

- Sociodemographic variables (Age, religion, ethnicity, educational status, marital status, income, occupation)
- Infections (Malaria infection, Hook worm, other helminthic infection, HIV/AIDS)
- Obstetric factors (Excess menses, PPH, APH, Birth interval, parity, Gestational age)
- Dietary practice

4.7.2. Dependent variable

- Anaemia

4.8. Operational definitions

Anaemia in pregnancy – WHO defines anemia in pregnancy as haemoglobin concentration below 11g/dl (3).

Additional meal - Food intake during pregnancy of at least one additional meal of what is available in the house per day as compared to non-pregnant state.

APH – A woman considered as she had APH by ANC physician was considered "yes" for APH question and was taken from ANC card.

Excess menses – is bleeding more than 8 days per cycle or bleeding that demands changing of more than 3 pads per day.

Gestational age - in completed weeks, was estimated based on the last menstrual period.

Mild anaemia - haemoglobin 10-10.9g/dL (3)

Moderate anaemia - Hb 7.0- 9.9g/dL (3)

Severe anaemia - haemoglobin < 7g/dL (3)

PPH History– since data is collected after physician assessment of the pregnant women, individual record as PPH by physician on ANC card was considered as she has PPH.

Parasitic Infection: Presence of organisms/ova in human blood/stool those are dependent on their hosts.

4.9. Data Processing and Analysis

After individual data was scrutinized thoroughly for completeness, coding was done accordingly and the data was subsequently fed into Epidata version 3.1 statistical package. Double entry verification was done. Then, the data was exported to SPSS version 16.0 for cleaning and analysis. Cases and controls were compared in terms of risk factors. Association between dependent variable and the risk factors was determined by using binary logistic regression analysis for each group separately. On the basis of the results in the binary logistic regression analysis, statistically significant variables were therefore included in the final multiple logistic regression model. Risk was estimated by calculating the adjusted odds ratio (AOR) as approximation of the relative risk (RR), together with 95% confidence intervals.

4.10. Data Quality Assurance

To assure the quality of the data, properly designed data collection tool was prepared, training was given to data collectors and supervisor by principal investigator, and on each data collection day the collected data was reviewed by principal investigator, any problem faced in the time of data collection were discussed and immediate solution were made. To control the quality of data for analysis, editing data before entry and cleaning was done. During data entry double entry verification on Epidata 3.1 statistical package was used.

4.11. Pre-test

The pretest was conducted for one week in Jimma health centers in Jimma town to avoid information contamination. Twenty three (10% of sample) pregnant women were interviewed by data collectors for pre-test. Then, necessary correction was made based on the feedback of the data collector and supervisor on clarity and logical sequence of the questionnaire.

4.12. Ethical considerations

Ethical clearance was secured from the Ethical clearance Board of Jimma University to conduct the study in the specified area. All concerned officials at all levels in the JUSH was communicated and informed about the purpose of the study. Confidentiality of the responses was assured by informing data collectors not to record name of the participant on the questionnaires. Informed consent signed by the participant and the data collector was obtained for each study subject before data collection. Participation on the study was on voluntary basis. The study participant may fill minimum pain while sample was drawn for hemoglobin. The participant was informed and reassured of this minimal pain. Those pregnant mothers diagnosed as cases and have any abnormality finding related to variables of the study were referred to health care provider of the setting for appropriate care.

4.13. Dissemination plan

The results of the study will be disseminated to relevant bodies such as woreda health office, JUSH, MOH, etc. This will be done through submission of reports and presenting findings at appropriate seminars, workshops and conferences. Besides publication of the study findings on the reputable peer-reviewed local/international journal will be considered.

CHAPTER FIVE

RESULT AND DISSCUSSION

5.1. RESULT

5.1.1. Socio-demographic characterstics of study population

A total of 234 pregnant women attending antenatal clinic in JUSH for booking visit were included in the study, i.e. 117 cases and 117 controls. The mean age of cases and controls were 24.3 (±4.21SD) and 23.7 (±3.94SD) years respectively. Majority of cases 47(40.2%) and controls 51(43.3%) were in the age group of 20–25 years. Twenty two percent and 25.6% of cases and controls respectively were 20years or younger. The majority of cases 67(57.3%) and controls 65(55.6%) were Muslims in religion. Concerning the educational status of the participants, 34(29.1%) of cases and 35(29.9%) of controls were illiterate while 37(31.6%) of cases and 46(39.3%) of controls could read and write. Only 8.6% of cases and 6% of controls were grade 9^{th} and above. Among 234 pregnant women included in the study, 195(83.3%) were married of which 103(88.0%) and 92(78.6%) were cases and control respectively. About 44(37.6%) of cases and 16(13.7%) of controls were rural residents. Nearly similar proportion, 46.2% of cases and 45.3% of controls had monthly income of ≤250 Ethiopian birr. Only 18.8% of cases and 11.1% of controls had monthly income of >450 birr. The majority of the study participant, 72(64.1%) of cases and 77(65.8%) of controls were house wife. Sixty four percent of the cases and 68.4% of the controls were Oromo ethnically.

5.1.2 Socio-demographic determinants of anaemia in pregnant mothers

Residence was significantly associated with anaemia (OR= 3.8, 95%CI 1.99 -7.26). Other socio-demographic variables were not significantly associated with anaemia in this study (Table 1).

Table 1:- Association of sociodemographic factors with anemia in pregnant mothers attending JUSH ANC clinic, Southwest Ethiopia, February 25 to April 15, 2011

Variables		*Cases Number (%) (n =117)*	*Controls Number (%) (n = 117)*	*Crude OR (95% CI)*
Age (in completed years)	<20	26(22.2%)	30(25.6%)	0.7(0.35, 1.40)
	20 – 25	47(40.2%)	51(43.6%)	0.7(0.41, 1.36)
	26 +	41(37.6%)	36(30.8%)	1
Religion	Muslim	67(57.3%)	65(55.6%)	1
	Orthodox	37(31.6%)	36(30.0%)	0.97(0.54,1.72)
	Protestant	12(10.3%)	16(13.7%)	0.72(0.32,1.65)
Educational status	Illiterate	34(29.1%)	35(29.9%)	1
	Read and write	37(31.6%)	46(39.3%)	1.2(0.63,2.29)
	1 -4 grade	25(21.4%)	21(17.3%)	0.8(0.38,1.72)
	5- 8 grade	11(9.4%)	8(6.8%)	0.7(0.25,1.97)
	9^{+} grade	10(8.6%)	7(6.0%)	0.6(0.23, 1.99)
Marital status	Single	14(12.0%)	25(21.4%)	0.5(0.24,1.02)
	Married	103(88.0%)	92(78.6%)	1
Residence	Rural	44(37.6%)	16(13.7%)	3.8(1.99, 7.26)*
	Urban	73(62.4%)	101(86.3%)	1
Monthly income (in birr)	≤250	54(46.2%)	53(45.3%)	0.63(0.28,1.38)
	251 - 350	24(20.5%)	27(23.1%)	0.55(0.22,1.33)
	351 - 450	17(14.5%)	24(20.5%)	0.43(0.17,1.11)
	≥451	22(18.8%)	13(11.1%)	1
Occupation	House wife	73(62.4%)	77(65.8%)	0.87(0.40, 1.90)
	Employee	16(13.7%)	15(12.8%)	1
	Merchant	15(12.8%)	16(13.7%)	0.87(0.32, 2.38)
	others	13(11.1%)	9(7.7%)	1.28(0.40, 4.07)
Ethnicity	Oromo	75(64.1%)	80(68.4%)	1
	Amhara	27(23.1%)	24(20.5%)	1.2(0.63,2.26)
	Dawro	7(6.8%)	8(6.8%)	1.0(0.38,2.98)
	Others	7(6.0%)	5(4.3%)	1.4(0.45, 4.90)

"*" *indicates significant at p<0.05* 1 *is reference group*

Magnitude of anaemia by severity

One in three, (78(66.7%)) of the cases were affected by moderate (Hb 7-9.9g/dL) anaemia. Twenty two (18.8%) and 17(14.5%) of cases were affected by severe anemia (Hb < 7.0 g/dL) and mild anaemia (Hb 10 -10.9 g/dL) respectively. The mean hemoglobin level among cases was 8.2(±1.2SD) g/dl and for controls 12.4(± 1.0SD) g/dl. The minimum and maximum hemoglobin level for cases were 5.3g/dl and 10.8g/dl respectively while the lowest and highest value of hemoglobin among controls was 11.0g/dl and 16.9 g/dl.

