PREVALENCE OF ANAEMIA AMONG PREGNANT WOMEN ATTENDING ANC AT MEDICAL CENTRE, MARARABA GURKU (MCMG).NASARAWA STATE, NIGERIA

BY

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BEING A THESIS PRESENTED TO THE DEPARTMENTOF COMMUNITY MEDICINE, FACULTY OF MEDICINE IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF MASTERS DEGREE IN PUBLIC HEALTH (MPH) OF THE AHMADU BELLO UNIVERSITY, ZARIA.

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DECLARATION

I here by declare that the work presented in this project for award of Master degree in public Health has not been presented either partly or wholly for any degree elsewhere.

The work is entirely the result of my research conducted under the supervision of Dr. M.N. Sambo. The works of other researchers have been acknowledged accordingly in the section entitled REFERENCES.

_____ _____

Doris Japhet John **Date**

CERTIFICATION

This Thesis entitled "**PREVALENCE OF ANAEMIA AMONG PREGNANT WOMEN ATTENDING ANTENATAL CARE AT MEDICAL CENTRE, MARARABAN GURKU (MCMG), NASARAWASTATE, NIGERIA"** by DORIS, Japhet John meets the regulation and requirement governing the award of masters degree in public health of the Ahmadu Bello university, Zaria, and is approved for its contribution to knowledge and literacy presentation.

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Head of Department

DEDICATION

I hereby dedicate this work to my parents Mr and Mrs Caleb Mwansat, who from their meager resources laid my academic foundation and sacrificed their comfort to see my siblings and I through school.

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First and foremost I am thankful to Almighty God for seeing me through the various stages of this work.

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LIST OF ABBREVIATIONS

ACD	-	Anaemia from Chronic Diseases
AIDS	-	Acquired Immune Deficiency Syndrome
ANC	-	Antenatal Care
GIT	-	Gastrointestinal Tract
Hb	-	Haemoglobin
HIV	-	Human Immunodeficiency Virus
IEC	-	Information, Education and Communication
IM	-	Intramuscular
IV	-	Intravenous
LGA	-	Local Government Area
MCH	-	Maternal and Child Health
MCMG	-	Medical Centre, Mararaban Gurku
MDG	-	Millennium Development Goal
NHIS	-	National Health Insurance Scheme
PCV	-	Packed Cell Volume
PHCN	-	Power Holding Company of Nigeria
QoL	-	Quality of Life
RBC	-	Red Cell Mass
SCD	-	Sickle cell disease
SPSS	-	Statistical Package for Social Sciences
TDI	-	Total Dose Infusion
UNTH	-	University of Nigeria Teaching Hospital Enugu
UTI	-	Urinary tract infections
WBC	-	White Blood Cell
WHO	-	World Health Organization

SUMMARY

Anaemia in pregnancy is a common problem in most developing countries and a major cause of morbidity and mortality especially in malaria endemic areas. 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. Anemia during pregnancy is highly preventable and treatable.

This study is aimed at determining the prevalence of anaemia among women attending ANC in Medical Center, Mararaban Gurku.

This was a cross sectional study of 406 women attending the antenatal clinic for their booking visit. The capillary technique was used for the estimation of the packed cell volume (PCV) to assess level of anaemia; Questionnaires were also administered to obtain demographic information- age, parity, social class and gestational age at booking were obtained and analyzed.

Out of the 406 women studied, 229 were anaemic thus making the prevalence of anaemia to be 56.4%. Most, 89.5% were mildly anaemic, 10.5% were moderately anaemic while none of the women were severely anaemic. Two hundred and sixty, (64%) of the women booked in the first trimester, 33.3% booked in the second trimester while only 2.7% booked in the third trimester. More women were anaemic in the 2nd trimester of pregnancy, with a higher prevalence among the multigravidae (59.3%). Anaemia was highest among company workers and least among civil servants. The women who had birth intervals of ≤1 year had the highest prevalence of anaemia (53.3%), followed by those who had a birth inter of 2-4 years, while those women who had a birth interval of more than 4years had the least Prevalence (44.5%) of anaemia.

The prevalence of anaemia amongst the participants was high. The parity, gestational age at booking, educational status and the birth interval are factors that were found to have affected the prevalence of anaemia in this study. Therefore educating women on early antenatal booking and compliance with the use of prescribed medications (Iron Supplements, Folate and Antimalarials) should also be emphasized to reduce the problem of anaemia in pregnancy in Nigeria.

Keywords: Anaemia, Prevalence, Pregnancy, Haemoglobin, Mararaba, Nasarawa

CHAPTER ONE

INTRODUCTION

1.0 Background

The health-conscious world community has come to realize that anaemia, the majority of which is due to iron deficiency, has serious health and functional consequences. And that it is widespread especially among tropical low-income populations and that most of its nutritional component is controllable with a very high benefit/cost ratio. Women of reproductive age and pregnant, lactating as well as their infants and young children are particularly affected.[1,2]

In response to the overwhelming evidence to this effect, world authorities have agreed that by the end of this century, anaemia in pregnant women must be reduced by 1/3. The more aggressive groups believe that with new approaches for the control of iron deficiency, a reachable goal is to reduce iron deficiency anaemia to overall levels below 10% in most populations.[3]

It is estimated that about 2.15billion people are iron deficient, and that this deficiency is severe enough to cause anaemia in 1.2 billion people globally.[4]About 90% of all anaemias have iron deficiency components. In the developing world, nearly ½ of the population is iron deficient.[3]

About, 47% of non-pregnant women and 60% of pregnant women have anaemia worldwide. In the developed world as a whole, anaemia prevalence during pregnancy averages 18%, and over 30% of these are iron deficient, with the poor mostly affected.[2]

Women in reproductive age and pregnant women are at high risk of incurring negative balance and iron deficiency due to their increased iron needs because of menstruation and demands of pregnancy. The average requirements of absorbed iron are estimated to be 1.36mg/day and 1.73mg/day among adult and teenage menstruating females respectively. However, 15% of adult menstruating women require more than 2.0mg/day, and 5% require as much as 2.84mg/day. The superimposition of menstrual losses and growth in menstruating teenage girls increase the demands for absorbed iron; 30% need more than 2.0mg/day; 10% as much as 2.65mg/day and 5% 3.2mg/day. These requirements are very difficult to meet even with good quality iron fortified diets.[4]

Iron needs are markedly increased during the second and especially during the third trimesters up to an average of 5.6mg/day (approximate range of 3.54 - 8.80mg/day).[4]This amount of iron needs cannot be met from food iron hence the importance of pre-pregnancy iron reserves upon which to draw and iron supplementation during pregnancy.

Iron deficiency during lactation is mostly residual from that of pregnancy and delivery and can be partially alleviated because of lactational amenorrhea, but once menstruation returns, if lactation continues, iron requirements become higher. The risk of iron deficiency in pregnancy and lactation begins with inadequate pregnancy iron reserves among women in reproductive age.

Folate deficiency has also been documented in pregnancy, often leading to combined iron-folate deficiency anaemia. This is common among lower socioeconomic groups who consume mostly cereal-based diets (poor in folate) aggravated by prolonged cooking and reheating. Folate requirements double in the second half of pregnancy and are markedly

increased by processes that involve haemolysis, such as malaria and haemoglobinopathies. Malabsorption processes common among tropical, low socio-economic groups impair folate absorption.

1.1 Problem Statement

Anaemia is one of a wide spread public health problem in the world. WHO estimates the number of anaemia, people worldwide to be a staggering 3.5 billion in the developing countries and that approximately 50% of all anaemia can be attributed to iron deficiency.[5,6] The global distribution of the disease burden of Iron deficiency anaemia is heavily concentrated in Africa and WHO regional Southeast Asia-D. These regions bear 71% of the global mortality burden and 65 % of the disability-adjusted life years lost.[7]Although estimates of the prevalence of anaemia vary, it can be assumed that significant proportions of younger children and women of the child bearing age are anaemic.[8,9] It is the only nutrient deficiency that is also significantly prevalent in the industrialized countries. Perusal of WHO global database on anaemia depicts that the most affected groups are pregnant women (48%) and 5-14 year old children (46%). Predictably, the prevalence of anaemia in developing countries is three to four times higher than in industrialized countries. The most highly affected population groups in developing countries are pregnant women (56%), school age children (53%), and non-pregnant women (44%). In industrialized countries, the most affected groups are pregnant women (18%) and preschool children (17%), followed by non-pregnant women and older adults, both at 12%. Asia has the highest prevalence of anaemia in the world; followed by Africa.[9] About half of all anaemic women live in the Indian subcontinent where 88% of them develop anaemia during pregnancy.

Available data indicate that up to 60% of pregnant Nigerian women, especially those in the rural areas, are anaemic during pregnancy.[10]This anaemia is mostly due to the nutritional deficiency of folic acid, iron, vitamin and trace elements; hence it is more common among the poor and malnourished women. Nutritional anaemia is a major cause of adverse outcomes of pregnancy in Nigerian women. It is a direct and indirect cause of maternal and perinatal morbidity and mortality. It causes intra-uterine fetal growth retardation, with resulting increase in rates of stillbirth, neonatal and perinatal mortality. Several Nigerian women have died during pregnancy because of severe anaemia (Hb<6.0g/l).[11] Despite the high incidence of anaemia as a cause of maternal mortality in Nigeria, very few interventions currently address anaemia as a major safe motherhood issue in Nigeria. To-date, only about 58% of pregnant Nigerian women receive iron supplement during pregnancy.[11]

1.2 Justification

The report on maternal health and safe motherhood by WHO showed that maternal mortality is unacceptably high especially in developing nations and progress to reduce it in most regions of the world is slow.[13]

Improving maternal health is the fifth Millennium Development Goal (MDG) which aims at reducing by three-quarters between 1990 and 2015, the maternal mortality ratio. Improving maternal health can in turn serve as an instrument to achieve other MDGs, especially those that are health related. The role of improved maternal health is therefore crucial to the achievement of the MDGs. Close to 500,000 maternal deaths occur every year, 99% taking place in the developing world. Anaemia is the major contributory or sole cause of 20-40% of such deaths.[14]Anaemia in pregnancy is an important public

health problem worldwide. WHO estimates that more than half of pregnant women in the world have a haemoglobin (Hb) level indicative of anaemia (Hb<11.0g/dl), the prevalence may however be as high as 56% or 61% in developing countries.[15]Estimates of maternal mortality resulting from anaemia range from 34/100,000 live births in Nigeria to as high as 194/100,000 in Pakistan.[15,16] In many regions, anaemia is a factor in almost all maternal deaths; it poses a five-fold increase in the overall risk of maternal death related to pregnancy and delivery.[16] The risk of death increases dramatically in severe anaemia. From local studies done in Zaria, it was reported that mortality for women during delivery or shortly after was 20% if their haemoglobin concentration was <5.0g/dl. Mortality decreased as Hb concentration rose: 4.5% for Hb levels between 6.0 and 5.0g/dl, average of 12.8% for Hb concentrations <6.0g/dl in contrast to 2.9% for Hb between 8.0 and 6.0g/dl.[17]These rates of maternal deaths contrast with those in the developed world where maternal mortality is 100 times less and severe anaemia is very rare. A study of this nature has not been carried out in this facility before, it is therefore, expected that findings from this study and the appropriate recommendations if implemented, will be of great help to the facility, Local Government and the country at large in reducing maternal morbidity and mortality due to anaemia in pregnancy.

1.3 Research Questions

1. What is the prevalence of Anaemia among among pregnant women attending ANC in MCMG?
2. What is the relationship between Anaemia and various demographic variables?
3. What is the knowledge of anaemia among pregnant women attending ANC in MCMG?

1.4 Aims And Objectives

1.4.1 General Objective

To assess the prevalence of anaemia in pregnancy amongst pregnant women attending ANC at Medical Centre, Mararaban Gurku (MCMG).

1.4.2 Specific Objectives

1. To determine the knowledge on anaemia amongst women attending ANC at MCMG.
2. To estimate the Hb (PCV) level among the pregnant women attending ANC at MCMG.
3. To determine the factors that predispose to anaemia in pregnancy amongst pregnant women attending ANC at MCMG.

1.5 Scope of the Study

This study was limited to pregnant women attending ANC at Medical Center, Mararaban Gurku.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

Anaemia is a common accompaniment of pregnancy because of the relatively greater expansion of plasma volume in comparison to the red blood cells. Adequate oxygen transport from the maternal blood to the fetal circulation is essential throughout pregnancy to deliver a viable and healthy infant.[18] Also the maternal morbidity is also affected depending on the degree of anaemia that is present during pregnancy. Anaemia thus, may precede conception, it is often aggravated by pregnancy, and the accidents of labour may perpetuate it.[19]It is therefore a major public health issue demanding utmost attention, since pregnancy and childbirth are daily occurrences all over the world, and if we must reduce in particular our high maternal mortality rate.

