Pregnant Women's knowledge and Attitude regarding Iron Deficiency Anemia at Elribat University Hospital And Samir Health Center, Khartoum Locality, Khartoum State, Sudan (2014)

Amal Ali Suluman Elsufi

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Upper Nile (2009)

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Supervision Committee:

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<tr>
<td>Dr. Ietimad Ibrahim Abd Elrahman Kambal</td>
<td>Main supervisor</td>
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<tr>
<td>Dr. Bothyna Bassyonie Elssayed Etewa</td>
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Examination Committee:

Name:          Position:          Signature:

Dr. Ietimad Ibrahim Abd Elrahman Kambal          Main supervisor
Dr. ..................          External Examiner
Dr. ..................          Internal Examiner

Date of Examination: 22-4-2015
الاية الكريمة

بسم الله الرحمن الرحيم

قال تعالى: (يَا مَعْشَرَ الْجِنِّ وَالإِنسِ إِنِ اسْتَطَعْتُمُ أَن تَنفُذُواْ مِنْ أَقْطَارِ السَّمَاوَاتِ وَالأَرْضِ فَانفُذُواْ لا تَنفُذُونَ إِلَّا بِسُلْطَانِ). صدق الله العظيم [الرحمن: 33].
DEDICATION

This work is dedicated to all the candles that fired to lighten my way

Special dedication to dearest sons for their supporting

To soul of my father, mother and my husband

Finally to my teachers and colleagues
Acknowledgement

Firstly, I would like to thank my merciful Allah forgiving us strength and health to do this work. I express my sincere thanks to my supervisor Dr. Ietmad Ibrahim Kambal.

My co-supervisor Dr. Bothyna Bassyonyie Elssayed Etewa for their supervision, valuable advices, for continuous support, patience and guidance. My thanks and gratitude extended also to the staff of Faculty of Applied Medical Science M. Sc program of nursing for their valuable help during the period of the program.

Finally, I would like to express my thanks and gratitude to the nursing staff of El-Ribat University Hospital for their unlimited help and cooperation in collecting the data of this study.
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Abstract

Iron deficiency anemia (IDA) is a global health issue with disproportionately high prevalence in women in developing countries. In addition to being an independent risk factor for decreased quality of life and increased morbidity and mortality especially among pregnant women. This analytical descriptive hospital-based study was carried out in Ribat university hospital and Samir health center aimed at assessing knowledge and attitude of the pregnant women towards iron deficiency anemia. Study conducted during period from September to December 2014 (Khartoum – Sudan) for the purposes of this study, the primary data was obtained through self-administration questionnaires that distributed to the study sample which consisted of 110 of pregnant women. The collected primary data was analyzed using Statistical Packages for Social Sciences (SPSS) the result were presented in form of frequencies and percentages tables. The study showed that (93.6%) were living in the urban area. Majority of the study sample with correct answer towards definition of anemia (87.3%) high level of knowledge about symptoms (88.2%), iron rich food sources (93.6%) importance of iron supplement (96.4) respectively. Poor knowledge was found with respect to the effect of iron deficiency on mother and fetal health and the use of iron supplements regular and absorption. Highly positive attitudes were also found in respect to the importance of regular visits to maternal care centers 89.3%, the study strongly recommended further health education promotional programs and rising women awareness to know the important of regular visit to antenatal care unit, and regular use of iron supplement for early detection. Although the adopted strategy concerning primary health care seems to be well planned and based on international recommendations, it seems to have no noticeable effect on the improvement of the prevalence of iron deficiency anemia.
معرفة واتجاهات الحوامل تجاه فقر الدم الناتج عن نقص الحديد بمستشفى الرباط الجامعي ومركز صحى سمير

امال على سليمان السيوفي

مستخلص الدراسة

يعتبر فقر الدم الناتج عن نقص الحديد مشكلة صحية ونتشر بنسبة عالية بين النساء الحوامل في الدول النامية. كما أنه أحد عوامل الخطرة التي تزيد من نسبة الوفيات بين النساء الحوامل. 

أجريت هذه الدراسة الوصفية التحليلية بمستشفى الرباط الوطني ومركز صحي سمير وهذته الدراسة إلى معرفة واتجاهات النساء الحوامل تجاه فقر الدم الناتج عن نقص الحديد. شملت عينة الدراسة 110 من النساء الحوامل في الفترة من (سبتمبر-ديسمبر) 2014 بمستشفى الرباط الجامعي ومركز صحى سمير. تم جمع البيانات باستخدام استمارة استبيان تم تصميمها للدراسة تم تحليل البيانات باستخدام برنامج الحزمة الإحصائية للعلوم الاجتماعية (spss) تتم عرض النتائج في شكل جداول للتكرارات والنسب المئوية بالإضافة إلى الأشكال الهندسية. 

