بسم الله الرحمن الرحيم

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Medicine Program

Research about:

Prevalence and Risk Factors Associated with Anemia among Pregnant Women Attending Ante-Natal Clinic at Soba University Hospital, Khartoum State, Sudan (2020-2021)

A thesis submitted for partial fulfillment of MBBS Degree in Medicine and Surgery Program

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MBBS , MPH, MD community medicine(1st part)

2021

Dedication

We dedicate this work to:

Our darling parents who are always supporting us and encouraging us to success. Our sisters and brothers who cooperated with us and gave us help and motivation. Our friends and colleagues who gave us the possibility of completing this thesis.

Everyone who has helped us to learn new things and to reach this level.

Acknowledgment

First of all our gratitude and thanks to our Almighty God, most gracious and most merciful, Who gave us the serenity, means of strength and patience to finish this work.

With grateful appreciation we acknowledge the effort of our supervisor **Dr. Hadeel** for his supervision, keen, unlimited patience, generous support and guidance.

We would like to express our gratitude and sincere thanks to all staff of Obstetrics and Gynecology in soba Teaching Hospital for their help during samples collection. Special thanks are extended to all staff of Primary Health Centre for their help and encouragement during samples analysis.

Also, we would like to thank all our subjects; the pregnant women who contributed to complete this research.

Finally, our deep gratitude goes to the members of Medical College in Napta for their motivation during this study.

Abstract

Introduction: *Anemia* is one of the most frequent complications related to pregnancy. Normal physiologic changes in pregnancy affect the hemoglobin (Hb), and there is a relative or absolute reduction in Hb concentration

Aim: to study the frequency and risk factor of *Anemia* among pregnant women attending Soba Hospital

Design: A descriptive, cross –sectional, Hospital based study was conducted among the pregnant women in the Ante-natal clinic at Soba University Hospital.

Results and conclusion: There was significant correlation between severity of *Anemia* and Taking furious compounds, Number of meals taken per day Number of deliveries of pregnant woman, vaginal bleeding during the pregnancy kidney problems during pregnancy and knowledge about the reasons of *Anemia* (p- value<0.05).

المستخلص

مقدمة :يعد فقر الدم من أكثر المضاعفات المرتبطة بالحمل شيوعًا .التغيرات الفسيولوجية الطبيعية أثناء الحمل تؤثر على الهيموجلوبين، وهناك انخفاض نسبي أو مطلق في تركيز الهيموجلوبين.
الهدف :دراسة تواتر وعوامل الخطورة لمرض فقر الدم بين الحوامل المترددات على مستشفى سوبا.
التصميم دراسة وصفية مقطعية بين النساء الحوامل في عيادة ما قبل الولادة في مستشفى سوبا الجامعي.
النتائج :وجود ارتباط معنوي بين شدة فقر الدم وتناول المركبات الغاضبة ، عدد الوجبات التي يتم تناولها في اليوم، عدد الولادات للمرأة الحامل ، النزيف المهبلي أثناء الحمل ، مشاكل الكلى أثناء الحمل ومعرفة أسباب فقر الدم(القيمة الاحتمالية < 0.05).

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List of abbreviations

Abbreviation	Full Name
PHC	Primary Health Centre
Hb	Hemoglobin
WHO	World Health Organization
IDA	Iron Deficiency *Anemia*
LDCs	Less Developed Countries
CBC	Complete Blood Count
gr	gram
GDP	Growth Domestic Product

Chapter one

Introduction

Chapter one

Introduction

1.1 Background:

Anemia is the most common nutritional deficiency disorder in the world, *Anemia* in pregnancy is defined as: a hemoglobin concentration below 11g/dl.[1] *Anemia* is a symptom of a wide variety of mild to serious diseases disorders and conditions. *Anemia* can result from nutritional deficiencies, trauma, hemorrhage, transfusion reaction, malabsorption, chronic diseases, inherited diseases, autoimmune diseases, malignancy, and treatments for malignancy, such as chemotherapy and radiation therapy. It is a major health problem in many developing countries. It is associated with increased rates of maternal mortality, and it has a significant impact on the health of the fetus such as preterm deliveries, low birth weights, perinatal mortality and morbidity, other adverse outcomes due to the impairment of oxygen delivery to placenta. Globally, *Anemia* affects 1.62 billion people (25%), among which 56 million are pregnant women. [1] 95.7% of whom live in developing countries, while in America and Europe the frequency is estimated at 24.1% and 25.1% respectively. Frequency of *Anemia* in South Asian countries in 2010 was 32.9% is among the highest in the world, resulting in 68.4 million with disability-adjusted life years (DALYs). [2]

In Africa, the frequency of *Anemia* in pregnancy is estimated to be between 35% and 75%, and with a high frequency and severity occurring among primigravida. The burden of disease is heavy so in Sub Saharan Africa *Anemia* poses a 5-fold increase in overall risk of maternal death related to pregnancy and delivery. [3]

1.2 Problem statement:

In Sudan; *Anemia* during pregnancy is a large health problem where pregnant women in different regions of Sudan are more susceptible to *Anemia*, irrespective of their age or parity. It is associated with poor maternal and

prenatal outcomes.[4] the maternal mortality ratio in Sudan was estimated at 750/100,000 live births. Sudan was one of eleven countries that are responsible for 65% of global maternal deaths according to a recent World Health Organization (WHO) estimate.[5] It is well known that the frequency of *Anemia* rises with increasing poverty level. The recent Sudan poverty assessment prepared by the World Bank and the Sudan government stated that overall 46.5% of the population was below the poverty line with a higher rate (57.6%) among the rural population.[4]

1. 3 Justification:

Anemia during pregnancy is a major health problem in Sudan, as It affect the poor segment of population and Sudan is one of the poorest counters in the world, it has serious effect on the mother, birth outcome and the GDP (Growth Domestic Product). This study will give a useful idea about the causes, prevention of *Anemia* and tools of controlling it through the advices and health education that is informing the pregnant woman, this will help in reducing the burden of the disease, as perception is a major driver for people attitude towards the intervention.

1.4 Objectives of the study:

1.4.1 General Objectives:

To study the frequency and risk factor of *Anemia* among pregnant women attending Soba Hospital.

1.4.2 Specific Objectives:

- To calculate the frequency of *Anemia* among pregnant women attending ANC.
- To determine the relationship between *Anemia* and the following factors: nutritional status, socio demographic, economic characteristics of pregnant women, maternal and obstetrical history, taking iron supplementation, eating habits, and some diseases.

Chapter two

Literature Review

Chapter two

Literature Review

2.1 Physiologic Background:

The plasma volume starts to increase at about 6 weeks of pregnancy in a healthy woman. This increase, which is disproportionately greater than the corresponding changes on the red cell mass, accounts for the physiologic fall in the Hb concentration during pregnancy. As a consequence, there is a significant reduction in arteriovenous oxygen extraction at the heart and an important increase of the oxygencarrying capacity of the pregnant woman, despite the fall in the Hb level. (6)

The increase in plasma volume is about 1,250 ml at term, a total increase of about 48% above the non-pregnant state. This is the result of an initial rapid rise, followed by a slower rise after the 30th week of pregnancy. Several studies demonstrate the positive correlation between the weight of the newborn and the increase in the plasma volume.1.5–8 It seems that the increase in plasma volume is an indication of normal growth of the fetus and one of the hallmarks of a successful pregnancy. As regards the red cell mass, it also increases although, in contrast to the plasma volume, it does so more slowly. The total increase is about 18% or 250 ml at term. After stimulation with iron supplements, however, the red cell mass may reach 400 ml—a total increase of about 30% compared with the nonpregnant state. Similar to the plasma volume, the increased red cell mass is linked to fetal growth, although probably to a lesser degree. (7)

2.2 Common types of *Anemia* during pregnancy:

2.2.1 *Anemia* of pregnancy:

In pregnancy, a woman's body makes extra blood. This causes the concentration of red blood cells in her body to become diluted. This is sometimes called *Anemia* of pregnancy.(8) .*Anemia* in pregnancy may be relative or absolute, relative *Anemia* is a normal physiological phenomenon that occurs

in pregnancy due to larger increase in plasma volume (approximately 45.0% in singleton and 50.0–60.0% in twin gestation) than in red cell mass, resulting in the well-known physiological *Anemia* of pregnancy. Absolute *Anemia* involves a true decrease in red cell mass, involving increased red cell destruction as in haemoglobinopathy, malaria, and bacterial infection like urinary tract infection, increased red cell loss as in bleeding or decreased red cell production as in nutritional deficiency or chronic disease.[2]