2.2 Definition

The word anaemia connotes a deficiency in the number of red blood cells or in their haemoglobin content, which can lead to a decrease in oxygen-carrying capacity of the blood, causing unusual tiredness resulting in pallor, shortness of breath, and lack of energy. Anaemia may be relative or absolute. Relative anaemia is that which occur in pregnancy.[20] Absolute anaemia involves a true decrease in red cell mass. The cells are manufactured in the bone marrow and have a life expectation of approximately four months (120 days).[20] To produce red blood cells, the body needs (among other things) iron, vitamin B12 and folic acid. If there is a lack of one or more of these ingredients, anaemia will develop.

Red blood cells are the cells that circulate in the blood plasma giving the blood its red colour. Through its pumping action, the heart propels blood around the body through arteries. The red blood cells obtain oxygen in the lungs and carry it to all the cells of the body. The cells use the oxygen to fuel combustion of sugar and fats, which produces the body's energy. During this process called oxidation, carbon dioxide is created as a waste product. It binds itself to the red blood cells that have delivered their load of oxygen. The carbon dioxide is then transported via the blood in the veins back to the lungs where it is exchanged for fresh oxygen by breathing.[20]

The World Health Organization (WHO) recommendation is that anaemia in pregnancy is present when the value of the total circulating haemoglobin (Hb) mass in the peripheral blood is 11g/dl (PCV 33%) or less, however, in developing nations it is generally accepted that anaemia exists when the Hb concentration is less than10g/dl or packed cell volume (PCV) is less than 30%.[21] Anaemia ranges from mild, moderate to severe and the WHO pegs the haemoglobin level for each of these degree of anaemia in pregnancy at 9.0 -10.9g/dl as mild anaemia; 7-8.9g/dl as moderate anaemia and <7.0g/dl as severe anaemia.[22]

2.3 Epidemiology

Each year more than 500,000 women die from pregnancy-related causes, 99% of these are from developing countries. Estimates of maternal mortality resulting from anaemia range from 34/100,000 live births in Nigeria to as high as 194/100,000 in Pakistan. In combination with obstetric haemorrhage, anaemia is estimated to be responsible for 17 – 46% of cases of maternal death. The incidence of anaemia in pregnancy would vary from place to place even within the same country depending on the socio-economic status and

level of development.[23]It is claimed that 5 –50% of pregnant women in the tropics who attend antenatal clinics are anaemic as against the prevalence rate of 2% in the developed world.[24]

It has been estimated that over half the pregnant women in the world have a haemoglobin level indicative of anaemia. In industrialized countries, anaemia in pregnancy occurs in less than 20% of women. This however, reaches the level of public health significance(>10%).Published rates for developing countries range from 35% to 72% for Africa, 37% to 75% for Asia and 37% to 52% for Latin America. A retrospective study of normal pregnant women who registered with the antenatal unit of the University of Nigeria Teaching Hospital (UNTH) Enugu between January 1, 2005 and October 30, 2005 showed that 40.4% of the study population wasanaemic (Hb< 11g) at booking. The prevalence of anaemia at booking increased significantly with increasing gestational age at booking.[25]Another study carried out in Gombe, North-eastern Nigeria showed a prevalence of anaemia in pregnancy of 51.8%. The majority of these patients 67.4% were mildly anaemic; 30.5% were moderately anaemic; while only 2.1% had severe anaemia.[26]

In West Africa, anaemia in pregnancy results from multiple causes, including iron and folate deficiency, malaria and hookworm infestation, infections such as HIV and haemoglobinopathies. Pica has been identified as a risk factor for anaemia in pregnancy.[27] This could be applicable to this environment in which special clay of the kaolin group (called 'nzu' in Igbo language) is easily accessible in the open markets, and some pregnant women crave it. The situation is particularly worse in southern Asia where ¾ of the pregnant women are anaemic (see table 2.1).Not only is anaemia common, it is often severe. From published reports available, it can be estimated that 2-7% of pregnant

women have Hb values <7.0g/dl, and probably 15 – 20% have values<8.0g/dl. It has been suggested that the prevalence of anaemia may depend on the season, increasing relation to malaria transmission in the wet season or in relation to increased food shortage at the end of the dry season.

In 1993, the World Bank ranked anaemia as the eighth leading cause of disease in girls and young women of childbearing age in developing countries, though anaemia is assumed to be less common in non-pregnant women.[23]

Table 2.1: Estimated prevalence of mild, moderate and severe anaemia in pregnant women in some continents (1998)

Continent	Hb<7 g/dl	7-9.9 g/dl	10-10.9 g/dl	No. of Countries	No. of Subjects	Total (%)
Africa						
Eastern	4	27	16	6	5687	47
Middle	5	2	21	3	4632	54
Northern	3	25	25	1	222	53
Southern	2	18	15	1	1936	35
Western	4	33	19	6	22131	56
Asia						
Eastern	++	24	13	++	++	37
S/Eastern	5	39	19	4	15811	63
Southern	7	43	25	4	14347	75
Western	2	28	20	4	3363	50
S/America						
Caribbean	2	33	17	12	11058	52
Central	2	26	14	2	841	42
Southern	1	24	12	4	7261	37

Source: WHO data base: Safe Motherhood March –June 1993.[28]

2.4 Causes Of Anaemia In Pregnancy

Anaemia in pregnancy is a major public health problem in developing countries. In sub Saharan Africa, such anaemia is generally accepted as resulting from nutritional deficiency, particularly iron deficiency. Women often become anaemic during pregnancy because the demand for iron and other vitamins is increased due to physiological burden of pregnancy. The inability to meet the required levels of these substances either as a result of dietary deficiencies or infections gives rise to anaemia. The mother must increase her production of red blood cells and, in addition, the foetus and placenta need their own supply of iron, which can only be obtained from the mother.

In order to have enough red blood cells for the foetus, the body starts to produce more red blood cells and plasma. It has been calculated that the blood volume increases approximately 50% during pregnancy, although the plasma amount is disproportionately greater.[1]This causes a dilution of the blood, making the haemoglobin concentration fall. This is a normal process, with the haemoglobin concentration at its lowest between weeks 25 and 30 of gestation.[20]The pregnant woman may need additional iron supplementation, and a blood test called serum ferritin is the best way of monitoring this.

Anaemia in pregnancy is often of multiple aetiologies. Iron and folate deficiency are by far the most important aetiological factors. The increased demand for these substances is further aggravated by multiple pregnancies, short birth intervals, parasitic and helminthic infections which is common amongst black women. Malaria parasites causing the destruction of the red blood cells contribute significantly to the prevalence of anaemia in a population. AIDS should be considered in the differential diagnosis of a patient with

anaemia. Haemoglobinopathies such as sickle cell disease contribute to the causation of anaemia in Africa.

2.4.1 Iron deficiency

Iron requirement is increased in pregnancy, due to the demand of the foetus and the increase in blood volume, especially in the last trimester, with up to 80% of the requirement relating to the third trimester. The total iron requirement during the whole pregnancy is about 1000mg (300mg for the foetus, 50mg for the placenta, 450mg for the increase in the maternal red cell mass and 240mg for the continuing maternal basal iron losses).[29] Requirements during the first trimester are relatively small (about 0.8mg per day), but rise considerably during the second and third trimesters to as high as 6.3mg per day. After delivery and during lactation, iron requirements decrease to 1.31mg per day, which is less than the requirement in menstruating women (2.3mg/day).[24] Despite an increase in iron absorption in pregnancy, diet alone is unable to satisfy the increased requirement. Therefore, the extra requirement for iron has to be met by the body's iron stores. However, many women in the developing world start pregnancy with a depleted iron store due to diets low in iron, chronic blood loss from parasitic infections, and frequent and closely spaced pregnancies, not giving the body enough time to replenish its depleted stores. It has been estimated that in the absence of iron supplementation, it can take up to two years to return to pre-pregnancy iron status. Iron stores in women of reproductive age are further depleted through menstrual blood loss.

Iron deficiency is mainly nutritional in origin. There are two types of dietary iron-haem and non-haem. Haem iron is found in foods of animal origin such as meat, fish, poultry and its bioavailability is high with absorption being 20-30%. It is absorbed about twenty

three times better than non-haem iron. Non-haem iron is found in food of plant origin, especially whole grain cereals, tubers, vegetables and pulses. A small amount of haem iron in the diet will improve absorption of non-haem iron and thus the diet composition is an important determinant of the amount of iron actually absorbed. Its bioavailability is lower and is determined by the presence of enhancing and inhibiting factors consumed in the same meal. Enhancers of non-haem iron absorption include meat, poultry, fish and vitamin C. Meat, poultry and fish are therefore of double value in that not only do they provide a rich source of bioavailable iron, but also enhance the absorption of non-haem iron contained in the rest of the meal.[23] The foods consumed in most African homes have low meat, low vitamins and high carbohydrates and high phytates which inhibit iron absorption. Phytates are present in wheat and other cereals, and even a small amount can markedly reduce iron absorption. In developing countries where meat intake is low, vitamin C is the most important enhancer of iron absorption. The addition of as little as 50mg of vitamin C to meal can double iron absorption. This amount of vitamin C can be provided by an orange, 20g of pawpaw or mango, or 100g of raw cabbage. But invariably, malnutrition or under-nutrition prevalent in many parts of the developing world are as a result of socioeconomic deprivation and sometimes due to taboos and superstitious ways of preparing certain foods for example, overcooking vegetables.

In addition to the diet derived from the food, the iron could be exogenous originating from the soil or iron cooking vessels. This can considerably increase the iron content of a meal.

2.4.2 Folate Deficiency

Folates are heat labile, light sensitive, water-soluble vitamins which are essential for red blood cell maturation.[30]Folates are found in almost all foods, but more in liver, yeast extract, dark green leafy vegetables, yam, sweet potatoes, egg yolk, fish, pulses, nuts and fruits such as banana, plantain and mangoes. Fresh foods rich in folates are only available during the harvest period which is seasonal, so the intake of folate is seasonal too. Some important staples in the developing world such as rice, cassava, millet, sorghum and maize are poor sources of folate. Folate deficiency produces an anaemia characterized by unusually large red blood cells (megaloblastic anaemia). Because folates are heat labile, prolonged cooking and repeated reheating of food, which is a common practice in the developing world can be an important factor in the aetiology of folate deficiency anaemia. Folate requirement approximately doubles during pregnancy, especially during the third trimester and puerperium[31] and since body stores of folate are limited and dietary intake is likely to be insufficient, anaemia often developed as a consequence. There is usually a steady fall in the level of serum folate throughout pregnancy, especially in women from lower socioeconomic groups, in multigravidae, smokers, and in women with twin pregnancies. Diseases associated with haemolysis such as malaria or sickle cell disease also increase the requirement for folate. Thus malaria and folate deficiency often coexist in pregnant women. Studies show that, anti-malarial prophylaxis alone without folate supplement reduces the frequency of megaloblastic anaemia in primigravidae by 50% while folate supplement completely abolishes it.[31]

Iron and folate deficiency, both of nutritional origins tend to coexist in the same subject. This must be kept in mind as iron deficiency most times conceals the presence of

coexisting megaloblastic anaemia. There is evidence that folate supplement given to a mother around the time of conception reduces the incidence of neural tube defects in infants born to these mothers.[32]

2.4.3 Malaria

In Sub-Saharan Africa the region of the world hardest hit by malaria, malaria infection is estimated to cause 400,000 cases of severe maternal anaemiayearly.[32]This is a major cause of severe anaemia in pregnancy. In high transmission areas, women have gained a level of immunity to malaria that wanes somewhat during pregnancy. It is a particular problem for women in their first and second pregnancies and for women who are HIV-positive. Anaemia associated with malaria is caused by haemolysis of the red blood cells, hypersplenism, (a condition characterized by exaggeration of the inhibitory or destructive function of the spleen); contribute to the anaemia in up to 25% of women who suffer from anaemia in pregnancy. Thus protection against malaria through chemotherapy and other methods of malaria control can immensely reduce maternal morbidity and mortality.[32]

2.4.4 Hookworm

This is one of the principal causes of iron deficiency anaemia in developing countries. About ¼ of the world's population has hookworm infection. It is prevalent throughout the tropics and subtropics where there is contamination of the environment with faeces and it is mainly by skin contact with such contaminated soil or vegetations.

The adult hookworms live in the small intestine, attached to the mucosa from which they suck blood, causing chronic blood loss. Over a period of time even small hookworm

loads may cause sufficient blood loss to deplete body iron stores. If the store is already depleted, hookworm infection can give rise to iron deficiency within a few weeks especially during pregnancy when iron requirements are increased.