الدراسة اظهرت أن (93.6)% من عينة الدراسة من المدينة وأعمارهم ما بين (20-40) سنة. (87.3)% من عينة الدراسة كانت اجابتهم صحيحة عن تعريف فقر الدم (%88.2) كانت اجابتهم صحيحة عن اعراضه (%93.6) عن الغذاء الغني بالحديد (46.4) عن اهمية تناول اقراص الحديد بالترتيب. كما أن هناك عدم معرفة كافية عن مسببات فقر الدم وعن تأثير نقص الحديد على صحة الأم والطفل وتناول اقراص الحديد بانتظام. أظهرت الدراسة أن هناك اسلوب عالي تجاه الزيارات المنتظمة للمراكز الصحية (89.3%) خصصت الدراسة إلى أن هناك عدم معرفة كافية عن أسباب وعلاج فقر الدم وقد اوصت الدراسة بشدة برفع مستوى الوعي لدى النساء الحوامل عبر البرامج التعليمية التثقيفية بالرغم من أن البرامج والسياسات التوصيات العالمية التي وضعت بال раكارالا إ ان الأصابات بفقر الدم ما زالت مرتفعة ولم تؤد إلى تحسين ملحوظ.
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Chapter One

Introduction
Introduction

1.1 Background:

Pregnant women with hemoglobin levels below 11.0 g/dl and/or a hematocrit level below 33% are generally considered anemic, though complications and symptoms from anemia during pregnancy do not usually occur until hemoglobin levels are well below 11.0 g/dl. Iron is a mineral that has long been known to be important during pregnancy. It’s essential to make hemoglobin, the molecule that carries oxygen to the cells and tissues of the body. During pregnancy, blood volume increases by 30%, which means women need more iron to make more hemoglobin. This is especially true during the 2nd and 3rd trimester. If a woman enters pregnancy without sufficient iron stores, she will become anemic during the later stages of pregnancy. This is why the Recommended Daily Allowance (RDA) for iron goes from 18 mg/d in non-pregnant women to 27 mg/d in pregnant women. On this basis alone, we might suspect it’s essential for all women to supplement with iron during pregnancy. And that’s exactly what the mainstream health authorities recommend. However, there are some problems with this approach. (WHO) First, it’s important to understand that it’s normal for hemoglobin levels to fall during pregnancy, normal levels of hemoglobin in non-pregnant women range from 12-16 g/dL. In a pregnant women 28 weeks, that range falls from 10-14 g/dL. This is a normal physiological change during pregnancy, and doesn’t indicate a problem. Hemoglobin levels will return to the non-pregnant range in the weeks after birth. Furthermore, the best birth outcomes are associated with hemoglobin levels at the low-end of the 10-14 g/dL range. This explains why previous studies show that routines supplementation of iron (without accompanying signs & symptoms of anemia) during pregnancy is not only not beneficial, but potentially harmful. Iron supplementation does raise hemoglobin & iron levels in the blood, but it has no detectable effects on important clinical outcomes like pre-term labor, birth weight and APGAR at birth. Iron supplementation can also be responsible for undesirable effects, such as reduced absorption of other minerals and gastrointestinal symptoms like gas, bloating and constipation.(BOTH.WELL2000) Women who exhibit signs and symptoms of anemia (fatigue, shortness of breath, pale skin, cold hands & feet, etc.) should be evaluated by a physician and may need iron supplementation.
1.2 Problem statement

WHO data indicates that iron deficiency anemia is a significant problem throughout the world ranging from 1% (average of 14%) in the industrialized countries to an average of 56% (ranging from 35-75%) in developing countries. The major risk groups for iron deficiency include women of childbearing age, pregnant women, and lactating postpartum women. According to the National Food Consumption and Nutrition Survey in 2003, 43.7% of pregnant women in Nigeria are iron deficient (Cunningham 2001). The most common causes of anemia in Nigeria include; nutritional deficiencies of iron and folate, parasitic diseases such as malaria and hookworm such as sickle cell disease and recently human immunodeficiency virus infection. In developing countries, maternal iron deficiency and anemia during pregnancy is a product of many compounding factors, such as maternal malaria, intestinal parasitic infection, recurrent infection, and malnutrition associated with reduced dietary intakes of iron containing diets. The prevalence of anemia in pregnancy varies considerably because of differences in socioeconomic conditions, lifestyles and health-seeking behaviors’ across different cultures. Anemia affects nearly half of all pregnant women in the world: 52% in developing countries compared with 23% in the developed world. The most common causes of anemia are poor nutrition, deficiencies of iron and other micronutrients, malaria, hookworm disease, and schistosomiasis, HIV infection are additional factors. Anemia is one of the most prevalent nutritional deficiency problems affecting pregnant women. The high prevalence of iron and other micronutrient efficiencies among women during pregnancy in developing countries is of concern and maternal anemia is still a cause of considerable prenatal morbidity and mortality Source. (Cunningham 2001).

1.3 Justification

Mild anemia is normal during pregnancy due to an increase in blood volume. More severe anemia, however, can put baby at higher risk for anemia later in infancy. In addition, if pregnant women are significantly anemic during their first two trimesters, they are at greater risk for having a pre-term delivery or low-birth-weight baby. Being anemic also burdens the mother by increasing the risk of blood loss during labor and making it more difficult to fight infections. Adequate knowledge of pregnant women about anemia and its further consequences is essential to avoid these serious consequences. (WHO 1989)
1.4 Objectives

1.4.1 General objective
To study knowledge and attitude of pregnant women regarding iron deficiency anemia in antenatal care unit in El-Ribat university Hospital and Samir health center during period from September to December 2014.