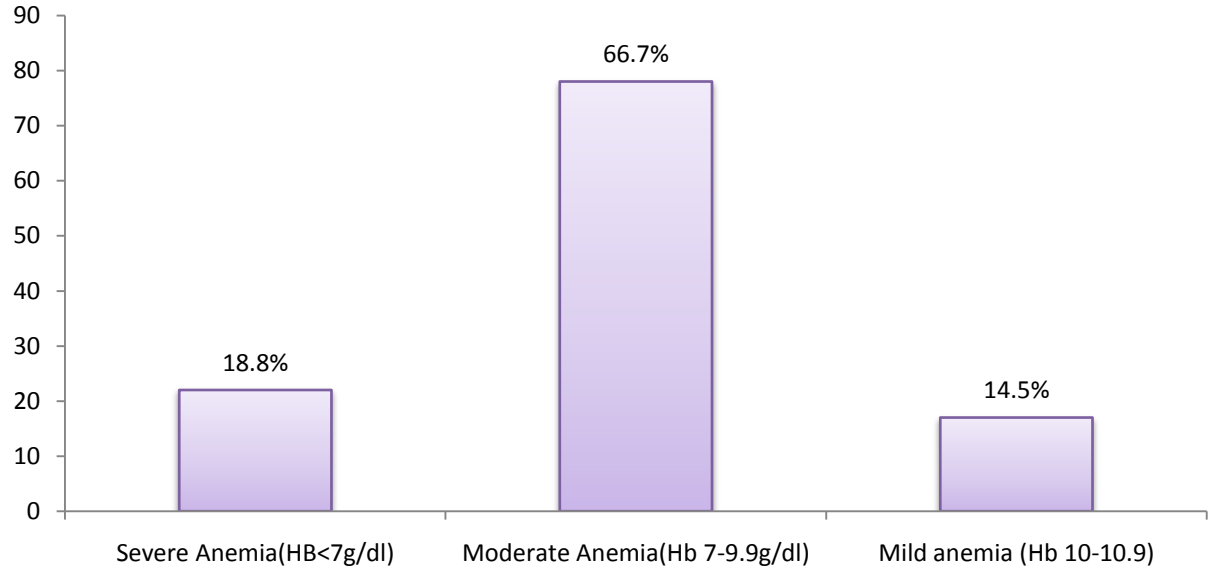


Figure 1: Magnitude of anaemia by severity among cases according to WHO classification in pregnant mothers attending JUSH ANC Clinic, Southwest Ethiopia, February 25 to April 15, 2011

Cause and prevention of anaemia

Of a total 234 study participants, only 43(18.3%) of them respond "yes" for the question "do you know the cause of anaemia?". Seven (53.8%) of cases and 9(30%) of controls consider bleeding during delivery as a cause of anaemia in pregnancy. Poor nutrition, multiparity and birth spacing, diseases and use of contraceptive were other response. Taking fluids was anaemia preventing method by four (30.8%) of cases and 9(30.0%) of controls. Improving feeding habit, taking medication and preventing disease were the other method of anaemia prevention by the participants.

5.1.3. Obstetric factors and anaemia

The majority of the study participant, 73(64.2%) of case and 80(68.4%) of controls were in the second trimesters. This study showed that gestational age of the pregnant mother had no statistically significant association with anaemia in pregnancy. Parity had statistically significant association with anemia, those mothers who had had 5 or more children were 2 times more likely to be anaemic as compared to those who had no child (OR= 2.0, 90%CI 1.02 - 4.11). There was a statistically significant association between anemia and birth interval from index pregnancy in the current study, those pregnant mothers who had $\leq$ 2 years of birth interval from index pregnancy had 7 times more likely to be anemic compared to those mothers who had birth interval greater than two years (OR=7.0, 95%CI 3.00 – 11.29). Abortion and contraceptive use had no statistical association with anemia in this study. About 70(59.8%) of cases had history of excess menses prior to index pregnancy compared to 24(20.5%) of controls who had history of excess menses prior to the index pregnancy. The difference was statistically significant (OR= 5.7, 95%CI 3.22 – 0.32). History of APH and PPH had no statistically significant association with anaemia in pregnancy in the current study (Table 2).

Table 2: - Association of obstetric factors with anemia in pregnant mother attending JUSH ANC clinic, southwest Ethiopia, February 25 to April 15, 2011

Variables		Cases Number (%)	Controls Numbers (%)	Crude OR(95% CI)
Gestational age(Trimesters)	First(≤13 weeks)	19(16.2%)	20(17.1%)	1
	Second (14 -25 weeks)	75(64.1%)	80(68.4%)	0.9(0.48,1.99)
	Third (>25 weeks)	23(19.7%)	17(14.5%)	1.4(0.58,3.45)
	Total	117	117	
Parity	0	53(45.3%)	64(54.7%)	1
	1-4	45(38.5%)	42(3.9%)	1.2(0.73,2.22)
	≥5	19(16.2%)	11(9.4%)	2.0(0.89,4.69)**
	Total	117	117	
Birth interval from index pregnancy	≤ 2 years	70(87.5%)	28(50.0%)	7.0(3.00,11.29)*
	>2 years	10(12.5%)	28(50.0%)	1
	Total	80	56	
Do you experience abortion	Yes	8(9.8%)	10(19.2%)	2.2(0.80,6.01)
	No	72(90.2%)	46 (80.8%)	1
	Total	80	56	
Contraceptive use	Yes	51(43.6%)	41(35.0%)	0.6(0.41,1.18)
	No	66(56.4%)	76(65.0%)	1
		117	117	
History of excess menses prior to index pregnancy	Yes	70(59.8%)	24(20.5%)	5.7(3.22,10.32)*
	No	47(40.2%)	93(79.5%)	1
	Total	117	117	
History of APH	Yes	25(21.4%)	18(15.3%)	0.6(0.29,1.18)
	No	92(78.6%)	99(84.7%)	1
	Total	117	117	
History of PPH	Yes	22(27.5%)	23(41.0%)	0.5(0.27,1.09)
	No	58(72.5%)	33(59.0%)	1
	Total	80	56	

*NB: **"* "indicates significant at p<0.05 "** " indicates significant at p<0.1 1 is reference group***

5.1.4. Infections and anaemia

Higher proportion of anemic cases 76(65.0%) had no regular shoe wearing habit compared to 48(41%) of controls who had regular shoe wearing habit. The difference was statistically significant (OR= 2.6, 95%CI 1.57 – 4.52). Twenty seven (23.1%) of cases were hook worm infected compared to only 9(7.7%) of the controls and the difference was statistically significant (OR=3.6, 95%CI 1.62 – 8.14). Serostatus of the pregnant women was statistically associated with anemia in pregnancy (OR =2.5, 95%CI 1.57 – 4.52). About 18.8% of the cases are seropositive compared to 8.55% of the controls. History of malaria infection, history of diarrhoea in the current pregnancy, and history of helminths infection other than hook worm were not statistically associated with anaemia in pregnancy (Table 3).

Table 3: - Association of chronic and parasitic infections with anemia in pregnant mother attending JUSH ANC clinic, southwest Ethiopia, February 25 to April 15, 2011

Variables		Cases No (%) n=117	Controls No (%) n = 117	Crude OR (95% CI)
Shoe wearing habit	Yes	41(35.0%)	69(59.0%)	1
	No	76(65.0%)	48(41.0%)	2.6(1.57, 4.52)*
Hook worm infection	Yes	27(23.1%)	9(7.7%)	3.6(1.62, 8.14)*
	No	90(76.9%)	108(92.3%)	1
History of malaria infection	Yes	40(34.2%)	31(26.5%)	0.7(0.40, 1.23)
	No	77(65.8%)	86(73.5%)	1
History of diarrhea in index pregnancy	Yes	13(11.1%)	11(9.4%)	0.8(0.35, 1.93)
	No	104(88.9%)	106(90.6%)	1
History of helminths infection	Yes	34(29.1%)	26(22.2%)	0.6(0.38, 1.25)
	No	83(70.9%)	91(77.8%)	1
Serostatus	Pos	22(18.8%)	10(8.5%)	2.5(1.37, 4.51)*
	Neg	95(81.2%)	107(91.5%)	1