2.4.5 Sickle cell disease (SCD)

About 60million people worldwide carry the sickle cell trait, 50million of whom are in Africa. Persons with the sickle cell trait (heterozygote) have minimal clinical problems, but the homozygotes have SCD, which causes chronic hemolytic anaemia. Over 100,000 infants are born each year with SCD, most of them in Africa.[33] Anaemia is a significant characteristic in sickle cell disease (which is why the disease is commonly referred to as sickle cell anaemia). Anaemia is usually severe and may be exacerbated by acute sequestration of sickled cells or more commonly by the 'aplastic crisis' which occurs when bone marrow haemopoesis is slowed down during acute infections. Folic acid and iron deficiency are often associated with SCD because the haemolytic process increases the requirement for these nutrients.[33]

2.4.6 Human Immunodeficiency Virus (HIV)

HIV infection must be included in the causes of anaemia in pregnancy among African women where seropositivity ranges from 6-24% in antenatal clinics.[21] When the anaemia is associated with leucopenia and thrombocytopenia, the antenatal health worker should suspect AIDS especially if she is not responding to treatment.

2.4.7 Vitamin A Deficiency

Vitamin A is a fat-soluble vitamin which is obtained from the diet as preformed vitamin A (Retinal) and from some carotenoid pigments in food that can be cleared in the body to

give Retinol. Preformed vitamin A occurs naturally only in animals and the richest dietary sources are liver, fish oils and dairy products. Between 25-35% of dietary vitamin A come from Carotenoids mainly from plant foods such as carrots and dark leafy vegetables. Caretenoids can be converted to vitamin A in the liver where vitamin A is stored. Absorption from plant sources is low. The digestion and absorption of vitamin A are closely linked with lipid absorption and therefore low dietary fat intake may interfere with vitamin A absorption.

Assessment of vitamin A status in pregnancy is commonly by measurement of serum retinol. In pregnancy as a result of the physiological changes earlier described, serum retinol levels have been shown to drop below non pregnancy concentration.[30] Vitamin A is believed to be essential for normal embryogenesis, haemopoesis, growth and epithelial differentiation. Basal requirement in pregnancy is 370mcg/day. A diet void of vitamin A results in decreased haemoglobinlevels.[30]A study carried out in Indonesia showed that antenatal supplementation with both iron and vitamin A reduces the prevalence of anaemia.[31]It has been suggested that vitamin A is required for the mobilization and utilization of iron for haemoglobinsynthesis.[32]Currently WHO recommends routine vitamin A supplementation during pregnancy or anytime during lactation in areas with endemic vitamin A deficiency.[33]

Other causes of anaemia in pregnancy include:

- Late ANC booking.
- Loss of blood due to bleeding from hemorrhoids (piles) or stomach ulcers.
- Urinary tract infections (UTI) of any aetiology and infections due to clostridium welchii can also cause anaemia in pregnancy.[34]

- Anaemia is more common in women who have pregnancies close together. Birth spacing favours iron nutrition among fertile-age women because each pregnancy has a high cost in terms of iron.
- Multiple pregnancy (women carrying twins or triplets).
- Low socioeconomic status as a result of the low socio-economic conditions in most developing countries coupled with deprivation due food taboos and superstitious beliefs, many pregnant women avoid some food items. Most of the foods consumed in most African homes are low in vitamins and high in carbohydrates and high phytate contents which reduce iron absorption. Most of the homes do not have means of food storage like refrigerators and some of these foods are seasonal.

2.5 Clinical Features Of Anaemia

2.5.1 Symptoms

The classical picture of tiredness, weakness and dizziness are present in only a small percentage of patients with anaemia. Infact, it is common for patients with haemoglobin of less than 6.8g/dl (PCV 18%) to walk into the clinic without any complaints. Over 80% of patients are picked during routine estimation of haemoglobin level during visits to antenatal clinic. This fact reveals the importance of routine haemoglobin estimation in pregnant women during each antenatal visit.[35]In severe cases however, there may be classical symptoms of anaemic heart failure which include dyspnoea and generalized oedema.

2.5.2 Signs

Through a careful general examination, the likely cause of the anaemia can be suspected. For example, patients with sickle cell disease are generally slim**,** with long thin limbs. Another feature is the prominence of the forehead (bossing). An important sign often missed in these patients are scarification marks over the joints; particularly the elbow and knee joints representing traditional treatment for chronic bone pains. Sometimes scarification marks are seen over the splenic area.

The central sign for anaemia is pallor and the areas to examine for pallor are the mucous membranes (conjunctiva, the tongue and the buccal mucosa), the palms and the nail beds. Jaundice should be excluded as its presence may suggest a haemolytic cause. There may be oedema of the limbs. In the chest, there may be basal crepitations which may be complicated by heart failure. In patients with moderate to severe anaemia, a pan-systolic murmur (ejection or haemic murmur) may be heard.

2.6 Effects Of Anaemia On Pregnancy Outcome

2.6.1 Effect of anaemia on maternal morbidity and mortality

The main function of haemoglobin is that of carrying oxygen to the tissues, other components of the blood perform other important functions. The main effect of anaemia therefore, is a high output cardiac failure. Iron deficiency has no direct effect on labour as such; however, a woman who is anaemic when going into labour will tolerate badly any blood loss, an inevitable occurrence at delivery. Normally, a mother can take blood loss of up to 1000 ml (one litre) in her stride, but a markedly anaemic woman may find this to be a tall order and it could create a life-and-death crisis. Severely anaemic women readily go into shock as a result of very small amount of blood

loss at delivery and mortality in such patients is in the range of 30 to 50%.The major concern about the adverse effects of anaemia on pregnant women is the belief that this population is at greater risk of perinatal mortality and morbidity. Maternal mortality from anaemia in selected developing countries ranges from 27/100,000 live births in India, 34/100,000 live births in Nigeria to 194/100,000 live births in Pakistan.[36]Some data show an association between a higher risk of maternal mortality and severe anaemia. Though such data were predominantly retrospective observations of an association between maternal hemoglobin concentrations at or close to delivery and subsequent mortality, there is little evidence of increased risk associated with mild or moderate anemia.

Such data do not prove that maternal anaemia causes higher mortality because both the anaemia and subsequent mortality could be caused by some other condition. For example, in a large Indonesian study, the maternal mortality rate for women with a hemoglobin concentration<10g/L was 70.0/10,000 deliveries compared with 19.7/10,000 deliveries for non anaemic women. In another study, often cited as showing an association between maternal anaemia and subsequent mortality, approximately one-third of the anaemic women had megaloblastic anaemia due to folic acid deficiency and two-thirds had hookworm. The cut-off for anaemia was extremely low (<65 g hemoglobin/L), and the authors stated that although anaemia may have contributed to mortality, it was not the sole cause of death in many of the women.[36]It has been suggested that maternal deaths in the puerperium may be related to a poor ability to withstand the adverse effects of excessive blood loss, an increased risk of infection and maternal fatigue; however, these potential causes of mortality have not been evaluated systematically. There is a dearth of information on the rates and severity of infection of anaemic pregnant women or iron-

deficient anaemic pregnant women. Iron deficiency was associated with lower lymphocyte stimulation indices and iron supplementation improved lymphocyte stimulation in severely anaemic pregnant Indian women. Additional studies on pregnant women are needed in which appropriate measures of immune function are evaluated in response to iron supplementation.

Pregnant women with sickle cell anaemia are classified as high-risk. Pregnancy adds stress to the body and increases the chance of a sickle cell crisis. Sickle cell anaemia in pregnancy also increases the risk of certain complications such as miscarriage, a type of high blood pressure called Pregnancy-induced Hypertension, and premature birth. However, thanks to modern medicine, pregnant women with sickle cell anaemia have a good chance of having a safe and healthy pregnancy.

2.6.2 Effect of maternal anaemia on birth weight

In several studies, a U-shaped association was observed between maternal haemoglobin concentrations and birth weight.[37] Abnormally high haemoglobin concentrations usually indicate poor plasma volume expansion, which is also a risk for low birth weight. Lower birth weights in anaemic women have been reported in several studies. In a multivariate regression analysis of data from 691 women in rural Nepal, adjusted decrementsin neonatal weight were associated with haemoglobin concentrations respectively. The odds for low birth weight were increased across the range of anaemia, increasing with lower haemoglobin in an approximately dose-related manner (1.69, 2.75,and 3.56 for haemoglobin concentrations of 90–109, 70–89,and 110–119 g/L, respectively).[37] Trials that included large numbers of iron-deficient women showed that iron supplementation improved birth weight. Some investigators reported a negative association between

maternal serum ferritin and birth weight and a positive association with preterm delivery.[38] These findings probably indicate the presence of infection, which elevates serum ferritin.

2.6.3 Effect of maternal anaemia on duration of gestation

There is a substantial amount of evidence showing that maternal iron deficiency anaemia early in pregnancy can result in low birth weight subsequent to preterm delivery. Fetal morbidity in the form of low birth weight (both preterm and intrauterine growth retardation) is said to be higher especially in untreated anaemic pregnant women.

Agboola found placental hypertrophy and villous fibrosis in the placentae of anaemic mothers, but the weights of infants born to these mothers were statistically within normal. It would appear that the type and duration of the anaemia in these patients is what affects the placentae and the birth weights of these babies rather than the anaemia per se.[24] For example, Welshwomen who were first diagnosed with anaemia (haemoglobin<10.4g/L) at 13–24 weeks of gestation had a 1.18–1.75-foldhigher relative risk of preterm birth, low birth weight, and prenatal mortality. After controlling for many other variables in a large Californian study, Klebanoff et al showed a doubled risk of preterm delivery with anaemia during the second trimester but not during the third trimester. Low haematocrit concentrations in the first half of pregnancy but higher hematocrit concentrations in the third trimester were associated with a significantly increased risk of preterm delivery. When numerous potentially confounding factors were taken into consideration, analysis of data from low-income, predominantly young black women in the United States showed a risk of premature delivery (<37weeks) and subsequently of having a low-birth-weight infant that was 3 times higher in mothers with iron deficiency anaemia on entry to

care.[38] There was no such increased risk for mothers who were anaemic but not iron deficient at entry to care, or for those who had iron deficiency anaemia in the third trimester. Similar relations were observed in women from rural Nepal, in whom anaemia with iron deficiency in the first or second trimester was associated with a 1.87-foldhigher risk of preterm birth, but anaemia alone was not. In an analysis of 3,728 deliveries in Singapore, 571 women who were anaemic at the time of delivery had a higher incidence of preterm delivery than did those who were not anaemic, but no other differences in either pregnancy complications or neonatal outcomes were observed.[39] Thus, the results of several studies are consistent with an association between maternal iron deficiency anaemia in early pregnancy and a greater risk of preterm delivery. The apparent loss of this association in the third trimester is probably because a higher haemoglobin concentration at this time may reflect poor plasma volume expansion and an inability to discriminate between low haemoglobin caused by iron deficiency from that caused by plasma volume expansion.

2.7 Diagnosis and Assessment of Anaemia

Ideally anaemia should be diagnosed when red cell mass (RBC mass) in the body decreases below the expected normal for a healthy population, which is a mean of 25ml/kg for women and 28ml/kg for men.[40] However, measurement of RBC mass is difficult and not easily available. Hence a convenient and practical way to define anaemia is the measurement of Hb concentration in blood.

Anaemia is said to be present when Hb concentration falls below 13g/dl in men, or <12g/dl in women. A lower threshold <11g/dl defines presence of anaemia in small children**.**[40]This definition assumes a normal distribution of RBC mass and plasma

volume. Problems may arise when this proportion is altered. For example, in normal pregnancy RBC mass increases by about 25% whereas the expansion in plasma volume is much greater, thereby bringing the Hb concentration down. And an Hb level of 11g/dlmay be a norm in pregnancy. One should be wary of such spurious anaemia or masked anaemia situations. These are physiological variations.

These days, electronic cell counters are widely available for estimating Hb concentration. These instruments automatically measure a lot many more parameters, apart from Hb concentration. Such parameters on RBC indices viz the MCV, MCH, MCHC, RDW, RBC count, haematocrit and also the WBC and platelet counts are informative in patients with anaemia. Reticulocyte may be measured automatically or manually.[41]Specific diagnosis in anaemia is a function of clinical assessment and laboratory investigations. The two must be put together for a comprehensive diagnosis: [41]

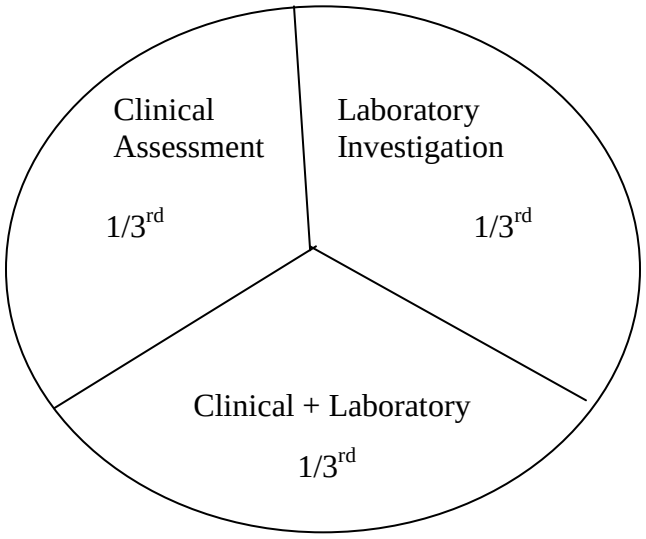


Figure 2.1: Source of Data for diagnosis in anaemia

2.7.1 Investigations in a patient with anaemia

1. Complete blood count is the single most important investigation in anaemia. It should include Hb, HCT, WBC, platelet count and RBC indices viz RBC count, MCV, MCH, and RDW.
2. Peripheral blood smears examination, to look for abnormalities in RBC, WBC, and platelets.
3. Reticulocyte count.