1.4.2 Specific objectives

- To assess the knowledge of pregnant women regarding impacts of hemoglobin decrease during pregnancy on that period.
- To determine the attitude of pregnant women regarding regular follow-up at antenatal care units.
Chapter Two

Literature review
2- Literature Review

2.1 Introduction
Iron is an essential component of hemoglobin, the oxygen-carrying pigment in the blood. Iron is normally obtained through the food diet and by recycling iron from old red blood cells and in the absence of the required iron blood concentrations, blood cannot carry oxygen effectively and hence normal functioning of every cell in the body will be affected. It is estimated that a median amount of 840-1210 mg of iron needs to be absorbed over the course of the pregnancy (Bread2000). The greatest need for increased iron intake occurs in the second half of pregnancy. When the iron needs of pregnancy are not met, maternal hemoglobin falls below 11 g/dL. When the hemoglobin level is below 10 mg/dl (hematocrit under 33%), iron deficiency is suspected (Xiongetal2001). Many women begin pregnancy in a slightly anemic state. In pregnancy, mild anemia can rapidly become more severe; therefore, it needs immediate treatment. Iron deficiency anemia is the most common medical complication of pregnancy, primarily because of expansion of plasma volume without normal expansion of maternal hemoglobin mass (Cunningham2001). Women with poor diet histories, frequent conceptions, or records of prior iron depletion are particularly at risk. Woman's nutritional status prior to and during pregnancy can significantly influence her own health and that of her unborn child. In general, many factors influence woman's ability to achieve good prenatal nutrition, including the following:

2.1.1 General nutritional status prior to pregnancy:
Good prenatal nutrition is the result of proper eating throughout life, not just during pregnancy, although pregnancy may motivate a woman to improve poor eating habits. Nutritional deficits at conception and during the early prenatal period may influence the outcome of the pregnancy.

2.1.2 Maternal age:
An expectant adolescent must meet the nutritional needs for her own growth in addition to the nutritional needs during pregnancy.

2.1.3 Maternal parity:
Mothers nutritional needs and the outcome of her pregnancy influenced by the number of pregnancies and intervals she passed through. The nutritional status does
affect her fetus. Factors influencing fetal well-being are interrelated, but nutrient deficiencies alone can produce measurable effects on growth of the developing fetus.

2.1.4 Socioeconomic level:
Poverty-level families are unable to afford the same foods that higher income families can. Thus, pregnant women with low incomes are frequently at risk for inadequate intake of nutrients.

2.1.5 Education level:
Knowledge about the basic components of a balanced diet is essential. Often educational level related to economic status, but even people on very limited incomes can prepare well-balanced meals if their knowledge of nutrition is adequate.

2.1.6 Psychological factors:
Emotions directly affect nutritional well-being and the expectant woman's attitudes and feelings about her pregnancy may influence her food consumption. A depressed woman who does not wish to be pregnant may manifest these feelings by loss of appetite or by an overindulgence of certain foods. Millions of men and women are affected by eating disorders each year, but eating disorders are most common in adolescent girls and young women. Women with eating disorders who become pregnant are at risk for a variety of complications that might result in a lack of nutrients available for the fetus; this in turn, can lead to an increased risk of low birthweight infants, miscarriage, premature birth, and prenatal death. The treatment needs of a woman with an eating disorder can best be met by a team approach that includes medical, nutritional, and psychiatric practitioners who are familiar with eating disorders. Pica is the persistent craving and eating of substances such as ice, freezer frost, cornstarch, laundry starch, baby powder, and clay, dirty and other nonnutritive substances. Most women who eat such substances do so only during pregnancy. Iron deficiency anemia is the most common concern with pica. The ingestion of laundry starch or certain types of clay may contribute to iron deficiency by replacing iron-containing foods from the diet or by interfering with iron absorption. Women with pica that involves eating ice or freezer frost often have poor weight gain because of lack of appetite, whereas the ingestion of starch may be associated with excessive weight gain. Regardless of substance women tend to have lower hemoglobin levels at birth. (Rainville1998)
2.2 Definition
Iron deficiency anemia is generally defined as a decrease in the oxygencarrying capacity of the blood and considered as the main cause of microcytic hypochromic anemia. This significantly reduces the hemoglobin per deciliter of blood and volume of packed red blood (hematocrit), or the number of erythrocytes.

2.3 Causes
In general, iron deficiency anemia among women could be due to several factors. These include:
1. Reduced intake or absorption of iron; this includes dietary deficiency and gastrointestinal disturbances such as diarrhea or hyperemesis.
2. Excess demand such as frequent, numerous or multiple pregnancies and in this case, iron stores are low in women experiencing a short period (less than 2 years) between pregnancies or those from low socioeconomic communities.
3. Chronic infection, particularly of the urinary tract.
4. Acute or chronic blood loss, for example menorrhagia (heavy periods), bleeding hemorrhoids, or ante-partum or postpartum hemorrhage.
5. Women who were using intrauterine device (IUD) may be deficient in iron from excessive blood loss with menstrual flows while those who have been taking oral contraceptives have lower risk for getting anemia. (Palestinian National Outhorty (2005)

2.4 Signs and symptoms
Signs and symptoms include pallor of the mucous membranes, fatigue, general weakness, decreased appetite, dizziness and fainting, headache, shortness of breath, increased heart rate (tachycardia) and palpitations.