2.2.2 Iron deficiency *Anemia* :

Is the most common type of *Anemia* during pregnancy, It is the lack of iron in the blood, which is necessary to make hemoglobin, the part of blood that distributes oxygen from the lungs to tissues in the body.[9] The World Health Organization (WHO) defines iron deficiency *Anemia* (IDA) as *Anemia* accompanied by depleted iron stores and signs of a compromised supply of iron to the tissues.[10] The baby uses the red blood cells for growth and development. If the pregnant woman stored an extra red blood cells in her bone marrow before she get pregnant, she can use that during pregnancy to help meet the baby's needs. Women who do not have adequate iron stores can develop iron deficiency *Anemia*. Good nutrition before becoming pregnant is important to help build up these stores and prevent iron deficiency *Anemia*.[11] Iron deficiency affects more people than any other condition, constituting a public health condition of epidemic proportions.[12] Iron deficiency and *Anemia* reduce the work capacity of individuals and entire populations, bringing serious economic consequences and obstacles to national development. It reduces the cognitive function. [13]

Iron deficiency is the only nutrient deficiency which is also significantly prevalent in industrialized countries. The numbers are staggering: 2 billion people – over 30% of the world`s population – are iron deficiency anemic.[3] Africa carries a high burden of *Anemia* with a frequency of 65.8 % among pregnant women, and in resource-poor areas, this is frequently exacerbated by

infectious diseases, Malaria, HIV/AIDS, hookworm infections, schistosomiasis, and other infections such as tuberculosis are particularly important factors contributing to the high frequency of *Anemia*.[14] The WHO/World Bank has ranked iron deficiency *Anemia* as the third leading cause of disability-adjusted life years (DALYs) lost for females 15–44 years of age. For men in this age group, iron deficiency *Anemia* was ranked among the top 10 disease burdens.[2] Poverty is one of the risk factors for iron deficiency in pregnant women.[14]

Women and young children in less developed countries (LDCs), are the most seriously affected group particular, in parts of the world where iron fortification Programs are not in effect.[15] Among women, iron deficiency occurs at a higher frequency than in men due to menstrual iron losses and the extreme iron demands of a growing fetus during pregnancy, which are approximately two times the demands in the no pregnant state. The growing fetus requires a large supply of Iron taken up from maternal blood via transferrin-receptor mediated endocytosis.[16] Once maternal iron stores are depleted, she becomes anemic and transfer of iron to the developing fetus is compromised.[17]

2.2.3 The effects of iron and folic acid on birth outcomes:

Iron has been identified as a key growth factor for the developing fetus[18] it leads to improvements in birth weight or length of gestation when iron supplementation taken during pregnancy. Studies conducted among severe maternal *Anemia* (Hb <8.0 g/dL) found that a birth weight values of 200–400 grams lower than in women with normal Hb levelsIn addition, two more recent randomized controlled trials found that iron supplementation led to improved mean birth weight and decreased risk of low birth weight.[19] Folic acid is necessary for cell growth and repair and essential for the formation and maturation of red blood cells. Deficiency of folate leads to slowing of DNA synthesis. IDA is associated with increased maternal and perinatal morbidity and mortality.[1]

2.2.4 Vitamin B12 deficiency *Anemia* :

Other micronutrients like Vitamin B-12, Folic acid and Zinc deficiencies have also been associated with *Anemia* in pregnancy[20] leading to a combination of both microcytic and megaloblastic *Anemia*. Vitamin B12 is important in forming red blood cells and in protein synthesis. Eating food that comes from animals, such as milk, eggs, meats, and poultry, can prevent vitamin B12 deficiency. Women who don't eat any foods that come from animals (vegan) are most likely to get vitaminB12defeciency they are liable to have a baby with certain birth defects of the brain and spinal cord (spina pevida) .[17]

2.2.5 Folate deficiency *Anemia* :

Folate, also called folic acid, is a B-vitamin that works with iron to help with cell growth. If the pregnant women don’t get enough folate during pregnancy, she could get iron deficiency. Folate help in reducing the risk of having a baby with certain birth defects of the brain and spinal cord if taken before conception and in early pregnancy.[21]

2.2.6 Effects of *Anemia* in pregnancy:

Anemia increases perinatal risks for mothers and neonates; and increases overall infant mortality. The odds for fetal growth restriction and low birth weight are tripled. The odds for preterm delivery are more than doubled. Even a moderate hemorrhage in an anemic pregnant woman can be fatal.[22]

2.2.7 Effects of *Anemia* on fetus and neonate

A basic principle of fetal/neonatal iron biology is that iron is prioritized to red blood cells at the expense of other tissues, including brain. When iron supply does not meet iron demand, the fetal brain may be at risk even if the infant is not anemic.[23] Although dietary deficiency may be contributory, the etiology of the vast majority of cases of iron deficiency *Anemia* in infancy and childhood is maternal iron deficiency *Anemia* in pregnancy. *Anemia* adversely affects cognitive performance, behavior and physical growth of infants, preschool and school-aged children. *Anemia* depresses the immune status and increases the

morbidity from infections in all age groups. It adversely impacts the use of energy sources by muscles and thus the physical capacity and work. *Anemia* continuous to be a major health problem in many developing countries and is associated with increased rates of maternal and prenatal mortality, premature delivery, low birth weight, and other adverse outcomes.(1)

In pregnancy, *Anemia* has a significant impact on the health of the fetus as well as that of the mother. 20% of maternal deaths in Africa have been attributed to *Anemia*. Fetuses are at risk of preterm deliveries, low birth weights, morbidity and perinatal mortality due to the impairment of oxygen delivery to placenta and fetus.(24)

Anemia in pregnancy leads to maternal and fetal morbidity and mortality such as puerperal infections, preterm labor, poor weight gain, postpartum *Anemia* hemorrhage, prematurity, low birth weight, pre term delivery, fetal cognitive impairment and poor APGAR scores and even infant deaths. Being anemic also burdens the mother by increasing the risk of blood loss during labor and making it more difficult to fight infections.(25) *Anemia* during the first two trimesters, leads to greater risk for having a pre-term delivery or low-birth-weight baby.(10)

2.2.8 Signs and symptoms of *Anemia* :

The most important element of red blood cells is called hemoglobin. Hemoglobin is a protein that carries vital oxygen from the lungs through the bloodstream to the cells, tissues and organs of the body. Many symptoms of *Anemia* are due to a decreased amount of hemoglobin in the blood. These symptoms can include dizziness, shortness of breath, weakness, palpitations, fatigue, and fainting spells, hypotension and pallor or pale skin, lips, nails, palms of hands, or underside of the eyelids, are also common symptoms.(2)

2.3 Causes of *Anemia* in pregnancy:

The common causes of *Anemia* include parasitic infestations such as malaria and hookworm, schistosomiasis, infections like HIV and hemoglobinopathies,

Anemia can be due to other diseases such as malaria, which can cause hemolytic *Anemia*, and increase the risk for still birth.[20]

In many developing countries, the physiologic changes that occur during pregnancy can be aggravated by under nutrition, leading to micronutrient deficiency states, such as *Anemia*, that can have disastrous consequences for both mothers and newborn infants.[14]

The body goes through significant changes when a woman becomes pregnant. The amount of blood in the body increases by about 20- 30 percent, which increases the supply of iron and vitamins that the body needs to make hemoglobin. Hemoglobin is the protein in red blood cells that carries oxygen to other cells in the body.[1]

Many women lack the sufficient amount of iron needed for the second and third trimesters. When the body needs more iron than it has available, the woman can become anemic. In pregnancy, when the volume of blood in the body increases by almost 50 percent to support both the pregnant woman and the growing baby. This, in turn, decreases the bloods' hemoglobin concentration. Since the body needs iron to make hemoglobin, without sufficient iron stores, red blood-cell production slows, along with their energy-boosting oxygen supply.[18]