"" indicate significant at P<0.05* 1 *is reference group*

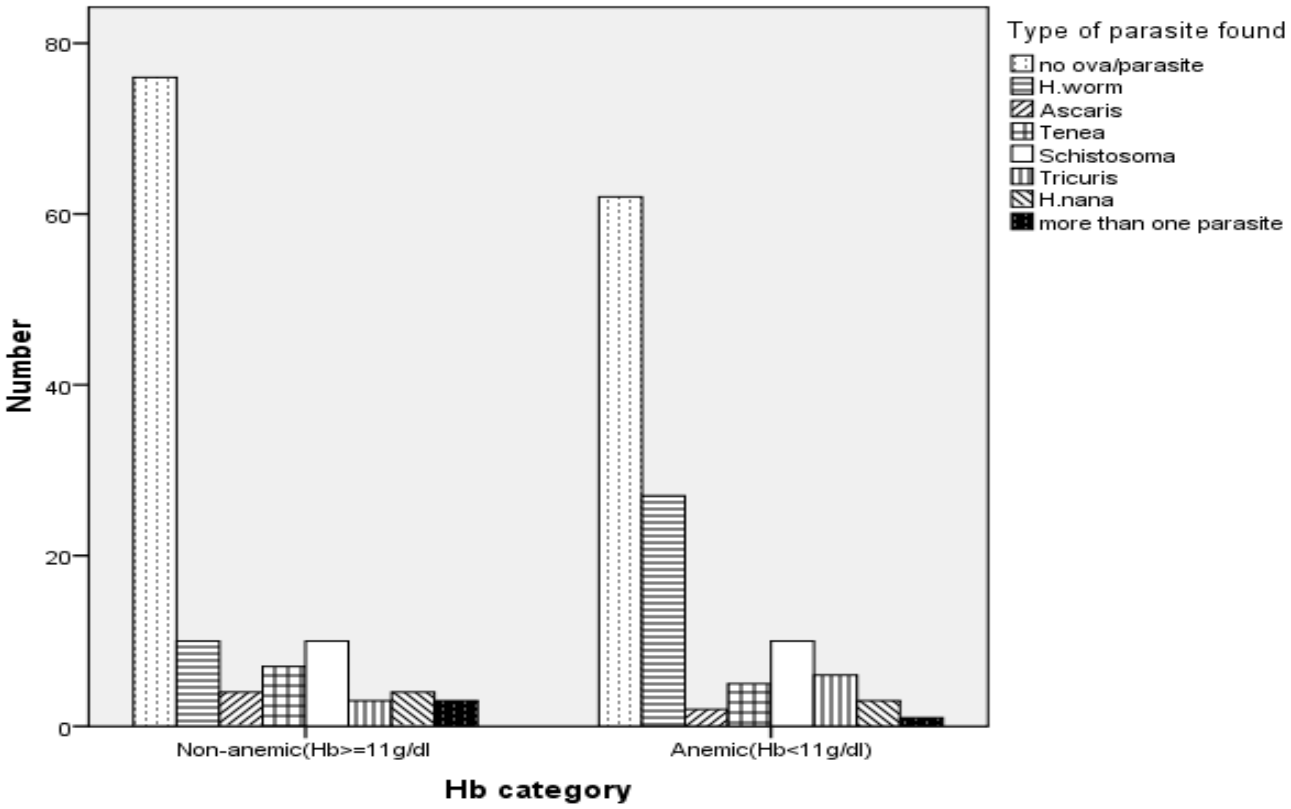


Figure 2: Intestinal parasites infection among cases and controls in pregnant mothers attending JUSH ANC clinic, southwest Ethiopia, February 25 to April 15, 2011

5.1.5. Dietary practice and anaemia

More than half (56.4%) of anemic cases used anti-acid repeatedly compared to 20.5% of controls who used anti-acid as a treatment of gastritis and the difference was statistically significant (OR=4.9, 95%CI 2.76 – 8.81). Those pregnant mothers who eat food from animal product once every two weeks had 2.3 times more likely to be anaemic as compared to those who eat animal food daily (OR=2.3, 90%CI 1.06 -5.12). Drinking coffee/tea immediately after meal had statistically significant difference among cases and controls. Those who had a habit of drinking coffee/tea immediately after meal daily had 3.1 times likely to be anaemic as compared to those who never drink coffee/tea (OR=3.1, 95%CI 1.12 - 9.07). Sixty one (52.1%) of cases had a habit of drinking coffee/tea immediately after meal daily while 26.6% of controls who had habit of drinking coffee/tea immediately after meal daily. Other variables like intake of green leafy vegetables, intake fruit after meal, having three regular meal per day, intake one additional meal a day during pregnancy, history of pica, food aversion and staple cereals commonly used were not statistically associated (Table 4).

Table 4: Association of dietary practice with anemia in pregnant mother attending JUSH ANC clinic, southwest Ethiopia, February 25 to April 15, 2011

Dietary practice		Cases Number (%) n= 117	Controls Number (%) n= 117	Crude OR(95% CI)
Do you use anti-acid repeatedly	Yes	66(56.4%)	24(20.5%)	4.9(2.76,8.81)*
	No	51(43.6%)	93(79.5%)	1
Eating food from animal product	Daily	11(9.4%)	18(15.4%)	1
	At least twice a week	16(13.7%)	16(13.7%)	1.6(0.58,4.54)
	weekly	19(16.2%)	26(22.2%)	1.2(0.46,3.10)
	Every 2 weeks	30(25.6%)	21(17.9%)	2.3(0.92,5.95)**
	Once a month	20(17.1%)	14(12.0%)	2.3(0.84,6.44)
	Never	21(17.9%)	22(18.8%)	1.5(0.59,4.07)
Eating green leafy vegetables	Daily	51(43.6%)	54(46.2%)	1
	At least twice a week	23(19.7%)	22(18.8%)	1.1(0.55,2.22)
	weekly	27(23.1%)	27(23.1%)	1.0(0.54,2.04)
	Every 2 weeks	16(13.7%)	14(12.0%)	3.17(0.32,31.53)
Drinking coffee/tea immediately after meal	Daily	61(52.1%)	30(25.6%)	3.1(1.12,9.07)*
	At least twice a week	13(11.1%)	23(19.7%)	0.8(0.27,2.85)
	weekly	18(15.4%)	38(32.5%)	0.7(0.24,2.23)
	Every 2 weeks	9(7.7%)	12(10.3%)	1.1(0.32,4.25)
	Once a month	9(7.7%)	3(2.6%)	4.7(0.93, 23.68)
	Never	7(6.0%)	11(9.4%)	1
Eating fruits after meal	Daily	29(24.8%)	33(28.2%)	1
	At least twice a week	40(34.2%)	39(33.3%)	1.1(0.60, 2.27)
	weekly	37(31.6%)	35(29.9%)	1.2(0.60,2.37)
	Every 2 weeks	5(4.3%)	6(5.1%)	0.9(0.26,3.43)
	Once a month	4(3.4%)	2(1.7%)	2.2(0.38,13.35)
	Never	2(1.7%)	2(1.7%)	1.1(0.15, 8.59)
Do you use 3 regular meals/day	Yes	79(67.5%)	89(76.1%)	1
	No	38(32.5%)	28(23.9%)	0.6(0.36, 1.16)
Eating one additional meal	Daily	13(11.1%)	13(11.1%)	1
	At least twice a week	29(24.8%)	28(23.9%)	1.0(0.41, 2.61)
	weekly	19(16.2%)	30(25.6%)	0.6(0.24,1.65)
	Every 2 weeks	22(18.8%)	14(12.0%)	1.5(0.56, 4.35)
	Once a month	2(1.7%)	1(0.9%)	2.0(0.16,24.87)
	Never	32(27.4%)	31(26.5%)	1.0(0.38,2.411)
History of pica	Yes	24(20.5%)	22(18.8%)	0.8(0.47, 1.74)
	No	93(79.5%)	95(81.2%)	1
Food aversion	Yes	47(39.7%)	33(28.2%)	0.5(0.34, 1.03)
	No	70(60.3%)	84(71.8%)	1
Staple cereals commonly used	Teff	65(55.6%)	66(56.4%)	1
	Maize	39(33.3%)	39(33.3%)	1.0(0.58,1.77)
	others	13(11.2%)	12(10.3%)	1.1(0.46,2.58)

NB: " " indicates significant at p<0.05* **"**"** *indicates significant at p<0.1* 1 *is reference group*

5.1.6 Predictors of Anaemia

The outcome of the final backward stepwise multiple logistic regression model (Back ward likely hood model) indicated that residence, parity, use of anti-acid repeatedly for treatment of gastritis and serostatus were dropped from the final model. In light of this analysis, the risk of being anemic increases 7.4 times by drinking coffee/tea immediately after meal on daily basis: 2.1 times by hook worm infection of the mother: 2.2 times by lack of regular shoe wearing habit: 9.7 times by history of maternal excess menses bleeding and 9.6 times by birth interval ≤2 years from index pregnancy independently for each (Table 5).