2.5 Diagnosis
Diagnosis of IDA during pregnancy is difficult due to the fact that morphological changes occur at a later stage, MCV increases slightly during the first and second trimester and serum iron drops and TIBC increases during pregnancy even in women who are not iron deficient. Iron deficiency anemia is usually discovered during a complete medical history and physical examination through routine blood test, which includes a complete blood count (CBC). A low hemoglobin concentration only indicates anemia is present; it does not reveal the cause of anemia. A lack of iron in the tissue can be demonstrated by measuring the serum ferritin is the body's main iron storage protein. Serum ferritin levels fall in proportion to the decrease in iron stores
and will show changes before the level of hemoglobin falls. (HigginsC2001) Serum ferritin is considered as one of the best laboratory tests for evaluation of iron deficiency as measurement of serum ferritin directly related to iron storage. However, inflammation is major problem seems to be associated with this test; a problem must be taken in consideration when thinking of use of this test. To avoid such problem one can use C-reactive proteins to exclude elevated feritin caused by acute phase reactions. A more reliable test in pregnancy may be to assess cellular iron status by measuring serum transferring receptor (TFR) concentrations. The serum transferring receptor (TFR) concentrations remain normal in pregnancy unless tissue iron deficiency is present.(Carriage MT1991).

The WHO recommendation for the lower limit of the normal range of hemoglobin concentration (Hb) is 11 g/dL (7). The Centers for Disease Control and Prevention specifies anemia as an Hb<11.0 g/dL or hematocrit <0.33 for the first and third trimesters and Hb<10.5 g/dL or hematocrit <0.32 for the second trimester. (CDC 1989). Because of the low sensitivity and specificity of Hb, its usefulness is greatly enhanced by combining it with a more specific index of iron status. (Palestinian National Authority 2004). A very useful coupling of measurements is that of Hb with serum ferritin concentration (SF). If both measurements are normal iron deficiency anemia is excluded; if both are low, iron deficiency anemia is likely. If the SF is low but the Hb is normal, the individual is at risk of iron deficiency anemia, while if the Hb is low but SF is normal, further test will be required to determine the cause of anemia. While it is generally recommended to add SF to the test battery to distinguish iron deficiency anemia from anemia of other causes during pregnancy, this is not universally applicable and must be approached with caution because of the normal physiological adaptations during pregnancy. (SchollTO 1992) Initial diagnosis of anemia is usually based on laboratory test of Hb or Hct levels in blood. This is usually carried in association with assessment of the general physical condition and nutritional status of pregnant women and look for signs of anemia such as fast breathing, pale lips, pale palms, height and weight gain.(CDC1989)

**Table (1) Classification of anemia:**

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<td>Mild</td>
<td>&gt; 9.5-10.9 g/Dl</td>
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<tr>
<td>Moderate</td>
<td>7-9.5 g/Dl</td>
</tr>
<tr>
<td>Severe</td>
<td>&lt; 7 g/Dl</td>
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Pre-pregnancy weight Category | Recommended total gain
--- | ---
BMI < 19.8 Underweight | 12.5-18.0 | 28-40
BMI 19.8-26.0 normal weight | 11.5-16.0 | 25-35
BMI > 26.0-29.0 Overweight | 7.0-11.5 | 15-25

**Table (2) Weight gain recommendations for pregnancy:**

**BMI = body mass index (kg/m2)(central disease control and prevention)**

Pre pregnancy Body Mass Index (BMI) is a measure of weight for height expressed as wt (kg)/ht (m2) before the woman became pregnant. The lower a woman’s weight-for-height (BMI below 19.8) prior to pregnancy is mostly associated with undernourishment (CDC 2005). Women who are underweight prior to pregnancy are at a higher risk for having low birth weight infant, fetal growth problems, prenatal mortality and other pregnancy complications. Women with severe anemia usually identified and treated through primary health care providers when possible and usually referred to other facilities especially for those considered to be at high risk pregnancy (history of vaginal bleeding during the pregnancy, or during childbirth if she is postpartum and still bleeding; thalassemic or sickle cell anemic; symptoms of severe anemia). These women usually advised to deliver at a facility where blood transfusion is possible. (CDC2005)

**2.6 Treatment**

Internationally, oral iron supplementation is the most common way of treatment, and dose depends on severity of condition. Oral iron preparations given prophylactically consist of one of the iron salts, either alone or in combination with folic acid. Common iron preparation includes ferrous sulphate, and ferrous gluconate. However, ferrous sulphate is the most common from used. The initial dose is usually 60-120mg elemental iron/day and in case of severe cases doses may increase depending on each case. Iron deficiency anemia treated with a daily ferrous iron supplement of 60-120mg, when the hematocrit becomes normal for the stage of pregnancy, the dose of iron decreased to 30 mg per day. Iron can also be given intramuscularly or intravenously thereby bypassing the gastrointestinal tract. This can be beneficial in
women who are unable to take, tolerate or absorb oral preparations. Intra-muscular iron is given in the form of iron sorbitol. Iron dextran is given as total dose intravenous infusion. Blood transfusion is rarely used to treat iron deficiency anemia in pregnancy. It may be considered where there is an inadequate amount of time to treat severe anemia prior to birth. (CDC 1989)

Treatment of anemic women who are stable is usually carried out in the primary health center or maternity home with very close follow-up that include the following procedure:

• Assessment of medical and obstetric history and food intake.
• Blood test for hemoglobin levels (CBC).
• Complete physical examination at the first antenatal visit or postpartum, initiate iron and folate treatment: 120mg iron + 800μg folic acid daily for three months and provide counseling to improve continuance and compliance of iron/folate therapy.
• Refer the women to an appropriate community health worker for ongoing nutrition assessment and support.
• Evaluate women health one week after starting iron/folate treatment.
• Provide follow-up of treated cases of severe anemia and if a woman's condition worsened, refer immediately, but if stable or improving, review counseling and nutrition.
• Be certain that she has enough iron and folate tablets to continue to take the appropriate dose for severe anemia.