Anemia in pregnancy may be relative or absolute. Relative *Anemia* is a normal physiological phenomenon that occurs in pregnancy due to larger increase in plasma volume (approximately 45.0% in singleton and 50.0–60.0% in twin gestation) than in red cell mass, resulting in the well-known physiological *Anemia* of pregnancy. Absolute *Anemia* involves a true decrease in red cell mass, involving increased red cell destruction as in haemoglobinopathy, malaria, and bacterial infection like urinary tract infection; increased red cell loss as in bleeding; or decreased red cell production as in nutritional deficiency or chronic disease.[26] The most common causes of *Anemia* in pregnancy worldwide is iron deficiency, the predisposing factors include low social-

economic status, Infectious diseases eg: malaria, and inadequate child spacing.[27]

Broadly, causes of *Anemia* may be classified as impaired red blood cell (RBC) production, such as in vitamin B12 deficiency, increased RBC destruction as in hemolytic *Anemia* and sickle cell disease, *Anemia* can also occur when there is a deficiency of hemoglobin in the red blood cells, such as in iron deficiency *Anemia* and thalassemia. Any disease, disorder or condition that causes heavy bleeding (hemorrhage) can also cause *Anemia*, these can include postpartum hemorrhage, postoperative hemorrhage, gastrointestinal bleeding, peptic ulcer, colorectal cancer, ulcerative colitis, ruptured aneurysm, and trauma that causes hemorrhage, and *Anemia* can be due to fluid overload (hypervolemia). Several of these may interplay to cause *Anemia* eventually. Indeed, the most common cause of *Anemia* is blood loss, but this usually does not cause any lasting symptoms unless a relatively impaired RBC production develops, in turn most commonly by iron deficiency.[2]

2.4 Risk factors behind *Anemia* during pregnancy:

Factors that put women at risk of acquiring *Anemia* in pregnancy include twin or multiple pregnancy spacing between two pregnancies is short and heavy menstrual flow before pregnancy due to either fibroids or abnormal uterine bleeding. When the pregnant woman is vomiting frequently due to morning sickness, or if she does not take enough iron in her food, and if has a heavy pre-pregnancy menstrual flow, or if she has an intestinal problem that can affect the absorption of iron. Other risk factors for *Anemia* included older maternal age, low educational level (illiteracy), farming occupation, low socioeconomic status, mild pregnancy-induced hypertension (PIH) and severe PIH. Also rate of *Anemia* was higher among those who do not practice any form of family planning and those with increased parity.[1] Young primigravidas also have a higher risk of *Anemia* in pregnancy due to their age and more often than not poor nutritional status. *Anemia* in pregnancy is also affected by comorbidities,

and *Anemia* was more prevalent and severe among the HIV positive mothers.[28] The predisposing factors include grand multi-parity, and malaria.[15]

2.5. Contributory factors behind *Anemia*:

2.5.1 Age:

One of predisposing factors of *Anemia* is age of pregnant women. The young pregnant woman (less than 24 years) is more susceptible to develop *Anemia*.[29]

2.5.2 Education:

The effect of educational level on frequency of IDA among pregnant women showed that the less educated (the no formal and primary education group) had higher frequency of IDA than those with secondary and post-secondary education. The less likely to maintain proper hygiene and sanitation and so are susceptible to infections.[29]

2.5.3 Economic status:

Studies have shown that iron deficiency *Anemia* affect the poor segment of population, and it affect the productivity of workers. For example, anemic tea pickers in sir-lanka are more tired and week than their non-anemic colleague.[1] Indonesian researchers analyzed anemic women and found that they carried out less house hold work and were less productive in non-physically strenuous factory work.[18] According to the World health Organization (WHO), iron deficiency has been one of the most expensive diseases in the world to less productivity. Scientists analyzing the economic consequences of iron deficiency cost developing countries an average 0.6 percent of their growth domestic products (GDP) .[30]

When the damage of children's intellectual development due to iron deficiency *Anemia* is added, the figure raises to 4 percent of GDP. And raise national productivity levels as much as 20 percent.[15][30]

2.5.4 Nutritional status:

Among the nutrition factors contributing to *Anemia*, the most one is iron deficiency. It is due to a diet that is monotonous, but in substances (phytates)

inhabiting iron absorption so that dietary iron cannot be utilized by the body.[31] Iron deficiency may also be aggravated by poor nutritional status, especially when it is associated with deficiency in folic acid, vitamin A or B12, and its frequency is high among the population living in developing countries.[32]

2.5.5 Inter pregnancy spacing:

Regarding the effect of child spacing on the frequency of IDA among pregnant women with child spacing of less than 1 year 1-1.5 year had significantly lower mean HB and higher frequency of *Anemia* than those with child spacing was found not to have any effect of the incidence of PEM among these pregnant women it is therefore seem that the negative effects on nutritional status of frequent cycles of pregnancy and location are more pronounced with regard to iron status than energy status.[1]

2.5.6 Bleeding:

Bleeding can be short term or persist other time. It can be caused by heavy menstrual period, bleeding from digestive or urinary tract, surgery, trauma, or cancer if bleeding significant, body can loss enough RBCs to cause *Anemia*.[33]

2.5.7 Family size:

The most important biological cause of *Anemia* is malaria and intestinal worms, biological related factors include education, house hold size, income, age, parity, birth and spacing of pregnancy. The more the family size the more increased risk of *Anemia*.[2]

2.5.8 Other diseases:

In poor resources areas, some infectious diseases, Malaria, HIV/AIDS, hookworm infections, schistosomiasis, and tuberculosis are particularly important factors contributing to the high frequency of *Anemia*.[34] *Anemia* can result from some diseases, and it can make other diseases worse. For example, some cancer treatments may damage the bone marrow that makes the red blood cells or damage this cells ability to carry oxygen. This makes the cancer patient weaker and less able to absorb iron.[35] It is estimated that malaria is responsible

for1.2 million Deaths and 2.9% of total DALYs from in low and Middle income population.[1]

2.5.9 *Anemia* and water related infections:

With regard to infection malaria is another major cause of *Anemia* it affects 300-500 million people, and in endemic areas it may be the primary cause of all severe *Anemia* cases.[2] Hookworms infection and in some place schostosmiasis also contribute to *Anemia*. Approximately 44 million pregnant women have Hookworms infection and 20 million people are infected with schostosmiasis. *Anemia* can also be due to excessive blood loss, such as gastrointestinal infection associated with diarrhea. The most important water-related cause of *Anemia* is diarrhea, water-born or water - related infection, *Anemia* effect half of preschool children and pregnant women and at least 30% to 40% in industrial countries in poorer malaria endemic countries, *Anemia* is one of the commonest preventable causes of death in children and pregnant women.[22][36]

2.6 Diagnosis of *Anemia* :

Anemia can be diagnosed with a complete blood count (CBC). A complete blood count can determine the amount of hemoglobin carried in the red blood cells and the number, size, hap, and color of the red blood cells,.because, in iron deficiency *Anemia*, red blood cells are smaller and paler in color than normal. In vitamin deficiency *Anemia*, red blood cells are enlarged and fewer in number [37] the levels of the red blood cells contained in the blood (hematocrit), normal adult hematocrit values are between 38.8 and 50 percent for men and 34.9 and 44.5 percent for women, normal adult hemoglobin values are generally 13.5 to 17.5 grams per deciliter for men and 12 to 15.5 grams per deciliter for women.[12]

Making a diagnosis also includes performing a variety of other tests to help to diagnose the underlying disease, condition or disorder causing *Anemia*. This may include a blood test that measures ferritin, a test for vitamin B12 deficiency and tests to determine if a person has sickle cell trait or thalassemia trait.[37]

The normal ranges for hemoglobin depend on the age and, beginning in adolescence, the gender. For example, the normal ranges of hemoglobin's are: Newborns 17 to 22 gm. /dl, Babies 1 week of age 15 to 20 gm. /dl, Babies 1 month of age 11 to 15 gm/dl, Children 11 to 13 gm. /dl, Adult men 14 to 18 gm. /dl, Adult women 12 to 16 gm. /dl, Men after middle age 12.4 to 14.9 gm. /dl, Women after middle age 11.7 to 13.8 gm. /dl.[12]

2.7 Prevention of *Anemia* during pregnancy:

Pre-pregnancy counseling, dietary advice and therapy are very important for ensuring best pregnancy outcomes. It is recommended that full blood count should be checked at the booking visit in pregnancy and repeated at 28 weeks to screen for *Anemia*. In high risk mothers and multiple pregnancies, an additional hemoglobin check should be performed near term. Dietary advice should be given to all mothers to improve intake and absorption of iron from food.[15]