The above triad comprises the primary investigations in anaemia and can be performed on a single EDTA blood sample.

Secondary investigations are guided by the results of the above tests in a given clinical context, and may include one or more from the following:

1. Serum ferritin, vitamin B12, and RBC folate levels
2. Hb electrophoresis and quantitation (Hb A2, Hb F etc)
3. Blood biochemistry for hepatic and renal functions
4. Bone-marrow aspiration
5. Trephine biopsy from bone marrow
6. Imaging studies may include X-ray chest/skull/ and other bones as warranted
7. Ultrasound abdomen, radio-isotope studies
8. RBC survival & kinetic studies (not available routinely).

Other specialized tests include Coombs test, osmotic fragility, Ham's test, erythropoietin level, immunocytochemistry, cytogenetics etc.

Another set of investigations may need to be undertaken to unravel the primary causative disease. These would depend upon the clinical suspicion and the results of investigations as listed above.

Thus, a patient with diagnosis of iron deficiency anaemia (commonest type of anaemia in clinical practice) may warrant one or more of the following investigations:

1. Dietary history
2. Stool for ova, cyst, and occult blood. If stool shows occult blood positive, do GI endoscopy or Barium meal studies (Ba Meal and Ba Enema)
3. Urine routine and for microscopic haematuria
4. Gynaecological assessment in women
5. Chest X-ray
6. Tests for bleeding disorders (PR, APTT, BT etc)
7. Tests of iron assimilation

Likewise, other types of anaemias may warrant a different set of investigations. Diagnosis in a patient with anaemia can be approached from several angles. It is dictated by the available clinical and laboratory information.

2.8 Management of Anaemia

The aim and goals of treatment should be to restore haemoglobin levels and Red cell indices to normal, and to replenish iron stores, to prevent a further fall in haemoglobin level, relieve symptoms related to anaemia thereby improving quality of life (QoL). If this cannot be achieved, consideration should be given to further evaluation. Large variation in clinical scenarios requires an array of actions. Initiation of treatment depends

on symptoms (fatigue, headache, dyspnea, and palpitations), aetiology and severity of anaemia, co-morbidity and potential adverse effects of therapy.

2.8.1 Iron therapy

For iron deficiency without anaemia, different approaches to iron replacement should be considered and discussed with the patient. If patients are likely to develop IDA, monitoring frequency should be increased. Options for iron supplementation include:

2.8.1.1 Oral Iron

Treatment of an underlying cause should prevent further iron loss, but all patients should have iron supplementation both to correct anaemia and replenish body stores. This is achieved most simply and cheaply with ferrous sulphate 200 mg twice daily.[42]Lower doses may be as effective and better tolerated and could be considered in patients not tolerating traditional doses. The main factor in favour of oral iron is convenience, not efficacy. Oral iron may not be able to compensate ongoing blood loss. Oral iron supplements can be used if absolute indications for IV iron therapy are not met. If oral iron is used, response and tolerance should be monitored, and treatment changed to IV iron if necessary. Side-effects are usually dose-related. The absorption and efficacy are not greater when high doses are used. Not more than 100 mg elemental iron daily should be prescribed. Other iron compounds (e.g. ferrous fumarate, ferrous gluconate) or formulations (iron suspensions) may also be better tolerated than ferrous sulphate.

Ascorbic acid (250–500 mg twice daily with the iron preparation) may enhance iron absorption. It is recommended that oral iron is continued until three months after the iron deficiency has been corrected so that stores are replenished.[42] It is true that if iron is taken

with food there is some reduction in side effect related to GIT. However staple African diet consists of cereals and cereals contain phytic acid. Phytate reduce iron absorption. Addition of vitamin C in medicine or in the diet enhances iron absorption. So the timing of oral iron intake in relation to food should be taken into consideration when managing the cases. If the predictable rise in haemoglobin does not occur after oral iron therapy, one must find out the possible reasons. Some of the reasons are as follows:

1. Incorrect diagnosis.
2. Mal-absorption syndrome
3. Presence of chronic infection
4. Loss of iron from the body
5. Lack of patients compliance
6. Ineffective release of iron from a particular preparation.

2.8.1.2 Parenteral iron

The defaulting rate with oral iron therapy in pregnant women is fairly high because of gastrointestinal side effects like nausea, vomiting, diarrhoea and abdominal pain.

Sometimes pregnant women present with severe anaemia after 30-32 weeks of pregnancy and in those cases time is an important factor to improve haemoglobin status. In such situations parenteral iron therapy is indicated. Parenteral iron can be given by intramuscular or intravenous route.

i. Intramuscular (IM) Iron

Sorbitol-citric acid complex (75mg) is used for intramuscular route only. On the other hand iron-dextran can be used both by intramuscular and intravenous route. The main

drawback of intramuscular iron is the pain and staining of the skin at injection site, myalgia, arthralgia and injection abscess.

ii. Intravenous (IV) Iron

Clinical comparative trials show faster and prolonged response with IV iron (compared with oral). IV iron is more effective, better tolerated and improves QoL to a greater extent than oral iron. Absolute indications for I.V iron include:

- Severe anaemia (haemoglobin<10 g/dl).
- Intolerance or inappropriate response to oral iron.
- Severe intestinal disease which reduces absorption of iron.
- Concomitant therapy with an erythropoietic agent.
- Patient preference.
- Where there is aversion for blood transfusion e.g. the Jehovah witness.
- When there is no blood available for transfusion.

I.V iron can be considered inappropriately interventional especially when iron dextran is used with its risk of anaphylactic reactions.

Intravenous route should be reserved for those who do not wish to have frequent intramuscular injections. Iron can be given intravenously at one shot as total dose infusion (TDI). Utmost caution is needed for total dose iron therapy via intravenous route because of severe anaphylactic reaction that may occur such as immediate vascular collapse, tachycardia, dyspnoea, cyanosis vomiting, pyrexia etc. Therefore total dose of iron therapy by intravenous route should only be given in a hospital setting where facilities are available to manage severe reaction after iron dextran.

The total dose of infusion of iron (TDI) is calculated using the following formular:

TDI= (15- patient's Hb) x body weight in Kg x3 =mg.[42]

2.8.2 Management of severe anaemia in late pregnancy (after 32 weeks)

These patients should ideally be managed in a hospital setting. They may or may not present with heart failure. However they all need urgent admission and bed rest. They need complete rest with sedation, oxygen. In case, of CCF patient should be given digitalis, diuretics and packed red cells. Packed red cells are preferred choice for severe anaemia in later part of pregnancy. This should be infused along with diuretics. Once the patient is stabilized total dose infusion of iron Dextran may be considered.[43]

Contraindications of parenteral iron therapy include Nephritis, cardio respiratory disease and allergy.

Table 2.2: Dosing and infusion intervals of I.V iron based on the compound used

Chemical properties	High MW iron dextran	Low MW iron dextran	Iron gluconate	Iron sucrose	Ferric carboxy-maltose
Complex stability	High	High	Low	Moderate	High
Acute toxicity	Low	Low	High	Medium	Low
Dosing					
Testdose required.	Yes	Yes	No	Yes*/No	No
Max. dose(mg).	1000	1000	62.5–125	200–500	1000
Max. infusion time(min).	360	360	60	30–210	15
Max.bolus dose (mg).	100	100	125	200	200
Max. injection time(min).	2	2	10	10	Fast push
Safety profile					
Risk of anaphylaxis.	Yes	Yes	No	No	No
Relative risk of serious adverse events.	High	Moderate	Low	Lowest	NA

Adapted from Table 5; MW= molecular weight; *only in Europe; NA = not available

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2.8.3 Erythropoietic therapy

Erythropoietic agents are effective for treatment of anaemia from chronic diseases (ACD) and may improve quality of life (QoL). This should be considered if haemoglobin is <10 g/dL or if there is no response to IV iron therapy within 4 weeks.

2.8.4 Vitamin supplementation

Replacement of vitamin B12 or folic acid should be initiated if serum concentrations are below normal.

2.8.5 Blood transfusion

Most patients have chronic bleeding and repeated blood transfusions are not appropriate. Management should be directed at diagnosing and stopping bleeding. Indications for replacement of blood after acute or chronic bleeding vary depending on the clinical situation, including rate of bleeding. Indications for replacement of blood after acute or chronic bleeding vary depending on the clinical situation, including rate of bleeding, haemodynamic state, haemoglobin, age and concomitant disease. Blood transfusion is no substitute for treatment of IDA with IV iron, possibly in combination with EPO. If transfusion is necessary, iron replacement therapy is still required.

2.8.5.1 Indications for blood transfusion

1. Acute blood loss.
2. All cases of severe anaemia in pregnancy irrespective of gestational age.
3. Where moderate anaemia coexists with serious diseases such as sepsis, renal failure, haemoglobinopathies and eclampsia.

4. Anaemic patients seen for the first time during labour, or when they are aborting or during the last four weeks of pregnancy, though their haemoglobin level may be around 6 or 7g/dl.
5. In severe cases of anaemia, intravenous administration of 50mg of ethacrinic acid or 40mg of frusemide is followed 5 or 10 minutes later by slow transfusion of packed cells. Transfusion of whole blood may occasionally be required to correct thrombocytopenia.[44]

2.9 Prevention of anaemia in pregnancy

It is advisable to build up iron store before a woman marries and becomes pregnant. This can be achieved by:

1. Routine screening for anaemia for adolescent girls from school days
2. Encouraging iron rich foods
3. Fortification of widely consumed foods with iron
4. Providing iron supplementation from school days
5. Annual screening for those with risk factors

If all pregnant women receive routine iron and folic acid, it is possible to prevent nutritional anaemia in pregnant women. National Nutritional Anaemia Prophylaxis Program recommends 60milligram elemental iron and 500 micrograms of folic acid daily for 100 days to all pregnant women. However it is suggested that 100milligram of elemental iron and 1 milligram folic acid are the optimum daily doses needed to prevent pregnancy anaemia. Higher dose is required in women from developing countries as they start pregnancy with low or absent iron stores due to poor nutrition and frequent infections like hook worm and malaria.[45]

CHAPTER THREE

METHODOLOGY

3.1 Background of Study Area

Nasarawa State is located in North – Central Nigeria. It was created in 1996 out of the defunct Plateau State by the late General Sani Abacha led-Government that lasted between 1995 and 1998. It is bounded to the South by Benue State, to the West by Kogi State, to the North-East by Kaduna and Plateau States, to the North-West by the F.C.T and to the South-East by Taraba State.[46] Its estimated population is put at 1,863,275 people, which consist of 945,556 males and 917,719 females (provisional 2006 population census).[47] Of the total population, 409,921 women are within the reproductive age. Nasarawa state is a multi-ethnic state with over 30 ethnic groups, it is also multi-religious, a home to all people from various parts of Nigeria and even beyond. Majority (>70%) of the inhabitants of the State are mainly subsistent rural farmers with low western education. The educated inhabitants who are mainly civil servants constitute <30% of the population. It has 13 local government areas, with 3 senatorial districts viz: Nasarawa North, Nasarawa East, and Nasarawa South.[46]

On the world map, Nasarawa States lies between latitudes $7^0$52' and $9^0$37' north of the equator and longitudes $7^0$25' and $8^0$37' east of the Greenwich meridian. It occupies an area of about 28,000 square kilometers.There are currently 2 government owned tertiary health facilities, 2 health training facilities, in addition to (13) thirteen general hospitals (rendering secondary level care) with bed capacity ranging from 30 to 60 in the State. In addition to several primary health care centres and private health facilities. The health status, like that of the rest of North-Central Nigeria is unsatisfactory as indicated by a

high maternal mortality rate of 800-1000/100,000 live births, infant mortality of 100-120/1000 live births and an annual growth rate of 2.8%.[10]

The Medical Center Mararaban Gurku is a 60-bed secondary level facility which was built by the then Governor, Abdullahi Adamu and commissioned by the then President, Olusegun Obasanjo in 2002. It serves the population of Karu LGA which is put at 205,477, with 107,303 males and 98,169 females and its environs, as well as being a referral center for the numerous Primary Health Care Centers.[47]The facility has a total staff strength of 133 out of which 8 are doctors, 5 Pharmacists, 32 Nurse-midwives, 5 Laboratory Scientists and 9 Medical Record Officers.