Table 5: Crude and adjusted associations of risk factors with anemia in pregnant mothers attending JUSH ANC clinic, Southwest Ethiopia, February 25 to April 15, 2011

Variables		Cases No (%)	Controls No (%)	Crude OR (95% CI)	Adjusted OR (95% CI)
Drinking coffee/tea immediately after meal	Daily	61(52.1%)	30(25.6%)	3.1(1.12,9.07)	7.4 (2.17, 14.05)
	At least twice a week	13(11.1%)	23(19.7%)	0.8(0.27,2.85)	3.9 (0.04, 1 3.65)
	weekly	18(15.4%)	38(32.5%)	0.7(0.24,2.23)	7.6 (0.82, 17.53)
	Every 2 weeks	9(7.7%)	12(10.3%)	1.1(0.32,4.25)	1.6 (0.15, 17.98)
	Once a month	9(7.7%)	3(2.6%)	4.7(0.93, 23.68)	8.0 (0.69, 19.30)
	Never	11(9.4%)	7(6.0%)	1.0	1
	Total	117	117		
Hookworm infection	Yes	27(23.1%)	9(7.7%)	3.6(1.62, 8.14)	2.1 (1.02, 4.22)
	No	90(76.9%)	108(92.3%)	1.0	1
	Total	117	117		
Shoe wearing habit	Yes	41(35.0%)	69(59.0%)	1.0	1
	No	76(65.0%)	48(41.0%)	2.6(1.57, 4.52)	2.2 (1.43, 5.13)
	Total	117	117		
History of excess menses bleeding prior to index pregnancy	Yes	70(59.8%)	24(20.5%)	5.7(3.22,10.32)	9.7 (2.51, 14.46)
	No	47(40.2%)	93(79.5%)	1.0	1
	Total	117	117		
Birth interval from index pregnancy	≤2 years	70(87.5%)	28(50.0%)	7.0(3.00-11.29)	9.6 (3.67, 13.17)
	>2years	10(12.5%)	28(50.0%)	1.0	1
	Total	80	56		

1 *is reference group*

5.2. DISCUSSION

Maternal anaemia is one of the most prevalent pregnancy complications. Despite reported associations with adverse pregnancy outcomes, progress towards the understanding of causal contributions to anaemia and the role of its primary prevention during pregnancy has been disappointing. Research has not addressed certain fundamental epidemiological questions regarding anaemia, most notably, variations in risk across different community of our country. Importantly, the epidemiology of anaemia in pregnancy in Ethiopia is largely unexplored.

In Ethiopia, anemia is the most frequent cause of morbidity among pregnant women with the prevalence ranging from 23% to 66.5%. There is an urban rural deferential in the prevalence of anemia. As indicated by studies in Asendabo and Mettu, anemia among pregnant women was consistently higher in the rural women compared to the urban counterparts (40, 41). Similarly the finding of this study showed rural women were more prone to anemia as compared to urban counterparts. This may be those mothers who live in rural were involved in farming work which needs high energy cost and increase their risk for infections like hook worm.

There was statistically significant association between anaemia and birth interval, in which those mothers ≤2 years of birth interval were 7 times more likely to be anaemic as compared to those >2 years birth interval (OR=9.6, 95%CI 3.67 – 13.17). It is well-known, frequent pregnancies with a short pregnancy cycles lead to maternal depletion syndrome. Appropriate time after each pregnancy for recuperation and replenishment of nutrient stores and circulating levels is a minimum of three to five years (24).

Women in reproductive age have a particularly high demand for haematopoitic nutrients. When not pregnant or lactating, regular menstrual losses constitute a continuing drain of nutrients which have to be replaced. On average a healthy woman loses 25 to 30 ml of blood each month. This is equivalent to an average daily blood loss of 0.5mg of iron (5). In the current study about 70(59.8%) of cases had history of excess menses prior to index pregnancy compared to 24(20.5%) of controls who had history of excess menses prior to the index pregnancy (OR= 9.7, 95%CI 2.51 – 14.46). Study done in Turkey showed slightly lower finding, that more than five days of menstrual bleeding (OR=3.01, 95% CI 1.94 - 4.66) was found to be risk factors for anaemia (48).

The current study showed 27(23.1%) of cases were hook worm infected compared to only 9(7.7%) of the controls and the difference was statistically significant (OR=2.1, 95%CI 1.02– 4.22). Blood loss caused by helminthiasis puts mother, fetus and child at risk of iron deficiency, which could lead to anaemia. The extent to which this deficiency occurs depends on the host's iron status, the infecting parasites and the intensity and duration of infection. It is known that the iron status of women in developing countries is frequently poor as a result of an inadequate dietary iron intake, concurrent infections and frequent or closely spaced pregnancies (43).The findings in this study indicated the need for screening every pregnant woman during the first antenatal care visit for anemia and its risk factors in order to deworm pregnant women, improve regular shoe wearing habit and apply other preventive measures for anemia. This has already been recommended in the WHO and federal Ministry of Health micronutrient prevention guidelines (5, 46). .

This study also showed those pregnant mothers who had a habit of drinking coffee/tea immediately after meal daily were 7.4 times more likely to be anaemic as compared to those who never drink coffee/tea immediately after meal (OR=7.4, 95%CI 2.17 – 14.05). Anaemia survey in Ethiopia showed that anaemia was slightly higher among women who had consumed tea (30.2%) and had less frequently eaten foods from animal (32.0%) and plant (31.8%) sources than their counterparts (1). A diet containing high amount of inhibitors and low amount of enhancers will lead to decreased availability of dietary iron which in turn results in iron deficiency anemia (47). Absorption of non-heme iron is enhanced by the presence of other dietary components like organic acids, and foods of animal origin in the diet. Eventhough the current study has tried to assess the different dietary risk factors for anemia, frequency of consumption of enhancers and inhibitors of iron absorption, the finding indicates intake of enhancers like vegetables, fruits and animal food were low. In contrary the consumption of inhibitors of iron absorption like drinking coffee/tae and use of anti-acid repeatedly were common which increase risk of anaemia by decreasing iron absorption.

National Guideline for control and Prevention of Micronutrient deficiency indicated pregnant women need at least one additional meal per day to address the requirements for herself and the baby (46). However, in this study there was no significant difference in terms of having additional meals during pregnancy between anemic and non-anemic women, as their diet during pregnancy was not different from the non-pregnant state in both groups. This indicate there was a problem on the implementation of the micronutrient guide line for prevention of anaemia (only about 11% of cases and 11% of controls take one additional meal per day)

Strength and limitation of the study

Strength

This study used analytical type of study design which is case control study design to assess risk factors of anaemia among pregnant mothers attending ANC clinic in JUSH which need less cost and time but relate cause and effect. This study also focus on risk factors of anaemia among pregnant mothers which get less attention by health care workers and the study population itself as the disease is chronic, but leads to devastating problem that can lead pregnant mother to death. Therefore identifying the risk factors by using such study help to plan prevention and control method from the grass route level before the problem occur.

Limitation of the study

- Participants might not give true information on the type of food they used, number birth they had, number of abortion they experienced and other information for social desirability bias.
- The study was facility based; pregnant mother who did not came to health facility might be systematically different from those who came to health facility.

CHAPTER SIX
CONCLUSION AND RECOMMENDATION

6.1. Conclusion

In conclusion, there are different risk factors of anaemia among pregnant mothers in the study area. The prevalence of anemia was high in those who had hook worm infection, excess menstrual bleeding before the index pregnancy, those who had less than two years of birth intervals between the current pregnancies and the last child they bear and those who had coffee/tea drinking habit immediately after meal daily.

Intake of food from animal product, vegetables, fruits and other enhancers of non-hem iron were low. They used similar food they used in non-pregnant state. The intake of additional meal during pregnancy than non-pregnant state was not practiced by the majority (88% of study cases and controls). Generally speaking nutritional practice was low interms of frequency and type food (variety like vegetables, fruits and animal products) they used during pregnancy.