To prevent *Anemia* the pregnant woman should eat food with a rich sources of iron this include, meats. Beef, lamb, liver, poultry. Chicken, duck, turkey, liver (especially dark meat), fish, egg yolk, leafy greens of the cabbage family. these include broccoli, kale, turnip greens, and collard, legumes, green peas, dry beans and peas, such as pinto beans, black-eyed peas, and canned baked beans, yeast-leavened whole-wheat bread and rolls, iron-enriched white bread, dry fruits, dark green leafy vegetables (spinach), lentils, pasta, rice, and cereals.[31]

Using cast iron utensils for cooking and taking iron with vitamin C (orange juice) can improve its intake and absorption. Certain foods which may inhibit iron absorption should not be taken with iron rich foods. These include polyphones (in certain vegetables, coffee), tannins (in tea), phytates (in bran) and calcium (in dairy products). Weekly iron (60 mg) and folic acid (2.8 mg) should be given to all menstruating women including adolescents, periodically, in communities where IDA is considered a problem.[24]

Increased intake of iron, treatment of underlying conditions like anti-helminthes therapy are important preventive measures. Pregnant women need iron to cover

their basic losses, increased RBC mass and demand from fetoplacental unit. Vitamin B12 and foliate deficiencies in pregnancy are rare and may be a result of inadequate dietary intake with the latter being more common. These vitamins play an important role in embryogenesis and hence any relative deficiencies may result in congenital abnormalities. Finding the underlying cause is crucial to the management of these deficiencies. From a neonatal perspective, delayed clamping of the umbilical cord at delivery (by 1–2 min) is important step in prevention of neonatal *Anemia*.[19]

In areas where malaria is endemic, intermittent preventive treatment with effective antimalarial and the distribution of insecticide-treated bed nets need to become implemented on a large scale.[1] Other preventive measures include ensuring comprehensive obstetric and social history at the antenatal clinic, proper dietary counseling on proper sources of iron available to the community, family planning services encouraging at least three year intervals and discouraging eating of soil during pregnancy.[18] Taking iron supplements is recommended in addition to consuming these foods. Foods that are high in vitamin C can actually help the body absorb more iron, so it is beneficial to make these additions as well. Vitamin C rich foods like citrus fruits and juices, oranges, strawberries, kiwis, tomatoes, Bell peppers.[30]

Good pre-pregnancy nutrition not only helps prevent *Anemia*, but also helps build other nutritional stores in the mother's body, eating a healthy and balanced diet before and during pregnancy helps keep up the levels of iron and other important nutrients needed for the pregnant health and that of the growing baby.[38]

Vitamin supplements containing at least 400 micrograms of folic acid are recommended for all women of childbearing age and during pregnancy. Food sources of foliate include, leafy, dark green vegetables, dried beans and peas, citrus fruits and juices and most berries, fortified breakfast cereals, and enriched grain products.[33]

In order to absorb as much of the iron as possible, it's best to take your iron pills on an empty stomach. Wash them down with water or orange juice (the vitamin C helps with absorption), but not with milk (calcium interferes with absorption). Coffee and tea also hinder absorption of iron. Pre-pregnancy counseling, dietary advice and therapy are very important for ensuring best pregnancy outcomes.[12]

Malaria prevention is important in part in preventing *Anemia* through control of malaria and haematinics supplementation.[11] All pregnant women receive routine daily supplementation of elemental iron and folic acid. Protection against malaria is usually achieved through the use of insecticide treated bed nets, intermittent preventive treatment of asymptomatic pregnant women, and early diagnosis and prompt and effective case management of malaria. Other interventions include HIV screening and management, health education on diet, cooking, and early diagnosis and treatment of *Anemia* which depends on the severity and its cause as well as the gestational age of the patient.[21]

2.8 Treatment of *Anemia* during pregnancy:

Oral ferrous sulphate 200 mg 2–3 times daily (each tablet provides 60 mg elemental iron) is the most common preparation used. Alternative preparations include ferrous gluconate and ferrous fumarate. In the first week following initiation of iron therapy, there is often no rise in hemoglobin level but reticulocytosis is observed.[33] Hemoglobin level usually starts rising in the second week and the expected improvement in hemoglobin is approximately 1 g/dL per week. Common adverse effects of iron therapy include nausea, constipation and occasionally diarrhea (reduced by taking tablets after meals).[12]

Parenteral iron is required for those not tolerating oral iron or who need rapid correction of *Anemia* (severe *Anemia* in last month of pregnancy) and where oral therapy has failed. Parenteral iron can be administered intramuscular (IM) or intravenous (IV). The main drawbacks of IM route are pain, staining of skin, myalgia, arthralgia and injection abscess. Intravenous iron can be administered

as total dose infusion; however, utmost caution is needed as anaphylaxis can occur. Iron dextran and iron polymaltose preparations can be used by both IM and IV routes.[12] (Blaragan, 2011).

Two newer IV preparations – iron sucrose and ferric gluconate are associated with reduced side-effects. Each iron sucrose ampoule contains iron sucrose equivalent to 50 mg elemental iron. Iron sucrose may be administered undiluted by slow intravenous injection at a rate of 1 mL (20 mg iron) solution per minute not exceeding 100 mg iron per injection, it may also be administered by IV infusion. Infusion must be administered as every 2.5mL iron sucrose diluted exclusively in a maximum of 100 mL of 0.9% NaCl (saline), immediately prior to infusion. The solution must be infused at a rate of 100 mg/15 minutes. Unused diluted solution must be discarded.[12] (Salhan, et al 2012).

Blood transfusion should be considered when a patient has decompensated owing to a drop in hemoglobin concentration and needs a more rapid rise in hemoglobin. Packed red cell transfusion may be indicated for pregnant women with severe *Anemia* (Hb of 6 g/dL or less) close to due date or less than 8 g/dL if they have increased risk of blood loss at delivery.[18] (Elzahrani,2012).

Correction of *Anemia* in pregnancy can be achieved either with haematinics or by blood transfusion.[3]

2.8.1 Management during labor:

Cross-matched blood should be available if needed in case of significant hemorrhage at the time of delivery. Strict asepsis is very important. In case of severe *Anemia* with congestive cardiac failure, active management of third stage (with methyl ergometrine) is contraindicated.[2]

2.8.2 Postpartum management:

Close monitoring should be performed for signs of decomposition, infection or thrombosis. Appropriate thromboprophylaxis and contraceptive advice should be provided and hematinic supplementation should continue.[15]

2.8.3 Recent advances in treatment of *Anemia* are:

Erythropoietin is the new agent used in treatment of *Anemia* in following situations: Erythropoietin deficient *Anemia*, severe or progressing iron-deficiency *Anemia*, Jehovah's Witnesses or other refusal of blood transfusion, placenta previa (or placenta accrete), preoperative and postoperative patients, autologous blood donation, hemoglobinopathies. Erythropoietin is gaining popularity as a therapeutic option during pregnancy and the postpartum period.[(2)]

2.9 Previous studies:

Study carried by Gebre (2015). To study the Frequency of *Anemia* in pregnancy In Ethiopia, was found to be 41.9% with urban areas having a frequency of 35.9% compared to rural population 56.8 %. *Anemia* in pregnancy leads to maternal and fetal morbidity and mortality such as puerperal infections, preterm labor, poor weight gain, postpartum *Anemia*, hemorrhage, prematurity, low birth weight, pre term delivery, fetal cognitive impairment and poor APGAR scores and even infant deaths. Being anemic also burdens the mother by increasing the risk of blood loss during labor and making it more difficult to fight infections.[39]

Study carried by Akhtar, et al (2012) represent the frequency of *Anemia* in pregnancy in Eastern Uganda was 46%. Anemia is a common problem in most developing countries and a major cause of morbidity and mortality especially in malaria endemic areas. 20% of maternal deaths in Africa have been attributed to *Anemia*.[13]

Study carried by (Grantham, 2008)*Anemia* affect a half of preschool children and pregnant women and at least 30% to 40% in industrial countries in poorer malaria endemic countries. The frequency among pregnant women was 52%. *Anemia* is one of the commonest preventable causes of death in children and pregnant women.[40]