Ultra sonographic service is provided by a doctor on part-time while the remaining are Administrative and support staff.

There are (2) two functional ambulances in the Hospital (504 Peugeot Station Wagon and a brand new J5).

The hospital is powered by the Power Holding Company of Nigeria (PHCN) through a dedicated transformer which is complemented by a generator that provides light every night, during meetings, drug launch and seminars.

Potable water is provided 24hours through 2 functional boreholes, 1 powered by electricity and the other using solar power.

The hospital provides a fully functional National Health Insurance Scheme (NHIS), with capitations paid regularly, being both a primary and secondary provider

3.2 Study Population

All pregnant women registered for antenatal care at the Medical Centre within the study period served as the study population.

3.2.1 Inclusion criteria

All singleton pregnant women between the ages of 15-49 years, who registered for Ante Natal Care at Medical Centre, Mararaban Gurku and did not have any complications in pregnancy during the time of study.

3.2.2 Exclusion criteria

Pregnant women with multiple pregnancy, chronic medical conditions such as sickle cell anaemia, HIV positive with complications in pregnancy, pregnant women with history of bleeding in the current pregnancy and pregnant women who did not give consent.

3.3 Study Design

This is a cross-sectional descriptive study which assesses anaemia in pregnant women attending ANC in the Medical Centre Mararaban Gurku, one of the secondary level health facilities in Nasarawa State.

3.4 Sample Size Determination

The sample size was determined using the formula for sample size determination for proportion.[49]

$$n = \frac{z^2_{(a-1)}pq}{d^2}$$

Where: n = the desired sample size when the population is greater than 10,000.

z^2 = The standard normal deviate usually set at 1.96 which corresponds to 95% confidence interval.

p = The proportion in the target population estimated to have a particular characteristics. According to a previous similar study carried out in Enugu, South Eastern Nigeria, the prevalence of anaemia in pregnancy was found to be 40.4%.[25] Using above formula, therefore:

q = 1.0-p

d = Degree of accuracy desired, usually set at 0.05.

Calculated from the formular[49]

z^2=1.96, p=40% (0.4), q=0.6, d=0.05.

If applied then, $n = \frac{1.96^2 \times 0.6 \times 0.4}{(0.05)^2} = 368.8$

In order to take care of attrition due to non-response 10% was added:

$\frac{10}{100} \times 368.8 = 36.88$

$368.8 + 36.88 = 405.68 \approx$ **406**

This brings the required minimum sample size for the study to **406**.

3.5 Sampling Technique

A systematic sampling method was used to select the required sample size. The health Facility runs ANC three days in a week and on each clinic day, an average of 150 pregnant women are seen. Therefore, a total average of 450 women are seen every week and 1,800 every month which is our study population. Sampling interval is calculated using the formula:

$K = \frac{\text{Study population}}{\text{Minimum Sample size}} = \frac{1800}{406} = 4.4 \approx 4$

The first patient on each clinic day was selected using random sampling by ballot, and subsequently, the interval of 4 was used to select the remaining patients. 45 patients were selected on each clinic day using systematic sampling technique. In the event that the required sample size was not met for a particular clinic day, the sampling continued on the next clinic day to meet the requirements for the previous clinic day and the day in question. The study was conducted over a period of 3 weeks.

3.6 Data Collection Tools

The questionnaire is divided into 4 sections under the following sub headings: Socio-demographic data where the age, ethnicity, occupation and educational status of the respondents were captured.

The second section addressed the obstetric data which include parity, gestational age at booking and last childbirth.

The third section addressed knowledge on what anaemia is and the possible causes of anaemia.

The last section of the questionnaire addressed the state of health and general wellbeing of the respondents through their medical and nutritional history.

3.7 Data Collection Technique/Procedures

An interviewer-administered questionnaire was used for data collection. The questionnaires were administered by the researcher (myself) and three trained research assistants. The research assistants were trained for one day on how to elicit responses from the respondents based on the questionnaire and to record same. Two laboratory

technicians were also engaged to help run the test on the women who did not already have their laboratory results at the time of the study.

Before the actual study, the questionnaire was pre-tested in another facility of similar standing to determine the effectiveness and clarity of the questionnaire and necessary adjustments made.

3.7.1 Packed cell volume (Haematocrit)

Principle: Haematocrit is the volume of erythrocytes expressed as a fraction of the volume of whole blood in a sample. This is determined by centrifugation.

Specimen: Venous blood is collected directly into heparinized capillary tubes after pricking the patient.

Method: The ball of the middle finger was swapped with cotton wool soaked in 70% alcohol (methylated spirit). The ball of the middle was pricked with a sterile lancet; the first drop of blood is wiped away and blood is allowed to enter thetubes by capillary action up to about 2/3 of its length and one end of the capillary tube is sealed with a sealer. The capillary tubes containing the samples are then arranged in the centrifuge grooves and spinned for 5minutes at 1,200 revolutions per minute. The PCV is subsequently determined by measuring the height of the red cell column and expressing this as a ratio of the total blood column. It is then read using haematocrit reader.

$$Hb = \frac{PCV}{3} \text{ (g/dl)}$$

Peripheral blood film was also examined for malaria parasites.

3.8 Data Analysis

The data obtained was analyzed using the statistical package for social sciences (SPSS) software version 12. Descriptive analysis was performed to summarize the demographic characteristics, obstetric history, antenatal care, and diagnoses of the participants. Differences in proportions were analyzed using the chi-square test. Frequencies and percentages of variables were calculated by anaemia status. The relationship between anemia, demographic characteristics, obstetric history, antenatal care, and diagnoses was investigated through bivariate analysis, and stratified by anaemia status. This analysis was done to determine significant associations between certain variables and anaemia status. The information was presented in form of tables, graphs and charts.

3.9 Ethical Considerations

Permission to undertake the study was obtained from the Department of Community Medicine, Ahmadu Bello University, Zaria. Ethical approval was also obtained from the Ethical Review Committee of the State Ministry of Health, Nasarawa. Informed consent was also sought and obtained from the women who participated in the study.

3.10 Limitations Of Study

1. The routine ANC investigation did not include Stool Microscopy which would have provided the data of those with Anaemia due to worm infestation.
2. Some questions were not be responded to appropriately for example, some of the women did not know or would not disclose their husbands' income, so the amount of money made available for food monthly was used to estimate the income.

CHAPTER FOUR

RESULTS

Four hundred and twelve respondents participated in the study out of which, data for this analysis was obtained from 406 respondents, giving a response rate of 98.5%. The respondents were asked questions concerning their socio-demographic data, their obstetric data and their knowledge on anaemia. The results are presented in the following tables and figures.

Table 4.1: Socio-Demographic Characteristics Of The Respondents

Variables	Frequency (n=406)	Percent (%)
Age Category (in years)		
<20	18	4.4
20-30	311	76.6
31-40	75	18.5
>40	2	0.5
Marital Status		
Yes	403	99.3
No	3	0.7
Ethnic Group		
Igbo	84	20.7
Hausa/Fulani	48	11.8
Yoruba	16	3.9
Tiv	30	7.4
Igala	43	10.6
Gbagyi	4	1
Others	181	44.6
Religion		
Christianity	311	76.6
Islam	94	23.2
Others	1	0.2
Occupation		
Civil Servant	18	4.4
Company worker	20	4.9
Unemployed	55	13.5
Self employed	204	50.2
Fulltime housewife	109	26.8
Educational Status		
Primary	46	11.3
Secondary	267	65.8
Tertiary	83	20.4
None	9	2.2
Others	1	0.2
Family Size		
≤ 3 people	204	50.2
4-6 people	158	38.9
7-9 people	28	6.9
≥10 people	14	3.4

A total of 406 respondents participated in the study. Majority of the women 274(67.4%) were in the age range of 20-29 years while those that were ≥ 40years old were the least (0.3%). The mean age of the respondents was 26.8years. Majority of the respondents 403 (99.3%) were married, while 3(0.7%) were not married.

The respondents cut across several ethnic groups, but Igbo as a single ethnic group had the highest number of respondents 84(20.7%).

Of the 406 respondents, 311(76.6%) were Christians, 94(23.2%) were Muslims, while 0.2%were of other religions.

Most of the respondents 396(97.6%) had formal education, other forms of education which included Islamic and Quranic education accounted for only 0.2%.

About 50% of the women were self-employed, while 4.4% were Civil Servants.

A larger proportion of the respondents (50.2%) had a household size of ≤3 people, 38.9% had a household of 4-6 people, 6.9% had a household size of 7-9 people, while 3.4% had ≥10 people in their household.