6.2. Recommendation

The results of this study emphasize the importance of giving due attention to dietary practice and other risk factors like infections and obstetric factors. In this way, provide a foundation for healthcare and nutrition policies that aim to solve the problem. As a preventative measure, in conjunction with other strategies, due emphasis should be given in improving the knowledge and practice of pregnant mothers on appropriate dietary practice and prevention of helminthic & chronic infections like HIV/AIDS. The following recommendations were forwarded based on the finding:

For health service delivery organizations

- Health education should be strengthened to the community at service delivery site like ANC clinic and Outpatient department on
  - prevention of infections like hook worm especially during pregnancy
  - promoting family planning and birth spacing
  - improved shoe wearing habit
- Screening for anaemia and giving iron-folate supplements to rural pregnant mothers should be more strengthened

For community health workers and other stake holders

- Health education & promotion activities should be more strengthened on drinking of coffee/tea immediately after meal, family planning (birth spacing), prevention of hook worm infection, and regular shoe wearing habit at community level specially for rural mothers.
- Health education on causes and prevention of anaemia specially during pregnancy should be given the community

For Researcher

- Further studies are needed to consider other risk factors like micronutrients status of the food, hereditary disorders
- On the other hand, as this was an institutional study further community based studies are recommended to identify risk factors for anaemia in pregnant mothers

For policy makers

- Strengthen micronutrient deficiency prevention and control programs particularly iron supplementation to pregnant mothers

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Annex I: QUESTIONNAIRE

Jimma University

College of public health and medical sciences

Department of Epidemiology

Questionnaire to assess risk factors for anemia among pregnant mothers attending JUSH ANC clinic, in Jimma zone, Oromia Regional State, south west Ethiopia , 2003EC.

INFORMATION SHEET

Hello, my name is _____ and I am working as a data collector in this study. I would like to inform you that I am going to have a short discussion concerning this study. Before we go to our discussion, I will ask you to listen carefully to what I am going to read to you about the purpose and general condition of the study and tell me whether you agree or disagree to participate in this study. As part of this study we are collecting information on risk factors for Anemia among pregnant mothers. You are selected to be one of the participants in the study. The Anemia risk assessment is being done to find out what factors are involving. This enables the concerning and pertinent bodies to develop programs to prevent and treat anemia particularly in pregnant mothers. But to do this it needs reliable information. That is why we are now asking information and collecting a few drops of blood from your finger and stool sample. The instruments I use for taking the blood are completely clean, sterile and safe. You may fill minimum pain while we collect blood from your finger for hemoglobin. The blood will be analyzed with new equipment and the results of the test will be given to you right after the blood is taken. The results and the information will be kept confidential. If a report of the result to be published, only summarized information of the total group will appear. If you diagnosed condition/disease, you will be referred immediately and will get the treatment in collaboration with ANC clinic.

Do you have any questions?

INFORMED CONCENT

May I now ask that you _____ participate in the anemia risk assessment study? However, if you decide not to participate, it is your right and I will respect your decision. Now please tell me if you agree to participate in the study.

Yes____ continue the interview *No* ____ stop the interview and thank the respondent

Date____/____/_____ Questioner no_____

Respondent (name and signature) _____

Interviewer (name and signature) _____

Supervisor (name and signature) _____

Instruction: Circle the response provided by the interviewee or write the appropriate answer on the space provided

S.№	Questions		If skip to
100	**General information**		
101	Woreda		
102	Kebele/town		
103	Age of respondent(in years completed)		
104	What is your marital status?	1. Single 3. Divorced 2. Married 4. Widowed	
105	What is your religion?	1. Muslim 2. Orthodox 3. Protestant 4. Others (specify)----------	
106	What is your ethnicity?	1. Oromo 2. Amhara 3. Kefa 4. Dawuro 5. Other (specify)----------	
107	What is your educational level?	1. Illiterate 2. Read and write 3. 1ST Cycle (1-4) 4. 2nd cycle (5-8) 5. Secondary (9-12) 6. Tertiary (12+)	

108	What is your occupation?	1. House wives (unemployed) 2. Employee 3. Merchant 4. Farmer 5. Daily labor worker 6. Other (specify)----------	
109	Family monthly income (in birr)		
110	Residence of the respondent	1. Urban 2. Rural	
111	Do you know the cause of anaemia?	1. Poor nutrition 2. Bleeding before/during delivery 3. Multiparity and birth spacing 4. Infection 5. Use of contraceptive 6. Other (specify)---------- 7. I donot know	
112	Do you know how to prevent anaemia?	1. Yes 2. No	
113	If yes for Q#112, how do you prevent?		
200	**Questions to assess risk factors for anaemia**		
201	Do you use anti-acid repeatedly to treat gastritis?	1. Yes 2. no	
202	Is there any food that you donot eat during pregnancy (not supported by your culture)?	1. Yes 2. No	2 → Q#204
203	If yes for Q#202 what type of food is it? (specify)		
204	Do you experience pica (eating strange substance) in	1. Yes 2. No	2 → Q#206

	your index pregnancy?		
205	If yes for Q#204, what do want to eat?		
206	Do you experience food aversion in your index pregnancy?	1. Yes 2. No	2 → Q#208
207	If yes for Q#206, what type of food do you avert?		
208	Do you use three regular meals per day?	1. Yes 2. No	
209	How often do you have animal food in your meal?	1. Daily 2. At least twice a week 3.Weekly 4. Every two week 5. once a month 6. Never	
210	How often do you have green leafy vegetables in your meal?	1. Daily 2. At least twice a week 3. Weekly 4. Every two week 5.once a month 6. Never	
211	How often do you take coffee or tea immediately after meal?	1. Daily 2. At least twice a week 3. Weekly 4. Every two week 5.once a month 6. Never	
212	How often do you eat fruits after meal?	1. Daily 2. At least twice a week 3. Weekly 4. Every two week 5. Once a month	

		6. Never	
213	How often do you eating one additional meal per day than non-pregnant state?	1. Daily 2. At least twice a week 3. Weekly 4. Every two week 5.once a month 6. Never	
214	Type of cereals commonly used (staple food)?	1. Teff 2. Maize 3. other(specify) ----------	
215	Do you have a history of excessive menstrual bleeding prior to index pregnancy?	1. Yes 2. No	
216	What is your gestational age (Trimesters)?		
217	What is the number of birth you give (parity)?		
218	What is your birth interval for your last child and the current pregnancy (in months)?		
219	Do you experienced abortion?	1. Yes 2. No	2 ⟶ Q#221
220	Number of abortions you experienced		
221	Do you used Contraceptive prior to index pregnancy?	1. Yes 2. No	
222	History of Antepartum hemorrhage (APH)(**from ANC card**)?	1. Yes 2. No	
223	History of PPH prior to index pregnancy **(ANC card)**?	1. Yes 2. No	

224	Do you have history of heart disease **(From card)**?	1. Yes 2. No	
225	Do you have a previous history of C/S**(From card)**?	1. Yes 2. No	
226	Do you have history of Hypertension/pre-eclampsia **(From card)**?	1. Yes 2. No	
227	History of renal disease (**from ANC card**)?	1. Yes 2. No	
228	Do you have history of diarrhea in your index pregnancy?	1. Yes 2. No	
229	Do you have a history of intestinal helminthic infection in the past three month?	1. Yes 2. No	
230	Parasitic infection from stool exam (**laboratory result**)	1. Yes 2. No	2 ⟶ Q#232
231	If yes for Q# 232, write type and density **(Laboratory result)**	Type of parasite----------	
232	Do you have regular Shoe wearing habit?	1. Yes 2. No	
233	Do you have history of malaria infection in the last three month?	1. Yes 2. No	
234	Do you have history of TB infection in the past 3 month?	1. Yes 2. No	
235	How often do you drink alcohol?	1. Daily 2. At least twice a week 3.Weekly 4. Every two week 5. once a month 6. Never	

236	Serostatus of the pregnant women(from ANC card)	1. Neg 2. Pos	
237	Haemoglobin level of the respondent **(From laboratory result)?**	----------g/dl	

Finally I thank you for your coordination

Afan Oromo version of questionnaire

Univarsiti Jimmaa

Kollejji Fayyaa Hawaasaa fi saayinsii Medicalaa

Mumme Epidemiology

Gaafilee waa'ee sababoota hawwan ulfaa hir'ina dhigaatiif saaxilan addaan baasuf qophaa'e.