In 1993 the World Bank rated *Anemia* as the eighth leading cause of disease in young girls and women in the developing world, the average frequency of *Anemia* in the world is 41.8%.[1]

Study carried by Elzaharani, et al(2012) frequency of *Anemia* about 56.7% among pregnant women I India.[18]

Study carried by Adinma et al, (2002)Frequency of *Anemia* in pregnancy in Nigeria is between (30-40%).[41]

Study carried by Mayaer, (2009) out on selected countries in South Eastern Africa showed a frequency of 58%, 76%, 75.6% and 74.4 in Mozambique, Rural Zaire, Coastal Kenya and Tanzania respectively.[42]

Study carried by Van den, et al (2000) in Malawi, on the urban population on women attending antenatal clinic at St. Elizabeth Hospital in Blantyre, the frequency was 57.1%.[34]

Study carried by Okube, (2016). In Kenya, to assess the frequency of *Anemia* among pregnant, conducted in kakamega put frequency of *Anemia* in pregnancy at 25.7%. Another study conducted in Kericho District had frequency of *Anemia* in pregnancy at 24.5%. While almost 70% of pregnant women in Kenya were moderately anemic. This is despite routine supplementation with iron for all pregnant women attending antenatal clinics.[39]

Study carried by Friday, et al (2004). Which is a Perspective study in severe *Anemia* in pregnancy that was done in Kisumu District and it studied frequency and risk factors of the respondents who developed obstetric complications, 22% were found to be anemic. Poor pregnancy care, illness during pregnancy, socioeconomic conditions of mother and sanitary conditions of the household among other things also significantly increased frequency of *Anemia* in this subjects.[44]

Study carried by (Ogunbode,2003) in Kilifi District, 10% of women booked for antenatal care had severe *Anemia* (Hb<7g/dl) with 76% having Hb, 11g/dl and the main causes of *Anemia* were reported as iron deficiency often exacerbated by hookworm infestation, malaria, folate deficiency and HIV infection.[39]

Study carried by Mohamed, (2006) in Sudan showed frequency of *Anemia* as 67%, this high frequency of *Anemia* in this study is therefore not surprising as Sudan is one of the poorest countries in the world. The recent Sudan poverty assessment prepared by the World Bank and the Sudan government stated that overall 46.5% of the population was below the poverty line with a higher rate (57.6%) among the rural population.[45]

Study carried by Adam et al (2011) in Kasalla Eastern Sudan showed that the frequency is (36.2%).[4]

Study carried by Haidar (2010)In Ethiopia, overall frequency of *Anemia* was found to be 41.9%.[15]

Study carried by Vivek, et al(2012) showed that *Anemia* 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, *Anemia* has a significant impact on the health of the fetus as well as that of the mother. 20% of maternal deaths in Africa have been attributed to *Anemia*.[30]

Study carried by (Grantham, 2008) showed that *Anemia* affect a half of preschool children and pregnant women and at least 30% to 40% in industrial countries in poorer malaria endemic countries, *Anemia* is one of the commonest preventable causes of death in children and pregnant women.[40]

Study carried by Koh, et al (2013) represent about half of the global maternal deaths due to *Anemia* occur in South Asian where *Anemia* frequency is 46.9%, resulting in 68.4 million years lived with disability (YLD) .[19]

Chapter three

Methodology

Chapter three

Methodology

3.1 Study design:

A descriptive, cross –sectional, Hospital based study was conducted among the pregnant women at Soba Hospital with objective to study the frequency of Anemia among the pregnant women, and to relate it to socio demographic factor.

3.2 Study area:

soba Hospital Khartoum State.

3.3 Study Populations and duration:

The study participants were pregnant women at ANC, during period from August to November 2021.

3.4 Sample size:

The study will conduct on 100 pregnant women .

3.5 Data collection:

Interviewer administered questionnaire will be used to collect the stated objectives of the study. The sample will be taken from the first 30 booked pregnant women in Soba hospital during the period of the study. Data will be obtained with respect to age, socioeconomic status, number of meals per day, HB concentration, some diseases that can cause Anemia e.g. malaria, number of pregnancies and other variables that can affect in causing Anemia. HB concentration is determined by the antenatal laboratory with laboratory scientist using the colorimetric method.

3.6 Data Statistical analysis:

The questionnaire data will be checked and cleaned for completeness and consistency. Statistical analysis will be performed using the Statistical Package for Social Sciences (SPSS) software version 26.

3.7 Ethical Considerations:

Each pregnant woman was told about the research importance during the interview and all of them were agreed to participate in this study.