One month after initiating iron/folate therapy, review the questions in rapid initial assessment of severe anemia:

• If a woman's condition is no better, refer immediately
• If is symptomatically improving, test her hemoglobin or hematocrit
• If there has been no improvement in her hemoglobin, refer for further evaluation
• If there has been improvement (of at least 1g/dL of hemoglobin) continue treatment for an additional two months.

After three months of treatment for severe anemia, a woman's iron stores should be replenished. At this time, if she is no longer severely anemic Hb is >7g/dL), initiate for pregnant or lactating women, the preventive regimen of an additional six to nine months: 60mg iron + 400μg of folate is recommended. Continue to provide counseling to improve continuance and compliance of iron/folate therapy.
2.7 Prevention of IDA among pregnant women

Iron supplementation beginning at the first prenatal visit. The Centers for Disease Control and Prevention recommends starting low-dose (30mg/day) supplements of iron at the first prenatal visit, with twin pregnancy, a larger dose needed. (Cunningham 2001) Most iron that obtained from the average diet is about 15 to 18mg/day. The recommended intake for iron during pregnancy is 27mg/day, thus, a supplement of simple iron salt, such as ferrous gluconate, ferrous fumarate, or ferrous sulfate, is needed.

Health education in the antenatal care; review the purpose of iron in the pregnant women's diet; explain the need for the women to develop iron storage and fetal iron stores; review the list of foods that are rich in iron; discuss how the women can be realistically incorporating these foods into her diet. Pregnant woman should be encouraged to eat an iron-rich diet to prevent anemia, she must balance iron requirements and intake. Although the rate of absorption of iron increases during pregnancy, it is still important to select foods high in iron to increase the daily intake. Lean meats, dark green leafy vegetables, eggs, and whole grain and enriched breads and cereals are the foods usually depended on for their iron content. Other iron sources include dried fruits, and legumes. Iron absorption is generally higher for animal products than for vegetable products.

Iron is best absorbed in an acid medium. Therefore, advise women to take iron supplements with orange juice or a vitamin C supplement. In addition, they need to eat a diet high in iron and vitamins. Some women report constipation or gastric irritation when taking oral iron supplements. These women usually advised to increase roughage in the diet as taking pills with food help to reduce these symptoms. The use of iron-fortified foods is a cost-effective and efficient way to increase iron intake.

2.8 Impact of anemia on fetus and mother

According to the WHO, around 18% of women in industrialized countries are anemic; in the developing world, this rises to 56% and is a contributory factor to women developing health problems and dying during pregnancy and childbirth. Such situation renders both mother and fetal neonatal risks. (WHO1992)

Women with iron deficiency anemia may be asymptomatic, however is more susceptible to infection, may tire easily, with increased chance of preeclampsia and postpartum hemorrhage, and tolerates poorly even minimal blood loss during birth.
Healing of an episiotomy or an incision usually delayed and if the anemia is severe (Hb less than 6g/dL), cardiac failure may ensue. On the other hand, there is evidence of increased risk of low birth weight (Low birth weight/ less than 2.500g). Iron deficiency anemia is associated with a higher incidence of low-birth weight infants preterm birth, pre-maturity, stillbirth, and neonatal death in infants of women with severe iron deficiency (maternal Hb less than 6 g/dL).(Salzberg2002)

Infants are not iron deficient at birth due to active transport of iron across the placenta, even when maternal iron stores are low. These babies do have lower iron stores and are at increased risk for developing iron deficiency during infancy. (Duran, P2000)

2.9 Nursing Care Management

Assessment:

Patients should be assessed for the presence of the following characteristics.

Subjective data

Weakness, Shortness of breath, palpitation, ringing in the ear, sore gum, tongue and lips, pica (in severe cases) = desire to eat unusual things, fainting, anxiety, loss of appetite, palpitation, nutritional: the food items consumed commonly in the family, awareness about the disease problem and preventive measures.

Objective Data

Decreased hemoglobin level (Refer to the normal Hgb for each age group in the core module.), increased pulse rate. (taccycardia), pallor (nail beds, conjunctiva, palm), edema (in severe cases), living standard - personal hygiene, shoe wearing habit.

1- Nursing Diagnosis

- Activity intolerance related to weakness and fatigue.

Goal:

- Develop tolerance of activity with minimum energy consumption.

Interventions

- Encourage frequent rest and activities as tolerated
- Postpone the activities that cause undue fatigue until endurance increase.

2- Nursing Diagnosis

- Altered oral mucus membrane related to the disease process.