Oddefannoo hirmaatotaaf kenamu

Nagaa gaafachu. Maqaan koo_____ jedhamaa. Amma kan hojachaa jiru odeffanno qu'anno sababi hawwan ulfaa hir'ina dhigaatiif saaxilu sassaabu irratti dha. Kanaafu waa'ee qu'anno kanaa ilaalchisee waan tokko tokko irratti akka walin dubannu barbaadaa. Marii Kenyaan durattii faayidaa qu'anno kanaa fi maal irratti akka xiyyefatu sitti himu barbaada. Akka qaama qu'anno kannatti odeffanno waa'ee sababoota hir'inna dhigaa fidan sassaabu barbaachisaa dha. Odeffanno kana argachuuf ammo akka isin hirmaatan afferamatanitu. Odeffannoo dhugaa irratti hunda'e isiin nuuf kennitan kun sababni hawwan ulfa qaban maaf rakko hir'ina dhigaatiif akka saaxilam addaan baasuuf gargaara. Sababota kan addaan baafachun ammo qaamni dhimmi ilaalu fulduratti rakko kana hambisuuf maal akka hojjachu qabu karaa saaqa. Odeffenno isiin natti himtan raga sayinsaawaa ta'en wal bira qabuuf akka nuu gargaaru dhiga xiqqo ishii qubarrra fi udaan xiqqoo fudhachun laboratory keessa illaalu barbaannaa.Yemmu dhiga qubarraa fudhannu xiqoo isiin dhukubu danda'a haa ta'u malee dhukubni kun yeroo saniif malee midhaa biraa hin fiduu. Meeshaaleen dhiga ittin fudhanu fi kanneen biro kun qulqullummaan isaani kan egame dha. Bu'aan qoranno laaboraatorii akka dhumeen issinitti himamaa. Bu'aan laaboraatoriis ta'ee odeffannon naaf kennitan icitiin isaa egamaa dha. Bu'aan qoranno yoo dhibee agarsiisa ta'ee kutaa hawwani waliin ta'un yaalli barbaachisaa ta'e isiinif godhamaa.

Wanti siif hin galle fi nagaafatu jiraa?

Waligalte Qayyabanno Irratti Hunda'e

Qu'anno kanarratti yoo hirmaate akam? Hirmaachuu yoo hin barbaanne ta'e mirga keeti.

Eyyen nan himaadha _____ gaafille kee itti fufi

Lakkii _____ gaafii kee asumatti dhaabiti maamila kee galatomfadhaan gageessi.

Guyyaa____/____/_____ Lakk. Gaaffii_____

Maqaa fi mallatto gaafatamaa _____

Maqaa fi mallatto gaafataa_____

Maqaa fi mallattoosupervisory_____

Qajelfama: *Deebii maamilli deebisee irratti mallattoo marsaa godhii ykn deebi deebise barreesi*

Lakk.	**Gaaffilee**		**Irra darbuu yoo barbaachisee**
100	**General information**		
101	Aanaa irraa dhuftee		
102	Ganda/magaalaa irra dhuftee		
103	Umrii hirmaattu (waggaadhaan)		
104	Haalli fudhaa fi heruma kee maal fakkaata?	1. Kan hin herumin 2. Kan herumtee 3. Kan hiktee 4. Kan jalaa du'e	
105	Amantaan kee maali?	1. Muslim 2. Ortodoksi 3. Protestaanti 4. Kan biro (ibsii)----------	
106	Sabni kee maali?	1. Oromoo 2. Amaaraa 3. Kafaa 4. Daawuroo 5. Kan biroo (ibsi)----------	
107	Sadarkaan barumsaa kee maal fakkaata?	1. Kan hin baranne 2. Dubisu fi barressu kan danda'u 3. Marsaa 1^{ffaa} (1-4) 4. Marsaa 2^{ffaa} (5-8) 5. Sadarkaa 2^{ffaa} (9-12) 6. Sadarkaa 3^{ffaa} fi isaa ol (12+)	
108	Ogumaan (hojiin) kee maalii?	1. Hadha manaa 2. Hojataa motummaa 3. Daldaltu 4. Qotee bultu 5. Hojattu guyaa 6. Kan biroo (ibsi)----------	

109	Galii ji'a (qarshii dhaan)		
110	Bakka jirenyaa maal fakkaata?	1. magaalaa 2. Baadiyaa	
111	Wanti hir'ina dhigaa fidu maal maal akka ta'e bektaa?	1. nyaata gahaa hin taane argachu 2.Dhangal'u dhigaa yeroo ulfaa fi daha 3. Baay'ee dhalu fi waliratti dhalu 4. Dhukkuba 5. Qorich qusanno maati fayadamu 6. kan biroo (ibsi)----------	
112	Hir'ina dhigaa akka hin qabamne akkamitti akka to'atan bektaa?	1. Eyyen 2. lakkii	
113	Eyyen yoo jette(Gaaffii #112), akkamiin akka ta'e ibsi		
200	**Gaafilee wantoota hir'ina dhigaaf saaxilan addaan baasuf qopha'an**		
201	Qoricha asidi garachaa nama gubu yeroo baayyatu kenamu yeroo baay'ee ni fayyadamtaa?	1. Eyyen 2. lakkii	
202	Nyaanni yeroo ulfaa aadaadhaan dhowamu jiraa?	1. Eyyen 2. Lakkii	2 → Gaafi #204
203	Eyyen yoo jette Gaafi #202 nyaata akkamiti? (ibsi)		
204	Yeroo ulfaa wanta yeroo biraa hin nyaatamne nyaachuuf fedhii qabdaa?	1. Eyyen 2. Lakkii	2 → Gaafii#206
205	Yoo eyyen jette Gaafii#204, maal nyaate bektaa?		
206	Yeroo ulfaa kee nyaatni sijibisisaa?	1. Eyyen 2. Lakkii	2 → Gaafii#208
207	Gaafii#206 Eyyen yoo jette, nyaata akkamitu sijibisisaa?		

208	Guyyaatti yeroo sadii ni nyaataa?	1. Eyyen 2. Lakkii	
209	Nyaata fonni fi annan irra qophaa'e yeroo hamamitti nyaataa?	1. Guyyaa guyyaattii 2. Guyya ≤ 6 tobanitti 3.Torbanitti 4. Torbaabn lammatti 5. Ji'atti 6. Siruma hin nyaadhu	
210	Naayta kan akka gomanaa fi ashaakiltti biro yeroo hamamin nyaataa?	1 Guyyaa guyyaattii 2. Torbanitti yoo xiqqaate guyaa lama 3.Torbanitti 4. Torbaabn lammatti 5. Ji'atti 6. Siruma hin nyaadhu	
		1. Eyyen 2. lakkii	
211	Buna/shaayi nyaatan booda battalumatti yeroo hammamin fudhataa?	1. Guyyaa guyyaattii 2. Torbanitti yoo xiqqaate guyaa lama 3.Torbanitti 4. Torbaabn lammatti 5. Jji'atti 6. Siruma hin nyaadhu	
212	Nyaatan bodatti kuduraa fi muduraa yeroo baay'ee ni fudhataa?	1. Guyyaa guyyaattii 2. Torbanitti yoo xiqqaate guyaa lama 3.Torbanitti 4. Torbaabn lammatti 5. Ji'atti 6. Siruma hin nyaadhu	
213	Nyaata dabalataa yeroo ulfaa keeti yoo xiqqaate nyaata	1. Guyyaa guyyaattii 2.Torbanitti yoo xiqqaate guyyaa 2	

	dabalataa tokko ni fudhataa?	3.Torbanitti 4. Torbaabn lammatti 5. Ji'atti 6. Siruma hin nyaadhu	
214	Akkaakun midhaan nyaataa yeroo baayee fayyadamtaa?	1. Xaafii 2. Midhaan kan akka qamadi,garbu 3. Boqqolloo 4. Kan biro (ibsi) ----------	
215	Ulfa kanaan dura xurii hammi isaa baayee ta'e sirraa dhangal'aa?	1. Eyyen 2. Lakki	
216	Ulfi garaa qabdu ji'a meqaa (Trimesters)?		
217	Ijolle meqa dhaltee (parity)?		
218	Ulfa kanaa fi di'ima kanaan dura dhaltee jidutti garaagarumaa ji'a/waggaa meqatu jiraa?		
219	Kanaan dura ulfi lubuun hin dhalanne jiraa?	1. Eyyen 2. Lakkii	2 → Gaafi#221
220	Yoo jiraatee meqa?		
221	Ulfa garaan qabatte kanaan dura qusannoo maatii ni fayyadamtaa ture?	3. Eyyen 4. Lakkii	
222	Yeroo ulfa keetti dhigni si dhangala'aa (APH)? (kaardi irraa)	1. Eyyen 2. Lakkii	
223	Erga dessee boda dhigni hammi isaa baay'ee ta'e sii dhangala'ee bekaa (PPH)? (kaardi irraa)	1. Eyyen 2. Lakkii	
224	Dhukuba onne qabdaa?	1. Eyyen 2. Lakkii	

225	Kanaan dura opereshinin dhalte beektaa?	1. Eyyen 2. Lakkii	
226	Dhukuba dhibbaa dhigaa	1. Eyyen 2. Lakkii	
227	Dhukkuba kale qabdaa?	1 Eyyen 2 Lakkii	
228	Yeroo ulfaa kanatti garaa yaasaan si qabe bekaa?	1. Eyyen 2. Lakkii	
229	Ji'a sadan darbee kanatti raammon garaa si qabatee bekaa ?	1. Eyyen 2. lakkii	
230	Rammoo garaa laaboraatorii irra argamee?	1. Eyyen 2. Lakkii	2⟶ Gaafi#231
231	Gaafii# 231 Yoo eyyen ta'e, akkaaku rammo argamee fi baayina isaa	Akkaaku ----------	
232	Yeroo hunda aadaa kophee godhachu qabdaa?	1. Eyyen 2. Lakkii	
233	Ji'a sadan darban kannatti dhukkubni busaa si qabe bekaa?	1. Eyyen 2. Lakkii	
234	Ji'a sadan darban kanatti dhukubni Daranyo sombaa siqabe beka?	1. Eyyen 2. Lakkii	
235	Dhugaatii alkooli torbanitti guyyaa meeqa dhugdaa?	1. Torbanitti guyyaa 1 -2 2. Torbanitti guyyaa 3-4 3. Torbanitti guyyaa 5-7 4. Alkooi hin dhugu	
236	Bu'a qoranno HIV/AIDS (kaardii irraa)	1. positivi 2. Negativii	
237	Hamma hemoglobini (from laboratory result)?	----------g/dl	

Dhumarratti siin galatomfadhaa!!!