Chapter Four
Results & Analysis

Chapter Four
Results & Analysis

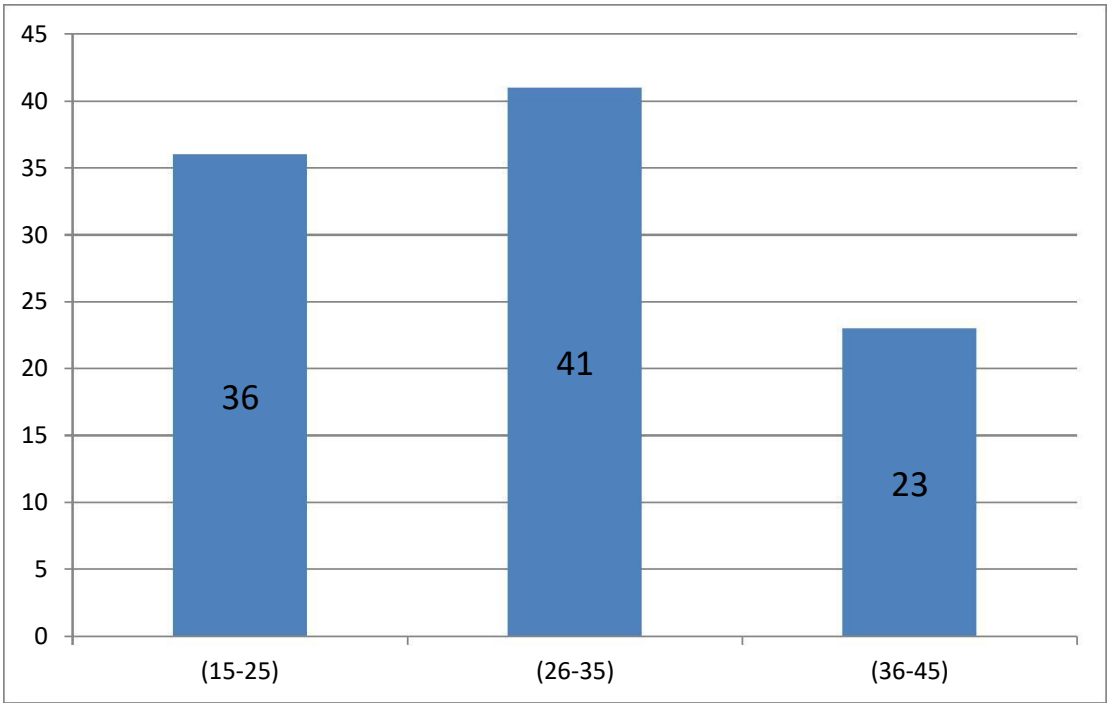

Figure (4.1): Shows frequency distribution of pregnant woman age

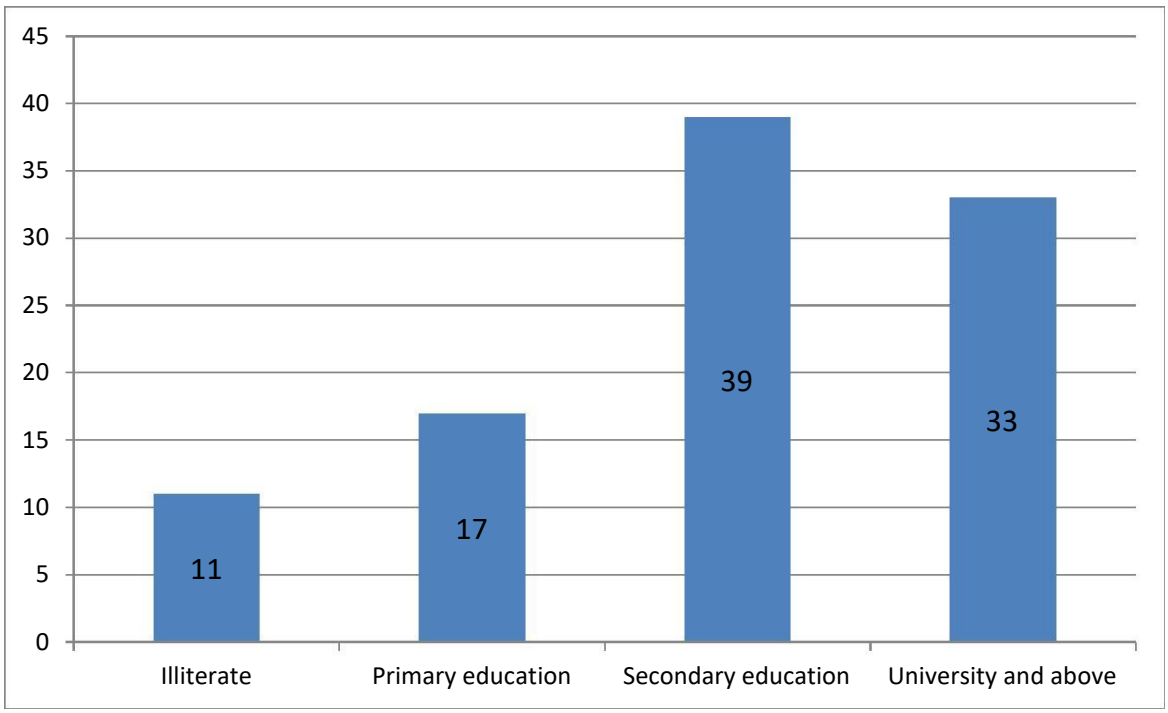

Figure (4.2): Shows frequency distribution of pregnant woman educational level

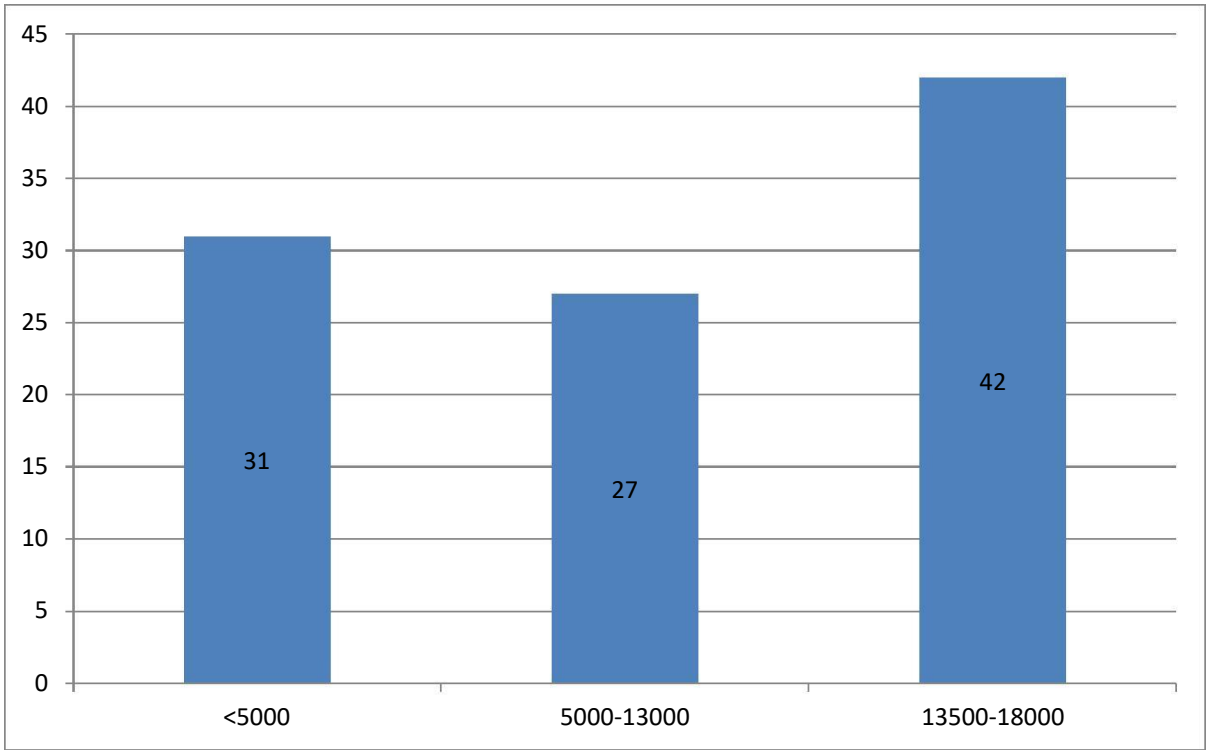

Figure (4.3): Shows frequency distribution of pregnant woman family monthly income