Goal:

- Have normal mucous membrane integrity.
Interventions
- Frequent oral hygiene with mild and cool tooth pest, and water (before and after meal).
- Avoid irritant foods, beverages example coffee.
- Avoid unnecessary exertion

3- Nursing Diagnosis
- Altered nutrition less than body requirement related to inadequate intake of iron.

Goal
- Maintain adequate nutrition.

Interventions
- Encourage taking well balanced diet.
- High protein and high calorie food, iron rich foods.
- Fruits and vegetables

3- Nursing Diagnosis
- High risk for infection related to decreased immunity.

Goal
- Demonstrate absence of infection or complication.

Interventions
- Decrease contact with infected individuals and source of infection.
- Practice good hand washing and personal hygiene.

4- Nursing Diagnosis
- Knowledge deficit regarding the nature of the problem and its preventive measures.

Goal
- Be aware of the disease process and its preventive measures.

Interventions
- Advice on health seeking behavior.

5- Nursing Diagnosis
- Non-compliance to drug regimen related to side effects of oral iron medication.

Goal
- Comply to the drug regimen.
Interventions

- Administration of prescribed medication

6- Nursing Diagnosis

Anxiety related to inability to perform activity of daily living.

Goal

- Experience less anxiety.

Interventions

- Encourage patient to express feeling of anxiety.
- Reassurance, psychological support

2.10 Previous studies

2.10.1 World wide:

According to the WHO, around 18% of women in industrialized countries are anemic; in the developing world, this rises to 56% and is a contributory factor to women developing health problems and dying during pregnancy and childbirth. Such situation renders both mother and fetal neonatal risks. (WHO1992). Women with iron deficiency anemia may be asymptomatic, however is more susceptible to infection, may tire easily, with increased chance of preeclampsia and postpartum hemorrhage, and tolerates poorly even minimal blood loss during birth. Healing of an episiotomy or an incision usually delayed and if the anemia is severe (Hb less than 6g/dL), cardiac failure may ensue. On the other hand, there is evidence of increased risk of low birth weight (Low birth weight/ less than 2.500g). Iron deficiency anemia is associated with a higher incidence of low-birth weight infants preterm birth, prematurity, stillbirth, and neonatal death in infants of women with severe iron deficiency (maternal Hb less than 6 g/dL). (Salzberg2002). Infants are not iron deficient at birth due to active transport of iron across the placenta, even when maternal iron stores are low. These babies do have lower iron stores and are at increased risk for developing iron deficiency during infancy. (Duran2000). Iron deficiency anemia is a serious public health problem affecting more than 700 million people in the world. (Dawood HS 19990). It is considerably more prevalent in the developing regions (59.0%) than in the industrialized world (14.0%) (DeMaeyer1989) Pregnancy, delivery, and lactation constitute a major drain on the iron reserves of women. (HalperL1987)(pAMOREr1996) Previous studies on iron deficiency anemia have revealed a prevalence of 39.7% in Kuwait((Dawood 1990), 78.0% in Liberia((JacksonRT1982)18), 73.9% in Guyana((JohsonAA1982)19), 61.0% in
Jamaica (Simmon Fox et al. 1982), 50.0% in Bahrain, 22.1% in Egypt, and 19.8% in Northern Ireland. (Strain J.J 1990)

**2.10.2 IN Developed countries**

Iron deficiency and iron deficiency anaemia (IDA) during pregnancy are risk factors for preterm delivery, prematurity and small for gestational age birth weight. Iron deficiency has a negative effect on intelligence and behavioural development in the infant. It is essential to prevent iron deficiency in the foetus by preventing iron deficiency in the pregnant woman. Requirements for absorbed iron increase during pregnancy from ~1.0 mg/day in 1st trimester to 7.5 mg/day in 3rd trimester. More than 90% of Scandinavian women of reproductive age have a dietary iron intake below the recommended 15 mg/day. Among non-pregnant women of reproductive age, ~40% have plasma ferritin ≤30 μg/L, i.e., an unfavorable iron status with respect to pregnancy. An adequate iron status during pregnancy implies body iron reserves ≥500 mg at conception but only 15-20% of women have iron reserves of such magnitude. 

Iron supplements during pregnancy reduce the prevalence of IDA. In Europe, IDA can be prevented by general low-dose iron prophylaxis of 30-40 mg ferrous iron taken between meals from early pregnancy to delivery. In affluent societies, individual iron prophylaxis tailored by the ferritin concentration should be preferred to general prophylaxis. Suggested guidelines are: ferritin >70 μg/L: no iron supplements; ferritin 31-70 μg/L: 30-40 mg ferrous iron/day; ferritin ≤ 30 μg/L: 60-80 mg ferrous iron/day.

In women with ferritin <15 μg/L, i.e., depleted iron reserves and possible IDA, therapeutic doses of 100 mg ferrous iron/day should be advised.