Amharic version questionnaire for interview

በአማርኛኛ □ዙ□□□ መ□□ቅ

ጅማ ዩኒቨርሲቲ ህብረተሰብ ጤናና ሜዲካል ሳይንስ ኮሌጅ ኢፒዲሞሎጂ ዲፓርትመንት

በጅማ ዩኒቨርስቲ ስፔሻላይዝድ ሆስፒታል በእርግዝና ክትትል ክፍል የነፍሰጡር □እናቶችን ለደም ማነስ ተ□ላ□ □ሚ□□ርጃቸው ምክኒያቶች ለማጥናት የተዘጋጀ መጠይቅ

<u>ለተሳታፊ የሚሰጥ ኢንፎርማሽን</u>

ሰላም!!□:: ስሜ _____ □ባላል:: እኔ እ□ህ እየሰራሁ ያለሁት በነፍጡር □እናቶችን ለ□ም ማነስ የሚያስከትሉ ምክንያቶች በሚል ለተዘጋጀ ጥናት መረጃ በማሰባሰብ ስራ ላይ ነው::በመሆኑም ይህን ጥናት ለማከሄድ □እርሶ □እንዲሳተፉ ስለተመረጡ አጠር ያለ ቃለምልልስ ከእሶ □ር ማ□ረፅ □እ□ል□ለሁ:: ወደ ቃለ ምልልሱ ከመሄዳችን በፊት ስለጥናቱ አጠር ያለ መረጃ ልስጥዎት::ጥናቱበዋነኛነት የሚያተኩረው ነፍሰጡር እናቶች የደም ማነስንዲጋለጡ የሚያደርጉ ምክንያቶችን መለየት ነው:: የዚህ ጥናት ጥቅም ደግሞ የደም ማነስ ምክንያቶቹን ለይቶ ብዙ እናቶችን እየጎዳ ያለውን በእርግዝና ወቅት የደም ማነስ ችግር መፍትሄ ለማፈላለግ መረዳት ነው:: ስለዚህ እርሶም የሚሰጡን ትክክለኛ መረጃ ትክክለኛ መፍትሄ ለማፈላለግ አይነተኛ □ቀሚታ አለው::መረጃውን በሳይንሳዊ መልኩ ለመደገፍ የደም ናሙና ከጣት እና አይነ ምድር ምርመራ ማድረግ እንፈልጋለን:: ደም ሲወሰድ ትንሽ ከሚሰማዎት ህመም በስተቀር ሌላ ችግር የለውም::ደም ለመውሰድ የምንጠቀመው በፍፁም ንፁህ በሆነ የህክምና መሳሪያ በመሆኑ ስጋት አይግባዎት:: የምርመራው ውጤት ለርስዎ ይነገርዎታል:: □ምርመራው ውጤት ምስጢር የተጠበቀ ነው:: የምርመራ□ ውጤት ህመም ካመለከተ ከክፍሉ ሰራተኞች ጋር በመተባበር አስፈላጊውን □እር□□ □□ረፅሎታል::

ጥያቄ ካሎዎት ይጠይቁኝ _____

<u>በመረዳት ላይ የተመሰለተ የስምምነት ውል</u>

አሁን በጥናቱ □ንዲሳተፉ ጋብዤዎታለሁ:: በአንባሩ ላለመሳተፍ ከፈለጉ/ከወሰኑ መብትዎ የተጠበቀ ነው::
ለመሳተ□ □ቃ□ኛ ነዎት?
አዎ _____ቃለ መ□□ቱ □ቀ□ል
አይደለሁም _____ □□ቄውን በማቆም አመስግነው ያሰናብቱ
ቀን _____/ _____/ _____
መ□□ቱ መለ□ ቁ□ር _____
□መረጽ ሰ□ ው ስምና □ርማ _____
ፍቃደኝነትን ያረጋገጠው ጠያቂ ስምና □ርማ _____
□ዙቆ□□ሪ□ ስምና □ርማ _____

መመሪ□፡ □ሚ□□ኑት መልስ ላይ በትክክል ያክብቡ ወይም የተሰጦትን መልስ በትክክሉ ይጻፉ

ተ.ቁ	መ□□ቅ		
	አጠቀላ□ መረጀ		**ማለፍ ከተፈለገ**
101	□ረ□		
102	**ቀበሌ/ከተማ**		
103	**እድሜ (በዓመት)**		
104	**የጋብቻ ሁኔ?**	**1. ያላገባች** **2. ያገባች** **3. □ፈታች** **4. የሞተባት**	
105	**ሀይማኖትሽ ምንድን ነው?**	**1. ሙስሊም** **2. ኦርቶዶክስ** **3. ፕሮቴስታንት** **4. ሌላ (□□ለ□) ----------**	
106	**ብሔር?**	**1. ኦሮሞ** **2. አማራ** **3. ከፋ** **4. □□ሮ** **5. ሌላ (□□ለ□)----------**	
107	**የት/ት ደረጃ?**	**1. ያልተማረች** **2. ማንበብና መጻፍ የምትችል** **3. 1ኛ □ር (1-4)** **4. 2ኛ □ር (5-8)** **5. 3ኛ □ር (9-12)** **6. 12+**	
108	**ስራ ዎት/ሞያ?**	**1. የቤት እመቤት** **2. ተቀ□ሪ(የመንግስት ሰራተኛ)** **3. ነ,ጋዴ** **4. ገብርና** **5. የቀን ሠራተኛ** **6. ሌላ (□□ለ□) ----------**	
109	**□□ር □ኪ (በብር)**		
110	**የመኖርያ አካባቢ**	**1. ከተማ** **2. □□ር**	

111	ደም ማነስን የሚያስከትለው ምን ምን • እንደሆን ያ¨ ቃሉ?	1. ´ቅተኛ የአመጋገብ ሁኔታ• 2. በእርግዝና/በወሊድ ወቅት መድማት ሲÁÒØ ም 3. ብ2 መ¨ ለ□/በላ□ በላ□ መ¨ ለ□ 4. በበሽታ መ□´ 5. የቤተሰብ ምጣኔ መዳኒት በመጠቀም 6. ሌላ (ÃÑ ነê) ----------	
112	የደም ማነስን መከላከል • እንደሚቻል ያውቃሉ?	1. አዎ 2. አላውቅም	
113	አዎ ከሆነ መልሶ(ተ.ቁ 112) አንዴት አንደሆነ ቢነግሩኝ		
200	**ደም ማነስ የሚያስከትሉት ምክንያቶችን በተመለከተ**		
201	የጨንራ ህመምን ለማስታ□ስ ¾ሚ¨ ስ□ ታብሌት በተÅÒÒ ሚ □¨ ስ□ሉ?	1. አዎ 2. አልወሰድኩም	
202	ምእርግዝናዎ ወቅት በባህል/በሌላ ምክንያት የማትበይው ምግብ አለ?	1. አዎ 2. ¾ላም	2⟶ ተ.ቁ 204
203	ካለ፣ምን አይነት ምግብ ነው?		
204	በ2 ህ • እርግዝና ወቅት ሌላ Ñ2 • ማማይላ ነገር የሰኞታል?	1. አዎ 2. አያሰኘነም	2 ⟶ ተ.ቁ 206
205	አዎ ካሉ ምን መብላት ያሰኞታል?		
206	በ2 ህ • እርግዝና ወቅት ¾ምፅብ ማስጠላት ስሜት ገጥሞት ያውቃል?	1. አዎ 2. አያውቅም	2 ⟶ ተ.ቁ 208
207	ካጋጠሞዎት ምን አይነት ምፅብ □ስ□ላ- ታል		
208	በቀን 3 ጊዜ ይመገባሉ?	1 አዎ 2. አልመገብም	
209	ከእንሰሳት ተዋጽዎ የተሰራ ምግብ በስንት ጊዜ ይመገባሉ?	1. በየቀኑ 2. ቢያንስ በሳምንት ሁለት ቀን 3. በሳምንት 4. በ2 ሳምንት 5. በ¨ ር 6. በጭራሽ አልጠቀምም	
210	• አንደ ጎመን ያሉ አትክልት በስንት ጊዜ ይመገባሉ?	1. በየቀኑ 2. ቢያንስ በሳምንት ሁለት ቀን 3. በሳምንት	