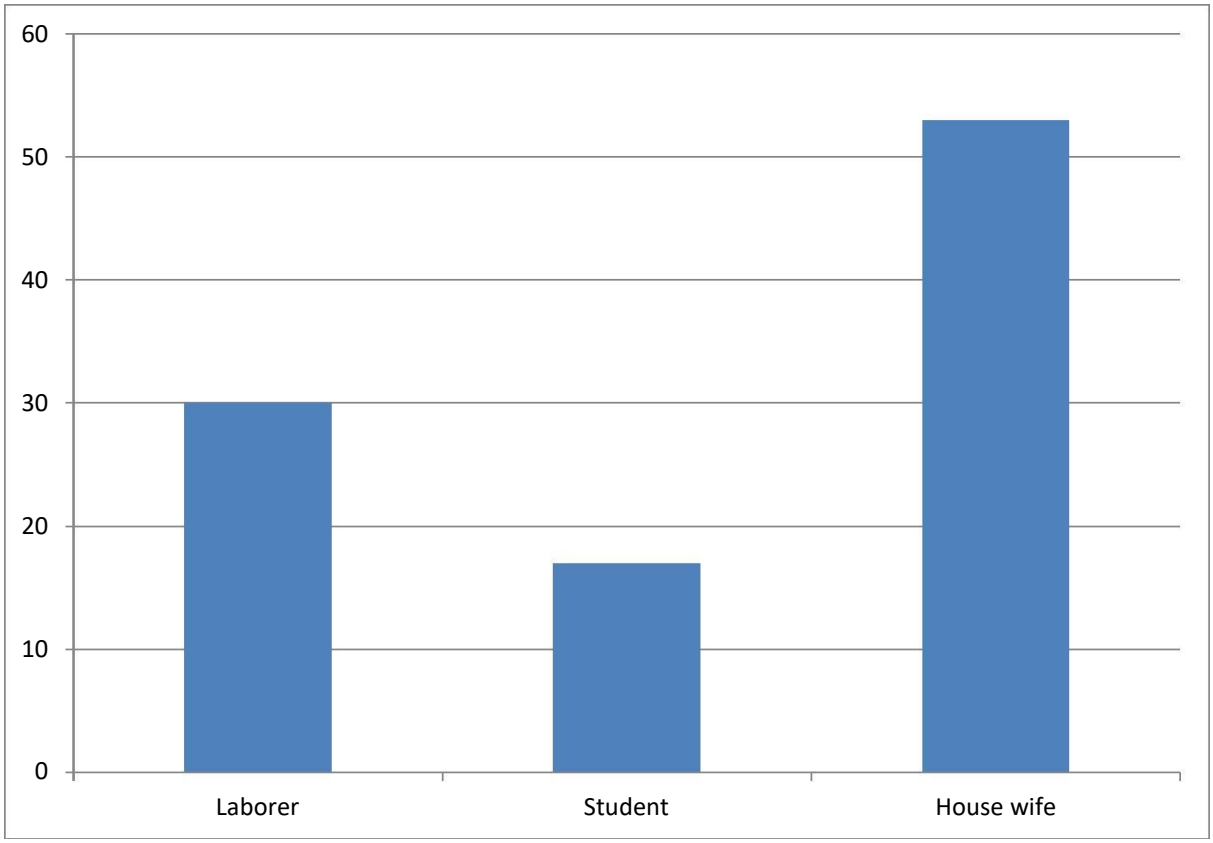

Figure (4.4): Shows frequency distribution of pregnant woman occupation

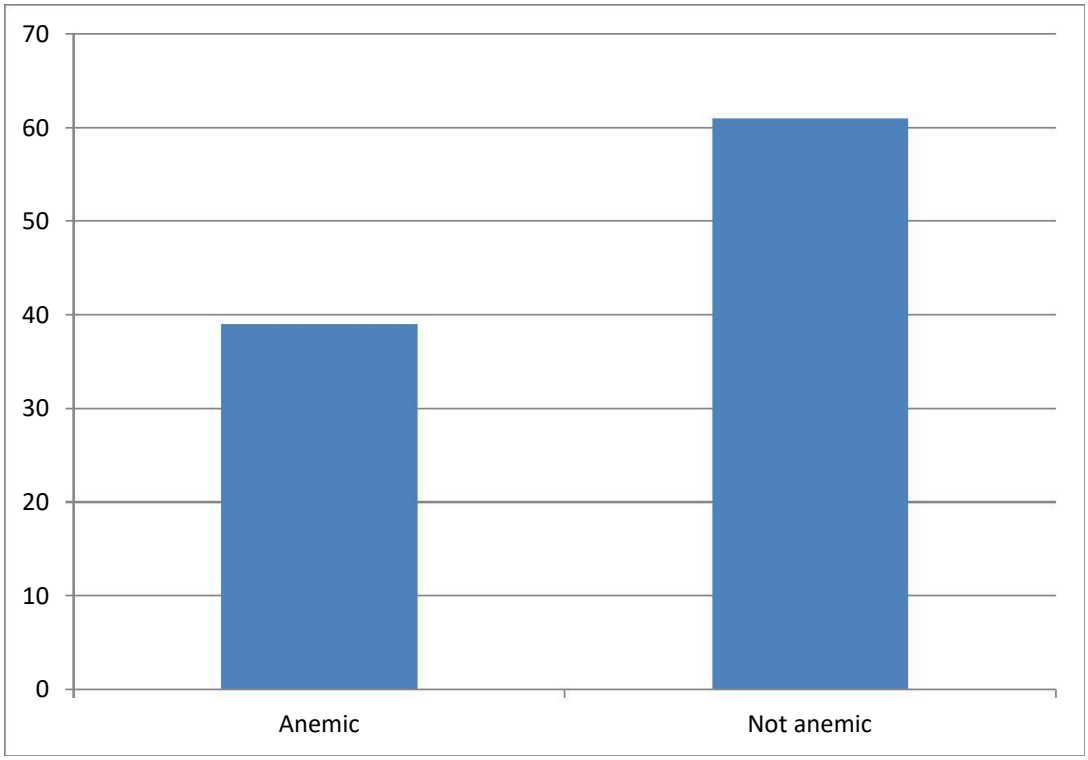

Figure (4.5): Shows frequency distribution of pregnant woman Hb% (severity of *Anemia*)

Table (4.1): Shows relation between Age of the pregnant woman and Hb%(severity of *Anemia*):

		Hb% among pregnant women		Total
		Anemic	Not anemic	
Age of the pregnant woman	(15-25)	16	20	36
	(26-35)	16	25	41
	(36-45)	7	16	23
Total		39	61	100
p-value=0.561				

Table (4.2): Shows relation between Educational level of the pregnant woman and Hb%(severity of *Anemia*):

		Hb% among pregnant women		Total
		Anemic	Not anemic	
Educational level of the pregnant woman	Illiterate	2	9	11
	Primary education	9	8	17
	Secondary education	16	23	39
	University and above	12	21	33
Total		39	61	100
p-value=0.314				

Table (4.3): Shows relation between Monthly income of the family of the pregnant woman per month and Hb%(severity of *Anemia*):

		Hb% among pregnant women		Total
		Anemic	Not anemic	
Monthly income of the family of the pregnant woman per month	<4500	10	21	31
	13500-18000	16	26	42
	5000-13000	13	14	27
Total		39	61	100
p-value=0.459				

Table (4.4): Shows relation between Occupation of the pregnant woman and Hb% (severity of *Anemia*):

		Hb% among pregnant women		Total
		Anemic	Not anemic	
Occupation of the pregnant woman	Laborer	11	19	30
	Student	9	8	17
	House wife	19	34	53
Total		39	61	100
p-value=0.432				

Table (4.5): Shows relation between Family size of the pregnant woman and Hb% (severity of *Anemia*):

		Hb% among pregnant women		Total
		Anemic	Not anemic	
Family size of the pregnant woman	<6	12	24	36
	>6	18	30	48
	=6	9	7	16
Total		39	61	100
p-value=0.282				

Table (4.6): Shows relation between Number of meals taken per day and Hb% (severity of *Anemia*):

		Hb% among pregnant women		Total
		Anemic	Not anemic	
Number of meals taken per day	One meal	8	7	15
	Two meal	14	11	25
	Three meal	17	43	60
Total		39	61	100
p-value=0.027				

Table (4.7): Shows relation between Drinking tea or coffee immediately after eating and Hb% (severity of *Anemia*):

		Hb% among pregnant women		Total
		Anemic	Not anemic	
Drinking tea or coffee immediately after eating	Yes	29	17	46
	No	10	44	54
Total		39	61	100
p-value=0.039				

Table (4.8): Shows relation between Taking furious compounds during pregnancy period and Hb% (severity of *Anemia*):

		Hb% among pregnant women		Total
		Anemic	Not anemic	
Taking furious compounds during pregnancy period	Yes	16	49	65
	No	23	12	35
Total		39	61	100
p-value=0.00				

Table (4.9): Shows relation between periodic antenatal checking during pregnancy and Hb% (severity of *Anemia*):

		Hb% among pregnant women		Total
		Anemic	Not anemic	
periodic antenatal checking during pregnancy	Checking	25	43	68
	Not checking	13	18	31
	3	1	0	1
Total		39	61	100
p-value=0.403				

Table (4.10): Shows relation between Number of deliveries among pregnant woman and Hb% (severity of *Anemia*):

		Hb% among pregnant women		Total
		Anemic	Not anemic	
Number of deliveries among pregnant woman	First time	12	13	25
	Less than 5 times	15	40	55
	More than 5	12	8	20
Total		39	61	100
p-value=0.021				

Table (4.11): Shows relation between Inter pregnancy intervals among the pregnant woman and Hb% (severity of *Anemia*):

		Hb% among pregnant women		Total
		Anemic	Not anemic	
Inter pregnancy intervals among the pregnant woman	One year	15	25	40
	Three years	13	23	36
	> three years	11	13	24
Total		39	61	100
p-value=0.728				

Table (4.12): Shows relation between Desire for eating non-food items and Hb% (severity of *Anemia*):

		Hb% among pregnant women		Total
		Anemic	Not anemic	
Desire for eating non-food items	Yes	20	27	47
	No	19	34	53
Total		39	61	100
p-value=0.493				

Table (4.13): Shows relation between severity of morning sickness a and Hb% (severity of *Anemia*):

		Hb% among pregnant women		Total
		Anemic	Not anemic	
severity of morning sickness	Normal	19	38	57
	Sever	20	23	43
Total		39	61	100
p-value=0.181				

Table (4.14): Shows relation between uterine fibroid during pregnancy and Hb% (severity of *Anemia*):

		Hb% among pregnant women		Total
		Anemic	Not anemic	
uterine fibroid during pregnancy	Yes	13	19	32
	No	26	42	68
Total		39	61	100
p-value=0.819				

Table (4.15): Shows relation between Severity of menstruation before pregnancy and Hb% (severity of *Anemia*):

		Hb% among pregnant women		Total
		Anemic	Not anemic	
Severity of menstruation before pregnancy	Normal	21	43	64
	Heavy	18	18	36
Total		39	61	100
p-value=0.091				

Table (4.16): Shows relation between Malaria during pregnancy and Hb% (severity of *Anemia*):

		Hb% among pregnant women		Total
		Anemic	Not anemic	
Malaria during pregnancy	Yes	19	24	43
	No	20	37	57
Total		39	61	100
p-value=0.356				

Table (4.17): Shows relation between Typhoid fever during pregnancy and Hb% (severity of *Anemia*):

		Hb% among pregnant women		Total
		Anemic	Not anemic	
Typhoid fever during pregnancy	Yes	19	20	39
	No	20	41	61
Total		39	61	100
p-value=0.111				