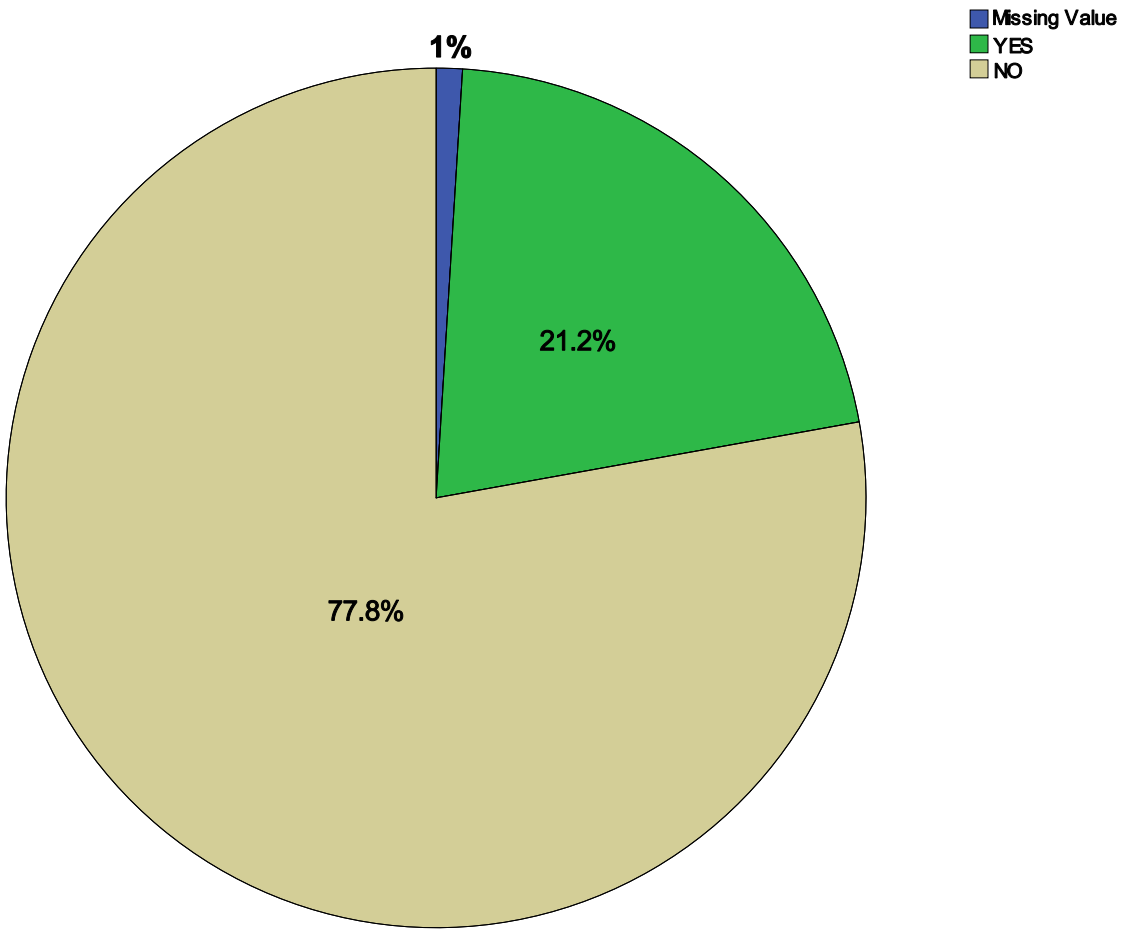


Figure 4.1: Ever Heard of Anaemia

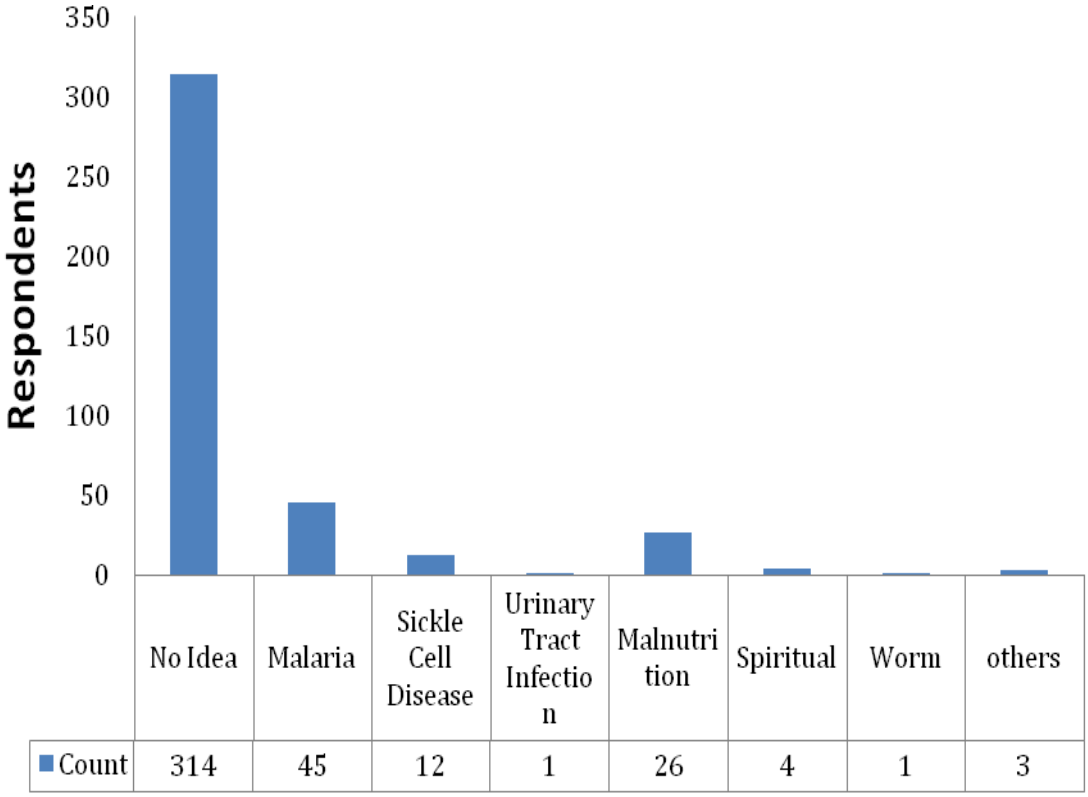
Most of the respondents, 316(77.8%) had never heard of anaemia, while 87(21.2%) said they have heard of anaemia before.

Table 4.2: Definition of Anaemia by respondents

Causes of Anaemia	**Frequency**	**Percent (%)**
Shortage of blood	79	19.5
Leaking of blood	1	0.2
Spiritual attack	4	1.0
Others	3	0.7
No idea	319	78.6
Total	406	100

Majority of the respondents (78.6%) had no idea what anaemia is, 19.5% say it is shortage of blood while 0.7% of them gave other diverse definitions of anaemia.

Figure 4.2: Respondents' Views On The Causes Of Anaemia



Out of the 406 respondents, 314 had no idea what the causes of anaemia are while 45 said it is caused by malaria, 26 said it is caused by Malnutrition and only 1 each said anaemia is caused by Urinary tract infection and worms.

77.8% have never heard of Anaemia, 78.6% cannot define Anaemia while 77.3% have absolutely no idea of the possible causes of Anaemia. From these findings, the knowledge of the respondents of Anaemia can be said to be poor.

Table 4.3: Prevalence of anaemia among women attending ANC in MCMG

PCV Status	**Frequency (n=406)**	**Percent (%)**
Anaemic	229	56.4
Non-Anaemic	177	43.6
Total	406	100

Out of the 406 respondents, 229 (56.4%) of them were anaemic using the WHO cut-off point of PCV<33% while 177 (43.6%) of them were not anaemic. Table 4.5: Distribution of Anaemia in Pregnancy According to Severity

Table 4.4: Distribution of Anaemia according to severity

Degree of Anaemia	**Frequency**	**Percent (%)**
Moderate	24	10.5
Mild	205	89.5
Total	229	100.0

Out of the 229 women that were anaemic, 89.5% had mild form of anaemia while 10.5% had moderate anaemia. None of the respondents had severe form of anaemia.

Table 4.5: Severity of anaemia among pregnant women by age group

Age (years)	Moderate	Mild	Non anaemic	Total
15-19	2(11.1%)	9(50.0%)	7(38.9%)	18(100%)
20-30	17(5.5%)	158(50.8%)	136(43.7%)	311(100%)
31-40	5(6.7%)	37(49.3%)	33(44.0%)	75(100%)
> 40	0(0%)	1(50.0%)	1(50.0%)	2(100%)
Total	24(5.9%)	205(50.5%)	177(43.6%)	406(100%)

Respondents in the age group 15-19 years constituted the highest percentage of anaemic cases both mild and moderate (61.1%) followed by 20–30 years age group (56.3%) compared to the other age groups.

Table 4.6: Severity of anaemia among the respondents by gestational age at booking

GA at booking (Trimester)	Moderate	Mild	Non- anaemic	Total
1st	14 (5.4%)	128 (49.2%)	118 (45.4%)	260 (100%)
2nd	10 (7.4%)	71 (52.6%)	54(40.0%)	135 (100%)
3rd	0 (0%)	6 (54.4%)	5 (45.5%)	11 (100%)
Total	24 (5.9%)	205 (50.5%)	177 (43.6%)	406 (100%)

Out of the 406 respondents, 260 (64%) of the women booked for ANC in the first trimester of their pregnancy, 33.3% booked in the second trimester while only 2.7% of the respondents booked in the third trimester.

Out of the 260 women who booked for ANC in the 1st trimester, 54.6% of them were anaemic, 60.5% of those who booked in the 2nd trimester were anaemic while 54.5% of those who booked in the 3rd trimester were anaemic.

Table 4.7: Prevalence of Anaemia amongst the respondents by parity

Parity	Degree of Anaemia			Total
	Moderate	Mild	Non anaemic	
Primipara	6(4.4%)	65(47.4%)	66(48.2%)	137(100%)
Multipara	17(7.0%)	127(52.3%)	99(40.7%)	243(100%)
Grand multipara	0(0%)	5(50.0%)	5(50.0%)	10(100%)
No response	1(6.3%)	8(50.0%)	7(43.8%)	16(100%)
Total	24(5.9%)	205(50.5%)	177(43.6%)	406(100%)

Of the 243 of the respondents who were multiparous, 144 (59.3%) of them were anaemic, while 71(51.8%) of the 137 primiparous women were anaemic. 16 out of the 406 respondents did not supply information on their parity and 9(56.3%) of them were anaemic.

Table 4.8: Relationship between Parity and Anaemia

Parity	**Anaemic**	**Not Anaemic**	**Total**
Primipara	71	66	137
Multipara	149	104	253
Total	220	170	390

$\chi^2 = 1.805$; $p = 0.05$; $df = 1$

Anaemia is more common among Multiparous women and this finding was found to be significant.

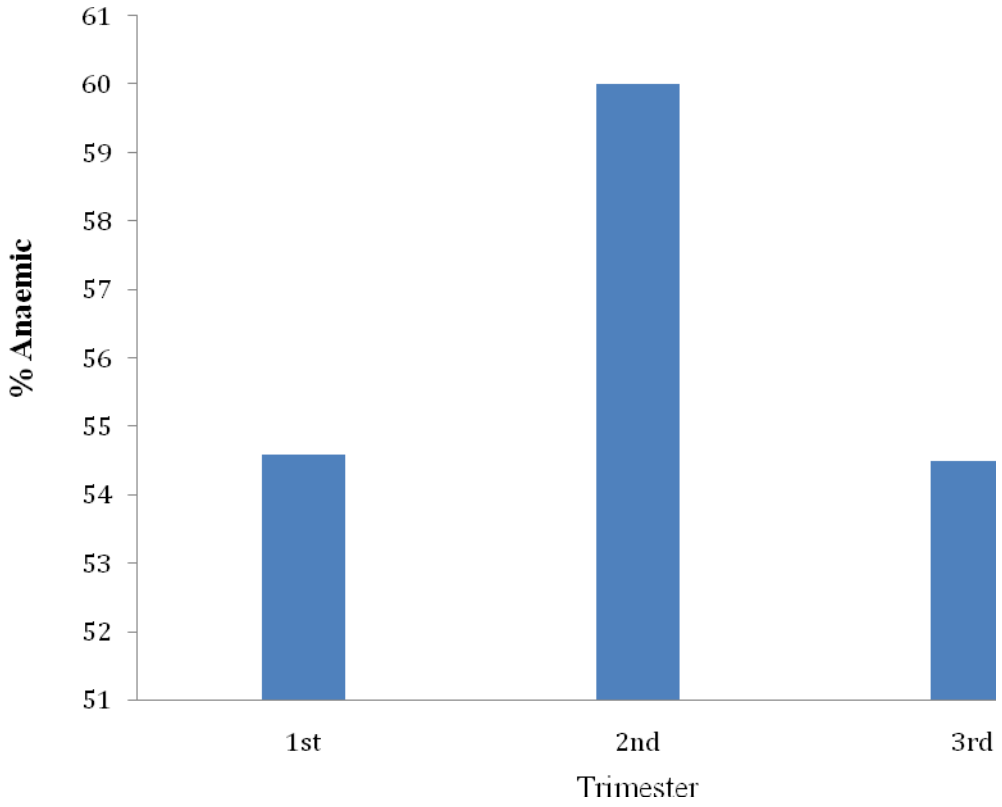


Figure 4.3: Prevalence of anaemia by gestational age at the time of study

Majority (60%) of the women who were in their second trimester during the study were found to be anaemic, while 54.6% and 54.5% were anaemic amongst those in the first and third trimesters respectively.

Table 4.9: Prevalence Of Anaemia Among Respondents By Birth Interval

Birth Interval (yrs)	**Degree of anaemia(PCV)**			**Total**
	21-26	**27-33**	**>33**	
Primigravida	16	87	50	153
≤1	0	8	7	15
2	1	36	50	87
3	4	40	28	72
4	1	13	15	29
>4	2	18	26	46
Total	24	202	176	402

Those who were primigravidae constituted 38.1% of the respondents, thus not relevant to the parameter in question. From the 249 respondents who were not primigravidae, 59% had a birth interval of more than 2 years while the remaining 41% had a birth interval of ≤ 2years.

Table 4.10: Relationship Between Birth Interval And Anaemia

Birth interval (yrs)	**PCV (%)**		**Total**
	≤33	**>33**	
≤ 2	45	57	102
>2	78	69	147
Total	123	126	249

χ^2=1.927; p = 0.05; df =1

Anaemia was found to be more common among women with birth interval greater than 2 years. This finding is not significant.

Table 4.11: Prevalence Of Anaemia By Educational Status Of The Respondents

Educational Status	**Anaemic (%)**	**Non-anaemic (%)**	**Total**
Primary	27(58.7)	19(41.3)	46
Secondary	152(57)	115(43)	267
Tertiary	44(53)	39(47)	83
None	5(55.5)	4(44.5)	9
Others	1(100)	0(0)	1
Total	229	177	406

Majority (58.7%) of the respondents who had only primary education were anaemic, while those who had tertiary level of education had the least prevalence of anaemia.

Table 4.12: Prevalence of Anaemia by Occupation

Occupation	**Anaemic (%)**	**Non-Anaemic (%)**	**Total**
Civil servant	4(22.2%)	14(77.8%)	18
Company worker	16(80.0%)	4(20.0%)	20
Unemployed	27(49.1%)	28(50.9%)	55
Self employed	119(58.3%)	85(41.7%)	204
F/ housewife	63(57.8%)	46(42.2%)	109

The prevalence of Anaemia was highest amongst the women who gave their occupation as company workers (80.0%) and least among Civil Servants.

Table 4.13: Prevalence of Anaemia by Degree of Malaria Parasitaemia

Malaria Parasites(MPs)	Anaemic (%)	Not Anaemic (%)	Total
None	122 (54.2%)	103 (45.8%)	225 (100%)
1+	84 (62.2%)	51(37.8%)	135 (100%)
2+	19 (54.3%)	16 (45.7%)	35 (100%)
3+	4 (36.4%)	7 (63.6%)	11 (100%)
Total	229 (56.4%)	177 (43.6%)	406 (100%)

Out of the 406 respondents, 62.2% of the respondents who had mild parasitaemia (1+) were anaemic, followed by those who had no malaria parasites (54.2%), while only 36.4% of those with severe parasitaemia (3+) were anaemic.