Key words: anemia; iron deficiency; ferritin; haemoglobin; iron; pregnancy; postpartum period

Iron is an essential mineral to man. It is necessary for the synthesis of haemoglobin and myoglobin as well as for the function of many vital iron-dependent enzymes. In women of reproductive age, iron deficiency, even in the absence of iron deficiency anaemia (IDA) reduces cognitive ability and physical performance. (Rowland TW, 1988) (Beard JL, 5005) In pregnant women, an adequate iron status is important to ensure an uncomplicated pregnancy as well as a normal development of the foetus and maturity of the newborn child (Milman N: 2008) The aim of this paper is to describe the consequences of iron deficiency and IDA in pregnancy and to outline strategies for prevention. **Demands for iron increase markedly in pregnancy** During pregnancy the physiologic need for iron is extraordinary high. In women of
reproductive age, the requirement for absorbed iron is on the average 0.8 mg/day. The average requirements for absorbed iron increase steadily during pregnancy from 0.8 mg/day in early first trimester to 7.5 mg/day in the third trimester (Fig. 1). The average requirement for absorbed iron in the entire gestation period is ~4.4 mg/day (Bothwell TH:2000) (Milman N:2006) The absorbed iron goes to a) expansion of the pregnant woman’s red cell mass, b) organ development and growth of the foetus, c) placenta and umbilical cord, d) compensation for blood, (iron) losses at delivery (Milman N:2006). The total iron content of a newborn child increases with the birth weight, being ~270 mg at a “normal” birth weight of 3500 g. Estimated total requirements for absorbed iron in normal pregnancies are ~1240 mg. After delivery, when the mother’s red cell mass declines to pre pregnancy level, the haemoglobin iron is recycled to replenish body iron reserves. Therefore, the net iron requirements associated with pregnancy per se, are ~630 mg (Bothwell TH:2000) (Milman N:2006).

**Dietary iron intake**

Apparently women do not make major changes in their dietary habits when they become pregnant [9]. Danish women have a mean dietary iron intake of 9 mg/day (90th percentile 12 mg) indicating that ~90% have an intake below the recommended 15 mg/day (Milman N:2006) (Pedersen A, , et al: 2003-2008.) [8, 10]. Women in Great Britain have a mean dietary iron intake of 10 mg/day (11. Alwan NA, ). The dietary iron intake in pregnant women is apparently higher than in the general population of women, probably due to selection bias. Pregnant Scandinavian women have a mean dietary iron intake of 11 mg/day; 96% have an intake of <18 mg/day (Trygg K, 1995) Pregnant British women have a mean dietary iron intake of 11.5 mg/day; 80% have an intake below the UK Reference Nutrient Intake of 14.8 mg/day (11. Alwan NA,) Pregnant Bavarian women have a mean dietary iron intake of 13.3 mg/day, which is far below the recommended intake (Hauner H, 2009)

Dietary iron consists of heme iron and non-heme iron, of which heme iron has the highest bioavailability. The major fraction of dietary iron, ~90% is non-heme iron, which in the average European diet has a bioavailability of 10-15%, depending on the amount of meat, fish and poultry in the diet. This means that dietary iron absorption in pregnant women is approximately 1.0-1.4 mg/day, which is far below the requirements during pregnancy (see above). In the USA and Germany a dietary iron intake of 27-30 mg/day during pregnancy is recommended. Such an intake would imply drastic and unrealistic dietary changes. Therefore, the Nordic Nutrition
Recommendations have refrained from giving figures for recommended dietary iron intake in pregnant women.

**Monitoring iron status in pregnant women**

5 The haemoglobin concentration is often used as a pseudomarker for iron deficiency. However, haemoglobin is not suitable to assess iron status – especially not in pregnancy due to hypervolaemia and haemodilution. Haemoglobin yields information about the presence of anemia in general and IDA in specific when body iron reserves are depleted (Milman N:1994) (Milman N:2006) Iron status can be assessed by biomarkers, including plasma ferritin, plasma transferrin saturation and serum soluble transferrin receptor (sTfR). In non-pregnant women, a ferritin concentration of 1 μg/L corresponds to 7-8 mg of mobilizable iron (Milman N:2008) Ferritin levels ≤30 μg/L indicate a low iron status, verified by the absence of bone marrow haemosiderin (Milman N:1983) Ferritin levels <15 μg/L are consistent with depleted iron reserves and levels <12 μg/L are associated with IDA. A plasma transferrin saturation <15% and a serum sTfR > 8.3 mg/L both indicate an inadequate supply of iron to the red cell precursors and other tissues. Plasma ferritin provides information about the capacity of body iron reserves, serum sTfR and to some plasma transferrin saturation yield information about iron deficiency on the cellular level, while haemoglobin gives information about iron deficiency on the functional level. For practical purposes, haemoglobin, i.e., a full blood count, and plasma ferritin are adequate to assess iron status and diagnose IDA.

**Consequences for the pregnant woman**

Iron deficiency, even without IDA reduces cognitive abilities, physical performance and working Capacity ((Rowland TW, 1988) (Beard JL, 5005). In pregnancy, IDA produces the same symptoms and has the same negative consequences on the quality of life as in non-pregnant women. General weakness, fatigue, dizziness, impaired thermogenesis, gastrointestinal symptoms, structural changes in hair, nails and skin, restless legs and impaired immune response predisposing to infections contribute to the spectrum of IDA. Furthermore, IDA is associated with an adverse outcome of pregnancy and complications at delivery, including premature birth [14] and increased perinatal maternal mortality (Milman N 2011)
Strategies to ensure an adequate iron supply to pregnant women