		4. በ2 ሳምንት 5. በ□ር 6. በጭራሽ አልጠቀምም	
211	ቡና/ሻይ ምግብ □እንደበሉ የሚጠቀሙበት በስንት ጊዜ ነው?	1. በየቀኑ 2. ቢያንስ በሳምንት ሁለት ቀን 3. በሳምንት 4. በ2 ሳምንት 5. በ□ር 6. በጭራሽ አልጠቀምም	
212	ከምግብ በኃላ ፍራፍሬ በምን □ህል □□ □መ□ባሉ?	1. በየቀኑ 2. ቢያንስ በሳምንት ሁለት ቀን 3. በሳምንት 4. በ2 ሳምንት 5. በ□ር 6. በጭራሽ አልጠቀምም	
213	ከማርገዞ በፊት ከሚመገቡት በተፊ ማሪ ቢያንስ አንድ ተጨማሪ ምግብ በምን ያህል ቀን ይመገባሉ?	1. በየቀኑ 2. ቢያንስ በሳምንት ሁለት ቀን 3. በሳምንት 4. በ2 ሳምንት 5. በ□ር 6. በጭራሽ አልጠቀምም	
214	ለምግብነት የሚጠቀሚቸው □ህል አይነቶች	1. □,□ 2. ስንዴ □ና ገብስ 3. በቆሎ 4. ሌላ (ፅ□)----------	
215	ከማረገዝዎ በፊት ከመጠን □ለ□ □□ር አበባ መፍሰስ አጋትሞት ነበር?	1. አዎ 2. አላጋጠመኝም	
216	እርግዝናዎ ምን ያህል ጊዜ ሆኖታል?		
217	ስንት ልጅ ወልደዋል?		
218	በዚህ ጽንስና ከዚህ ጽንስ በፊት በተወለደው ልጅ መሃል ስንት ወር አለ?		
219	የጽንስ መቋረጥ(ውረጃ) አጋጥሞዎት ያውቃሉ?	1. አዎ 2. አላጋጠመኝም	2 ⟶ተ.ቁ 222

220	ካጋጠሞዎት ስንት ጊዜ		
221	የቤተሰብ ምጣኔ መድሃኒት(አንክብል) ይጠቀሙ ነበር?	1. አዎ 2. አልተጠቀምኩም	
222	በእርግዝናዎ ወቅት የደም መፍሰስ አጋጥሞት ያውቃል (*From ANC card*)?	1.አዎ 2. አላውቅም	
223	ካሁን በፊት ከወሊድ በኃላ ከባድ የደም መፍስ አጋጥሞት ነበር (*ANC card*)?	1. አዎ 2. አያውቅም	
224	ካሁን በፊት የልብ ህመም አለብዎት/ያጋጥሞት ነበር (*From ANC card*)?	1. አዎ 2. አያውቅም	
225	ካሁን በፊት በኦፕሬሽን □ል□□ ነው□ቃሉ(*ANCcard)?*	1. አዎ 2. አያውቅም	
226	የደም ግፊት በሽታ□ ነበረቦት(*From ANC card*)?	1. አዎ 2. አይ	
227	ካሁን በፊት የኩላሊት በሽታ አጋጥሞተ ያውቃለ(*ANC card*)	1. አዎ 2. አያውቅም	
228	ከዚህኛ□ □እርግዝና ወቅት ተቅማጥ አጋጥሞት ያውቃል	1. አዎ 2. አላውቅም	
229	ባለፉት 3 ወራት የሆድ ትላትል ታይቶት ያውቃል?	1. አዎ 2. አላውቅም	
230	የሆድ ትላትል (በላቦራቶሪ) ተ□ኘቷል?	1. አዎ 2. □ለም	2 ⟶ተ.ቁ 232
231	ከተገኘ	ምን _____	
232	ሁል□□ □ ማ □ማ□ለቅ ልምድ አለዎት?	1. አዎ 2. □ለኘም	
233	ባለፉት 3 ወራት በወባ □ታመ□ □□ቃሉ?	1. አዎ 2. አላውቅም	
234	በቲቢ በሽ□ ተ□□□ □□ቃሉ	1. አዎ 2. አላውቅም	

235	**አልኮል በምን ያህል □□ □□□ሉ?**	**1. በየቀኑ** **2. ቢያንስ በሳምንት ሁለት ቀን** **3. በሳምንት** **4. በ2 ሳምንት** **5. በ□ር** **6. በጭራሽ አልጠቀምም**	
236	□HIV/AIDS **□ምርመራ ውጤት** (*From ANC card*)**?**	**1. □ □ቲቭ** **2. ነገቲቭ**	
237	**የሒሞግሎቢን መጠን**	----------g/dl	

በመጨረሻ ላመሰግንዎት □ፈ□□ለሁ!

Annex II: LABORATORY PROCEDURES

Formol-ether concentration method for diagnosis of helminth infection

All concentration procedures have their limitation, being good at concentrating some parasites and not others. The only solution is to use 'broad spectrum technique' i.e. Formol-ether concentration method. This is the most useful of all the concentration procedures, as it will concentrate most of the cysts and ova to be found in feces. The ease with which the specimen may be examined microscopically more than compensates for the time and trouble taken in its preparation. Trophozoites are destroyed by this method (44).

Material needed:

1. Conical test tube
2. Sieve
3. Applicator slick
4. Slide
5. Cover slip
6. Formalin
7. Ether
8. Centrifuge
9. Pasteur pipette
10. Microscope

Test procedure:

1. Emulsify approximately 1g of faeces in 10ml of Formol water
2. Strain the mixture through a wire sieve 400-45- um pore (a commercial nylon tea or coffee strainer is a useful substitute) into a beaker
3. Pour the filtrate into a 15 ml conical centrifuge tube and centrifuge at 350 g for 1 min. discard the supernatant.
4. Add 10ml of 10% formalin and 3ml of ethyl acetate, seal with a bung and shake vigorously for 1 min (or mix for 15 seconds on a vortex mixer)
5. Centrifuge so as to reach 600g after 2min. switch off the centrifuge and allow it to come to a stop. The mixture will have separated in to four layers: the top layer, ethyl acetate, contains the dissolved fat; the second layer, a fatty plug, contains faecal debris; the third layer is the formalin; and the bottom layer, the sediment, contains the parasite.
6. With an applicator stick, loosen the fatty plug, invert the tube and carefully pour away the fluid entire content, leaving the sediment, when the tube is again held upright, enough fluid will collect to allow re-suspension of the sediment.
7. mix thoroughly and examine microscopically

Sahli Hailliege method of hemoglobin Determination

Blood sample was taken from ring finger of left hand using sterile blood lancet. After the blood was collected on microscopic slide 20µl of the blood was transferred to standard sahli tube by sahli pipette for the hemoglobin measurement procedure. The method had its own draw back. There is personal variation while comparing with the standard (45).

Material needed:

1. Standard Sahli tube
2. Sahli pipette
3. 0.1 N HCl
4. Cotton
5. Blood lancet
6. 75% absolute alcohol

Test procedure:

1. 20µl of blood is dropped to sahli tube
2. 20µl of 0.1% hydrochloric acid is added and stopped for 5 minute
3. Dilute the blood by dropping 0.1N HCl up to it match to standard
4. Read and record the result on the format

Table 6: - Laboratory result registration format for Hemoglobin and stool examination for helminth infection

Date (d/m/y) _____

ID.No	Hemoglobin level (mg/dl)	Intestinal Parasite 1=Asc 2=hwk 3=trc 4=sch 5=ev 6= other	Name and signature of technician

Asc=ascaris, hkw=hookworm, trc=trichuris trichiura, str=strongyloids, sch=schistosoma, ev=enterobium vermicularis, oth=others