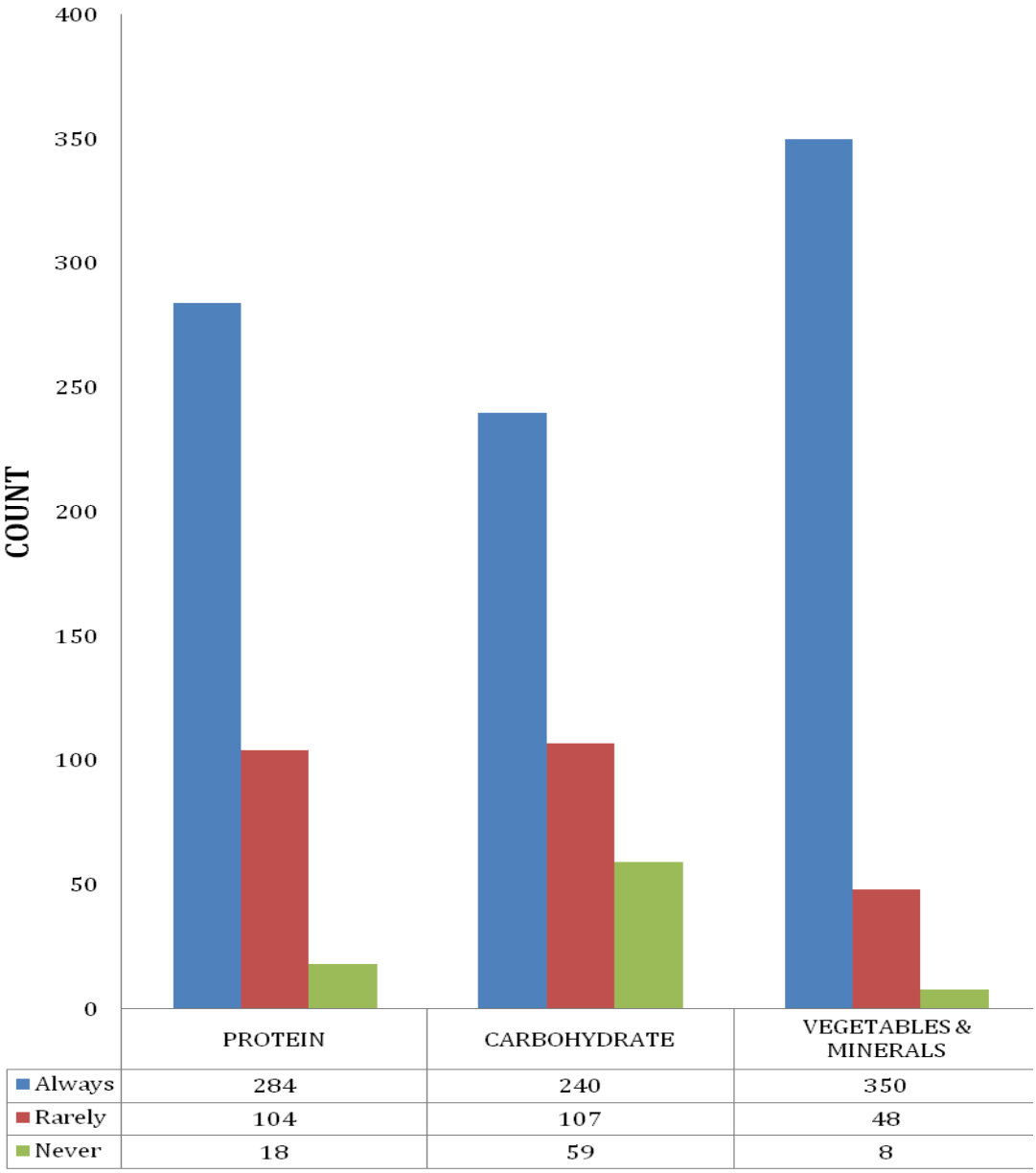


Figure 4.4: Respondents' Dietary Intake

The respondents eat mostly vegetables 76.1%, followed by protein 70% and 59.1% Carbohydrate food items.

CHAPTER FIVE

DISCUSSION

The socio-demographic characteristics of the study population revealed that out of the 406 respondents, 274 of them were in the age range of 20-29 years while those that were 40years old and above were the least (0.3%). The minimum age of the respondents was 16years while the maximum age was 46years. The mean age of the respondents was 26.8years.

The respondents cut across several ethnic groups, but Igbo, as a single ethnic group had the highest number of respondents (Table 4.1). The multi ethnicity of the study population can be attributed to the proximity of the study center to the Federal Capital Territory. The household sizes of the respondents were as follows: A larger proportion of the respondents (50.2%) had a household size of 3 or less people, 38.9% had a household of 4-6 people, 6.9% had a household size of 7-9 people, while 3.4% had ≥10 people.

The knowledge about anaemia and its causes, in this study is low (21.2%), majority of the respondents said they had never heard of anaemia. This is in line with a similar study conducted in Raichur, India where knowledge about anaemia in pregnancy is very low (6.48%).[53] Most women who have heard of anaemia were not able to correctly identify the causes. A major hurdle is the fact that anaemia is not perceived a major health problem by many even by sufferers who ascribed its consequences to general fatigue. Even where the problem is recognized, there may be a reluctance to invest necessary funds owing to scepticism regarding the effectiveness of interventions for controlling it. Evidence of the independent effect of iron status on function would therefore, help in advocacy.

About half of the women were self-employed, 26.8% were fulltime housewives, 13.5% were unemployed, and 4.9% were company workers, while 4.4% were Civil Servants.

More than three-quarter of the respondents had one form of formal education or the other, while only a meager 2.2% had no any form of education at all. This certainly must have affected their level of awareness and health-seeking behavior hence, the least prevalence of anaemia among those with tertiary education.

The prevalence of anaemia (PCV<33%) amongst women attending ANC in Medical Centre, Mararaban Gurku in this study was found to be 56.4%.This falls within the range 35%-75% from previous reports from a study by Chukwubelu and Obi.[54] It is however higher than 29.1% reported from similar studies conducted in Sagamu, 8.8% reported from Enugu and 29.79% from Lagos.[54,55,56]The high prevalence of anaemia found among women in this study could be attributed to low educational status, low nutritional and socio-economic status commonly found among residents of urban slums. According to the World Health Organization, a severe public health problem exists if the prevalence of anaemia is equal or greater than 40% in any group.[57] This is therefore, an indication that anaemia during pregnancy is a major problem in Nigeria.

The majority (89.5%) of the pregnant women that were anaemic in this study had mild anaemia whereas 10.5% were moderate had anaemia. None of the respondents had severe anaemia, this is a pleasant finding considering the fatal effect of severe anaemia on maternal health and pregnancy outcome. In a similar study done by Glover-Mengor et al[69] in Sekyere Ghana, 36.6% of the women had mild anaemia, 14.1% had moderate and 1% had severe anaemia. This high prevalence of mild anaemia in this study could be

attributed to physiological anaemia due to the haemodilution which occurs in pregnancy. The prevalence of anaemia was higher in pregnant women at the second trimester (60%), more than that recorded amongst those in the third trimester who had 54.5%. The peak of anaemia recorded in this study (2nd trimester) coincides with the period when haemodilution is at its peak. This may have contributed to the high prevalence recorded in the 2nd trimester, indicating that anaemia is further aggravated by haemodilution. However, this result is at variance with the report of WHO in which anaemia is said to be significantly higher in the 3rd trimester of pregnancy than the first two trimesters.[58]

In this study, the highest prevalence of anaemia, was found in age range of 15-19 years (61.1%) followed by 20–29 years age group (56.3%) compared to the other age groups. This is in line with findings from a similar study done in Abeokuta by Idowu et al[68] which also showed the highest prevalence of anaemia (81.5%) among teenage mothers (15-19 years). This could be attributed to possible poor iron reserve in their adolescent years before the occurrence of pregnancy.Those who embark on pregnancy with a good haemoglobin level and with good iron stores, are more likely to enjoy continued general well-being. Such women can and will tolerate unduly heavy blood loss much better. They will also go into the postnatal period healthier, better placed to face the challenges of new motherhood, than those who embark on pregnancy while already anaemic or with low iron stores.

The results of this study also showed that the prevalence of anaemia was higher in the multiparous women than the primiparous women. This is in line with a similar study which showed that high parity pregnancies carry about three times higher risk of developing anaemia in pregnancy than low parity pregnancies, and that the risk of

anaemia in pregnancy increases in a dose-response fashion over increasing levels of parity.[59]This may be explained by the increased susceptibility to hemorrhage in women having high parity.

High parity is among the factors with etiologic potential in causing anaemia in Pregnancy. The WHO defines high parity as five or more pregnancies with gestation periods of ≥ 20 weeks, and low parity as less than 5 pregnancies with gestation periods of ≥ 20 weeks.[59] Compared to the non-pregnant state, every pregnancy carries an increased risk of hemorrhage before, during, and after delivery. Therefore, higher parity exposes women more frequently to periods of hemorrhage risk.

The women who had birth intervals of 1 year or less had the highest prevalence of anaemia, followed by those who had a birth inter of 2-4 years, while those women who had a birth interval of more than 4years had the least Prevalence of anaemia. This is an indication that women who have pregnancies too close are at risk of developing anaemia in pregnancy. This is because women with short birth spacing tend not to be able to replenish their nutritional stores after each delivery. Pregnancies among such women tend to be very vulnerable and have a higher risk of anaemia. Low availability and poor absorption of iron, and closely spaced pregnancies lead to depleted iron stores of pregnant women.[60]

When the women were considered based on their occupation, the prevalence of Anaemia was highest amongst the women who gave their occupation as Company Workers (80.0%) followed by those who are self-employed, while those in Civil Service were least anaemic of them all.

Their occupation would determine their income and how much is made available for feeding monthly and consequently their nutritional status.

Out of the 229 women that were anaemic, 46.7% had parasitaemia of various degrees while 53.3% of them had no parasitaemia. This is indicative that the anaemia in this group of women who had no parasitaemia is likely to be from other possible causes of anaemia other than malaria infection. It was also observed that the degree of parasitaemia is not directly proportional to the prevalence of anaemia in the various groups. This gives the impression that Malaria infection is not the commonest cause of anaemia in pregnancy among women who attend ANC in this health facility even though it is a known fact that malaria is an under-recognized cause of anaemia in pregnancy in endemic areas like ours and is usually asymptomatic. Malaria may cause or aggravate anaemia. Both malaria and anaemia in pregnancy therefore pose a serious public health challenge.

Out of the 406 respondents, 64% of the women booked for ANC in the first trimester, 33.3% booked in the second trimester while only 2.7% of the respondents booked in the third trimester. This is at variance with findings of other studies that revealed late booking as a common practice in sub Saharan Africa.[61,62]Although early ANC booking has been associated with improvement in haemoglobin concentration and significantly better birth weights, in Nigeria, majority of pregnant women booked their first ANC attendance during the second trimester.[63,64]In a similar study done by Singh and Khare in Zimbabwe, initial ANC attendance was made during the second and third trimester.[65]Similarly, recent surveys of antenatal patients in Pretoria and in Greytown, Kwazulu Natal in South Africa, have also demonstrated that the majority of women only

commence their antenatal care late in their pregnancy (i.e. in the second or third trimester).[66,67]

Relating the anaemic status of the respondents to their educational status, the study showed that 58.7% of those who had primary education were anaemic, followed by those who had secondary education (57%). This difference is however, not statistically significant. Those who had tertiary education had the least prevalence of anaemia (53%). This could be explained by the fact that, a limited education results in low literacy, lack of knowledge and awareness regarding health issues. There is no doubt that a person's level of education has a direct bearing on their health seeking behavior.

CHAPTER SIX

CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

The prevalence of anaemia was high (56.4%) among the pregnant women in this study. Assessment of anaemia during pregnancy is important, because it directly or indirectly contributes to the high Maternal and perinatal morbidity and mortality seen in Nigeria. It also affords one the opportunity to institute interventions to prevent complications especially when carried out at booking. Therefore, there is a need to identify the risk factors for anaemia.

Among other findings, the study showed that the lack of knowledge of anaemia was almost universal.

Highest prevalence of Anaemia (61.1%) was observed among the women in the age group 15-19years, followed by 20–30 years age group (56.3%) compared to the other age groups. In line with this, it can be concluded that prevalence of anaemia reduces significantly with increasing age of the woman at first pregnancy ("pregnancy too early").

Additional finding shows a strong correlation between parity and prevalence of anaemia, that the higher the parity, the greater the prevalence of anaemia ("pregnancy too many").

Prevalence of anaemia was higher among women who booked for ante-natal after the first trimester.

Another finding worthy of note here is the correlation between birth interval and prevalence of anaemia which showed that the prevalence of anaemia is inversely proportional to the birth interval.