Table (4.18): Shows relation between knowledge about the reasons of *Anemia* among pregnant women and Hb% (severity of *Anemia*):

		Hb% among pregnant women		Total
		Anemic	Not anemic	
knowledge about the reasons of anemia among pregnant women	Yes	26	51	77
	No	13	10	23
Total		39	61	100
p-value=0.050				

Table (4.19): Shows relation between vaginal bleeding during the pregnancy period and Hb% (severity of *Anemia*):

		Hb% among pregnant women		Total
		Anemic	Not anemic	
Vaginal bleeding during the pregnancy period	Yes	19	5	24
	No	20	56	76
Total		39	61	100
p-value=0.00				

Table (4.20): Shows relation between kidney problems during pregnancy and Hb% (severity of *Anemia*):

		Hb% among pregnant women		Total
		Anemic	Not anemic	
kidney problems during pregnancy	Yes	6	1	7
	No	33	60	93
Total		39	61	100
p-value=0.009				

Chapter five

Discussion

Chapter five

Discussion

5.1Discussion:

A descriptive, cross –sectional, Hospital based study was conducted among the pregnant women in the Ante-natal clinic at Soba University Hospital with an objective to study the frequency and risk factor of *Anemia* among pregnant women attending Soba Hospital. It revealed the following finding as explained in the discussion below.

Frequency of *Anemia* among pregnant women attending Soba University Hospital is 39%. There is an actually problem of *Anemia* among pregnant women this results of the frequency of *Anemia* is similar to the findings of a the frequency in study [41] was between (30-40%).

The study showed that the higher percentage of *Anemia* (16%) is among the young age groups of pregnant women (15-25 and 26-35 year) for each one.

The study showed that insignificant association between pregnant women level of education and *Anemia*, (p-value=0.314), Secondary education were 16, University and above were 12, Primary education were 9 and Illiterate were 2.

Results of the economic status of respondents in this study, showed percentage of 16 of anemic pregnant women from families had monthly income (13500-18000) SDG per month, it is same as cross-sectional [1] that show there was a trend of decreasing severity of *Anemia* with higher per capita income,the study shows that the proportion of pregnant women suffering from *Anemia* in classes I and II were less (47.61% and 71.42%, respectively) as compared with the lower socioeconomic status the frequency was, (93.51%, 94.9%, in classes III-V respectively).

Regarding the family size the relation was insignificant with anemia, (p-value=0.282) about 18 represent anemic pregnant women from families with more than 6 person, the finding is similar to previous study revealed that a total of 34% represented anemic women in joint families (more than 6 person), this

agreed with what stated by [26] that IDA is common among joint family than nuclear one.

Significant relation (p-value=0.039) is clearly observed between drinking tea or coffee immediately after food, rate of 29 no other previous study is found, the association is possible due present of tannin in tea and coffee which can reduce the absorption of iron.

The study showed there is a strong relationship between taking furious compounds during pregnancy period and frequency of *Anemia* in the study (p-value=0.00), about 23 are the anemic pregnant woman that does not take ferrous compound during pregnancy, it is similar to study that showed frequency as (64%)[17], this result agrees with that reported by [2] (among the nutrition factors contributing to *Anemia*, the most one is iron deficiency.

There was insignificant relation (p-value=0.403) between initiation of anti natal care and *Anemia*. About (20%) are anemic women had irregular or late ANC in the second or third trimester, this might be due the fact that increase in trimester may cause reduction in maternal iron reserves, the result agree with other study represent (81.5%)[46] and other study conducted in Thailand, to determine the risk factor of *Anemia* among pregnant mothers showed frequency of (65.2%), are anemic pregnant women due to late antenatal booking.

The study demonstrated insignificant relation (p-value=0.091) between heavy menstruation before pregnancy and *Anemia*, about 18 of the pregnant women were suffered from heavy menstruation before pregnancy. This finding disagree with the result of studies shows a statistically significant association between anemia and history of excess menstrual bleeding (56, 4%)[11].Other study represent, 43 % (Bag, et al 2008), and 47%.[12]

The study showed i n s ignificant relation between malaria and *Anemia*, (p-value=0.356), almost 19 from the anemic pregnant women has malaria, this disagree with other Eastern Sudan[4] found the frequency of malaria among

pregnant women was (33.6%, 62%) respectively, this might be due to the fact that malaria is a significant public health in Sudan.

There was insignificant correlation between severity of *Anemia* and Typhoid fever during pregnancy of pregnant woman (p-value=0.111). 19 had typhoid.

There was significant correlation between severity of *Anemia* and knowledge about the reasons of *Anemia* of pregnant woman (p-value=0.05). 26 of anemic pregnant women had knowledge about the reasons of *Anemia*.

There was significant correlation between severity of *Anemia* and vaginal bleeding during the pregnancy of pregnant woman (p-value=0.00). 19 had vaginal bleeding.

There was significant correlation between severity of *Anemia* and kidney problems during pregnancy of pregnant woman (p-value<0.05). 6 had kidney problems.

Chapter six

Conclusion and Recommendations

Chapter six

Conclusion and Recommendations

6.1 Conclusion:

The study concluded to 39% of pregnant women were anemic, there was significant correlation between severity of *Anemia* and Number of meals taken per day of pregnant woman, Taking furious compounds of pregnant woman, Number of deliveries of pregnant woman, knowledge about the reasons of *Anemia*, vaginal bleeding, kidney problems during pregnancy.

6.2 Limitations:

1. Difficult in communication internet and calling.
2. Restriction of movement and meeting Pt. due to pandemic of COVID19.
3. Funding issues.
4. Overall political situation in our country.
5. Some of Pt. feels uncomfortable to share their socio-demographic information.

6.3 Recommendations:

- Early diagnosis of *Anemia* through investigating and screening of pregnant women for *Anemia* by taking blood samples for full hologram.
- Routine iron supplementation should be encouraged as a prophylactic measure.
- Creation of awareness on the magnitude of *Anemia* within the pregnant women, through applying interventional measures and programs to educate the mothers on the need to initiate antenatal care early.
- Establish health education talks on nutrition needs for the mother and the growing fetus, with concentration on food rich in iron in each area, considering the economic status of the pregnant women. Therefore, formulation of strategies to reduce the adverse consequences of *Anemia* in order to improve maternal health and reduce poor prenatal outcome, so an integrated package of intervention are recommended.

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Appendix

Appendix

Questionnaire

Napata College

Medicine Program

Questionnaire for the study of the frequency of anemia among pregnant women in Soba Hospital 2021.

Basic information:

1. Age of the pregnant woman :

15-25 Year ( ). 26-35 year ( ).

36-45 year ( ).

2. Educational level of the pregnant woman :

Illiterate ( ) Primary education ( )

Secondary education ( ) University and above ( ).

3. Monthly income of the family of the pregnant woman per month :

>450SDG ( ) 900-1350SDG ( )

1351-1800SDG ( )

4. Occupation of the pregnant woman :

Laborer ( ) house wife ( )

student ( )

5. Family size of the pregnant woman:

>6 Persons ( ) =6 persons ( )

< 6 ( )

6. Number of meals taken per day :

One meal ( ) two meals ( )

Three meals ( )

7. Drinking tea or coffee immediately after eating :

Yes ( ) No ( )

8. Taking furious compounds during pregnancy period :

Yes ( ) No ( )

9. periodic antenatal checking during pregnancy :

Checking ( ) Not checking ( )

10. Number of deliveries among pregnant woman :

First time ( ) More than 5( )

Less than 5 times ( )

11. Inter pregnancy intervals among the pregnant woman :

One year ( ) Three years ( )

More than three years ( )

12. Desire for eating non-food items :

Yes ( ) No ( )

13. severity of morning sickness a :

Normal ( ) Sever ( )

14. uterine fibroid during pregnancy:

Yes ( ) No ( )

15. Severity of menstruation before pregnancy:

Normal ( ) Heavy ( )

16. Malaria during pregnancy:

Yes ( ) No ( )

17. Typhoid fever during pregnancy:

Yes ( ) No ( )

18. knowledge about the reasons of anemia among pregnant women :

Yes ( ) No ( )

19. Vaginal bleeding during the pregnancy period :

Yes ( ) No ( )

20. kidney problems during pregnancy:

Yes ( ) No ( )

21. Hb% among pregnant women……%