From this study it can therefore, be concluded that the prevalence of Anaemia among pregnant women attending ANC in MCMG is high. It is highest among those within the Age 20-30years and also very high among the multiparous women. Factors contributing to this include Educational Status, Occupation, birth interval and parity.

Measures to improve and demonstrate maternal and child health (MCH) effectiveness through built-in evaluation procedures should thus go hand-in-hand with a drive to increase awareness of the need for iron supplements. Such an increased awareness will lead to an increased demand.

Ultimately, adherence with iron therapy at the user level is affected by interactions between policy, service system and user factors. As already mentioned, lack of awareness of the prevalence, health impact and economic cost of anaemia, and the efficacy of iron supplementation at all three levels (health policy makers, health care providers and among vulnerable groups within communities) are all significant problems.

6.2 Recommendations

In order to reduce the high Maternal and perinatal morbidity and mortality from anaemia seen in Nigeria, certain measures should be put in place by the government:

1. Public enlightenment campaigns should be embarked upon to sensitize the public on what anaemia is, its causes, risk factors and complications.

2. Health education and promotion, especially to encourage all pregnant women to book early for antenatal care and to take appropriate intervention measures. Information, Education and Communication (IEC) efforts should be directed towards increasing levels of awareness and commitment at all levels.
3. Strategies should be put in place to increase awareness on anaemia. These should include dissemination of information via antenatal and under-five clinics, public radio, and community development meetings conducted by extension workers.
4. Education of the girl-child should be made compulsory to avoid teenage and unplanned pregnancy. This can also help in delaying first pregnancy.
5. Distribution of iron tablets in communities targeted at adolescent girls and women after marriage and before conception, as well as in the inter-pregnancy period will prevent iron deficiency at the onset of a pregnancy.
6. Government should encourage women to delay the first pregnancy, and space successive pregnancies by improving the availability and provision of appropriate family planning devices.
7. Commonly consumed foods in this part of the country should be fortified with iron.
8. Ante-natal services, including routine drugs and tests should be free in all government hospitals.
9. All pregnant women should be intermittently screened for the presence of anaemia (e.g. at the booking visit, thereafter at 28 weeks and again at 36 weeks) instead of just at booking which is the practice in most health facilities.

10. Government should distribute free insecticide treated nets to all pregnant women who attend ANC and ensure they sleep under the nets.
11. Antihelminthic drugs should be given to pregnant women in their second trimester in addition to the iron supplements and antimalarial drugs routinely.

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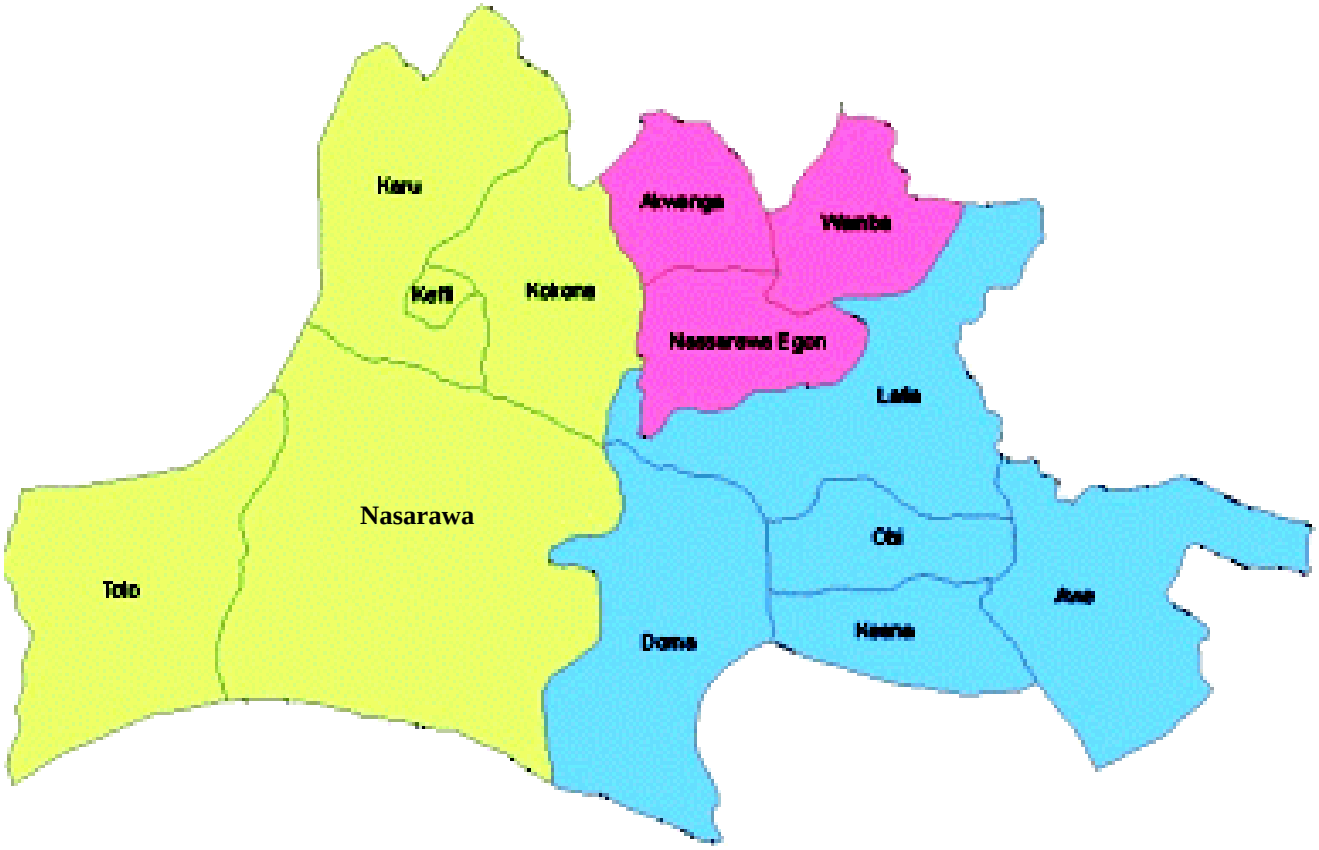
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APPENDICES

APPENDIX A



The Map of Nasarawa State

APPENDIX B

DEPARTMENT OF COMMUNITY MEDICINE
FACULTY OF MEDICINE
AHMADU BELLO UNIVERSITY, ZARIA

Questionnaire

I am a postgraduate student of the above university, and I am conducting a study on the Prevalence of anaemia in pregnancy among pregnant women attending ANC in Medical Centre Mararaba Gurku, Nasarawa State.
I would like to ask you some questions and I assure you that everything you say will be kept confidential and your identity will not be revealed to anyone, thank you.

A. Socio- demographic data

1. Age (yrs): [ ]
2. Married: Yes [ ] No [ ]
3. Ethnic group: ----------
4. Religion:
    a. Christianity [ ]
    b. Islam [ ]
    c. Others (specify): ----------
5. Occupation:
    a. Govt. worker [ ]
    b. Company worker [ ]
    c. Unemployed [ ]
    d. Self-employed [ ]
    e. Fulltime housewife [ ]
6. Educational Status:
    a. Primary [ ]
    b. Secondary [ ]
    c. Tertiary [ ]
    d. None [ ]
    e. Others (specify):----------
7. Husband's educational Status (if married):
    a. Primary [ ]
    b. Secondary [ ]
    c. Tertiary [ ]
    d. None [ ]
    e. Others (specify) ----------

8. Husband's occupation (if married): ----------

9. Family size: How many of you live under the same roof and eat from the same pot? ---

10. Average family income per month: ----------

11. How much money is made available for food per month? ----------

12. Is there any food you are forbidden from eating during pregnancy by your culture?
Yes [ ] No [ ]

13. If yes, can you mention at least 3: (i)
(ii)
(iii)

B. Obstetric data

Past Pregnancy

1. Parity (How many times have you given birth) ----------
2. Last child birth: ----------
3. Have you ever had an abortion or miscarriage before? Yes [ ] No [ ]
   If yes, how many times? ----------
4. Have you ever delivered a baby that was not alive? Yes [ ] No [ ]
   If yes, how many times? ----------
5. Did you have any vaginal bleeding during your last pregnancy? Yes [ ] No [ ]
6. Did you lose much blood after delivery in your last pregnancy? Yes [ ] No [ ]
7. Did you have any blood transfusion in your last pregnancy? Yes [ ] No [ ]
8. How old were you at your first pregnancy? ----------

Index Pregnancy

1. How old was this pregnancy when you first came to book at this ANC? -------
2. How old is this pregnancy? ----------
3. How many times have you attended ANC so far? ----------
4. In this pregnancy, have you experienced any of the following?
   a. Vaginal bleeding? Yes[ ] No[ ]
   b Have you had any blood transfusion in this pregnancy? Yes[ ] No[ ]
   c. Dizziness? Yes[ ] No[ ]
   d. Fainting? Yes[ ] No[ ]
   e. Getting tired after doing normal daily work? Yes[ ] No[ ]
5. Are you taking any of the following drugs?
   a. Fersolate Yes[ ] No[ ]
   b. Folic acid Yes[ ] No[ ]
   c. Antimalarial Yes[ ] No[ ]
   d. Native/Herbal drugs Yes[ ] No[ ]
6. How do you take the above drugs?
   a. Fersolate ----------
   b. Folic acid ----------

c. Antimalarial ----------

d. Native/Herbal drugs ----------

7. Do you for any reason refuse or stop taking these drugs? Yes[ ] No[ ]
   If yes, give reasons----------

C. Knowledge on anaemia

1. Have you ever heard about anaemia? Yes [ ] No [ ]
2. What is Anaemia?
   a. Shortage of blood [ ]
   b. Leaking of blood [ ]
   c. Too much blood [ ]
   d. Spiritual attack [ ]
   e. Others [ ]
3. What do you think is the cause of Anaemia?
   a. Malaria [ ]
   b. Sickle cell disease [ ]
   c. Urinary tract infection [ ]
   d. Malnutrition [ ]
   e. Spiritual [ ]
   f. Worms [ ]
   g. Others (specify): ----------

D. State of health and general wellbeing

1. How often do you eat the following?

	Always	Rarely	Never
a. Meat	[ ]	[ ]	[ ]
b. Poultry	[ ]	[ ]	[ ]
c. Fish	[ ]	[ ]	[ ]
d. Liver	[ ]	[ ]	[ ]
e. Eggs	[ ]	[ ]	[ ]
f. Beans	[ ]	[ ]	[ ]
g. Fruits	[ ]	[ ]	[ ]
h. Vegetables	[ ]	[ ]	[ ]
i. Milk	[ ]	[ ]	[ ]
j. Rice	[ ]	[ ]	[ ]
k. Yam	[ ]	[ ]	[ ]
l. Tuwo	[ ]	[ ]	[ ]
m. Eba	[ ]	[ ]	[ ]
n. Akpu/fufu	[ ]	[ ]	[ ]

2. Do you reheat your food? Yes [ ] No [ ]
3. Are you a sickle cell anaemia patient? Yes [ ] No [ ]

4. During this pregnancy, have you been treated for the following?
   a. Malaria: Yes[ ] No[ ]
   If yes, how many times? ----------
   b. Urinary tract infection:
   (i) Fever with discomfort/pain when urinating? Yes [ ] No [ ]
   (ii) Pains in your loin? Yes [ ] No [ ]
   c. Severe chest infection:
   (i) Disturbing cough? Yes [ ] No [ ]
   (ii) Chest pain? Yes [ ] No [ ]
   (iii) Breathlessness/ difficulty with breathing? Yes [ ] No[ ]

E. Investigations

1. PCV---------- %

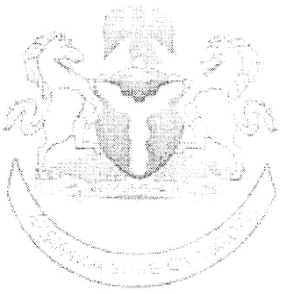
2. MPs ----------

APPENDIX C

ETHICAL CLEARANCE

NASARAWA STATE OF NIGERIA
MINISTRY OF HEALTH

In replying, please quote reference and date
All correspondence should be directed to the Commissioner



Ministry of Health Headquarters
Private Mail Bag 032
Lafia, Nasarawa State
*Telephone:*_____

S / MOH / 819 / 1

16th January, 2014

Dr. John, Doris Japhet
Ahmadu Bello University,
Zaria

PREVALENCE OF ANAEMIA AMONG PREGNANT WOMEN ATTENDING ANC AT MEDICAL CENTRE, MARARABA GURKU (MCMG), NASARAWA STATE, NIGERIA

Reference to your application of 4th February, 2014 on the above subject matter, I wish to convey the Ministry's approval of the provisional ethical clearance as your application is been processed for the final approval please.

Dr. Ekom G. Haruna
Ag Director Clinical Services
For: Honourable Commissioner