In pregnant European women not taking iron supplements, the prevalence of prepartum IDA is approximately 25% compared to 0-3% in women taking iron supplements (Milman N 1994). According to the World Health Organization, the estimated number of women with prepartum anaemia in Europe is ~2.5 million. Dietary measures by themselves are ineffective to obtain a good iron status in the majority of pregnant women (see above). A safe way to secure an adequate iron status in mother and child is to give iron supplementation during pregnancy. It is highly evidence-based that oral iron supplements in appropriate doses are very effective in the prevention of iron deficiency and IDA (Milman N 1994)(Milman N 1991)(2005)

Guidelines for prevention of prepartum iron deficiency

Many countries do not have guidelines on iron prophylaxis in pregnancy and guidelines vary considerably between European countries. There is a strong need for consensus on this important issue. In the USA, women are recommended 30 mg ferrous iron supplements daily from early pregnancy and in Denmark the recommendation is 40 mg/day (Milman N 2005). In the UK, iron supplements are not recommended and in Germany there are no common nationwide guidelines.

Which dose of iron supplements is appropriate?

Due to the potential side-effects of oral iron, we should aim at giving the smallest dose of iron, which is effective in the prevention of iron deficiency and IDA in more than 95% of pregnant women. A dose response study (Milman N 2005) has demonstrated that 40 mg ferrous iron/day taken at bedtime or between meals is effective to prevent IDA, while a dose of 20 mg iron/day appeared to be insufficient. Apparently, there was no benefit in giving higher doses of 60 or 80 mg of iron.

When should iron supplements start?

Ferrokinetic studies in pregnant women have shown that the red cell mass starts to increase already around 12 weeks gestation (Cavill I:1995) In order to obtain maximum effect of iron on the growing foetus and on the birth weight, low-dose iron supplements should be started as early in pregnancy as possible, e.g., when pregnancy is verified or at the first antenatal care visit and should continue until delivery. Whether supplements should be continued during the lactation period is as yet unclarified, but it should at least be recommended to women with significant blood losses at delivery.
During pregnancy, iron status can be monitored by plasma ferritin and a full blood count. The iron requirements during pregnancy are extraordinary high and cannot be fulfilled by dietary interventions alone. Oral iron supplements are necessary in more than 80% of pregnant women in order to prevent iron deficiency and IDA. As a general iron prophylaxis, low-dose ferrous iron formulas 30-40 mg/day from early pregnancy to delivery are effective. Ideally, individual iron prophylaxis tailored according to iron status should be preferred in countries with the available antenatal health care resources.

The study conducted in Malatya, which is an eastern Anatolian province with 800 000 inhabitants, showed a moderate prevalence of anemia (27.1%). Our findings did not correlate with the results reported by PAI and WHO which indicated that pregnant women in Turkey have had severe anemia. Our results also notice that anemia trends might have changed in Turkey and a nationwide anemia study is necessary for determining the new anemia status and for international notification. As a matter of fact, the reduction in anemia prevalence from that projected earlier in 1970s is expectable since there was a rapid socio-economic growth of the Turkish population over the past two-three decades which had a major impact on both health status and disease patterns throughout the country and particularly in east Anatolia. Since 1985, governments in collaboration with international organizations (UNICEF) conducted programs related to mother and child health such as safe motherhood, antenatal care, nutrition education of the public and food aid to the the low income families. Human resources, education, industry, agriculture and health sector was improved through national development plans and, Eastern Anatolian Project including Malatya since 1997]. Even though the study showed 27.1% prevalence, this is higher than the prevalences in European countries (25.1%) and in Americas (24.1%) or averaging 18% in developed countries. Therefore, it is necessary to continue anemia control programs. Anemia prevalence in our study was also lower than those reported from different parts of the country such as 29.4% in Afyon and 42.4% in Elaziğ provinces, the latter is in the eastern Anatolia near Malatya [. Socio-economic status is a known determinant of anemia. In this study, anemia was more prevalent among those women who received financial support (p < 0.05) and who had a low monthly family income (OR = 1.6). The majority of anaemic pregnant lived in nuclear rather than extended families which might seem paradoxical. As a result of industrialization, urbanization and internal migration, people are more likely to be living in nuclear households in
Turkey, recently. However they might be low income families that immigrated for a better life. Family economics and nutrition related problems need to be investigated in detail in such households to determine the contributing effects of social structure and life styles on morbidity.

2.10.3 In developing Countries: India is among the countries with high prevalence of anemia. It is widely prevalent in all age groups, being particularly high among the most vulnerable; nearly 58 per cent in pregnant women, 50 per cent among non-pregnant non-lactating women, 56 per cent among adolescent girls, 30 per cent in adolescent boys and around 80 per cent in children under two years of age. Anemia, thus poses a major threat to maternal and child survival, contributes to low birth weight, lowered resistance to infection, poor cognitive development and decreased work productivity. The magnitude of anemia together with the associated adverse health, development and economic consequences, highlights the need for intensified action to address this public health problem. Success in prevention and control of anemia will contribute to reduction of maternal and child mortality and improve health outcomes for population as a whole. In Bahrain the prevalence of IDA in the developing country is very high; it ranges from 13.6% in Iran to 75% in other countries compared to 18% in the industrialized world. (Moosa et al.) reported that 41.9% of pregnant women in Bahrain had anemia and 40% had IDA or were in danger of getting it. In Kuwait, the prevalence of anemia among pregnant women was reported to be 24%, of which 66% were IDA. Younger age group (≤ 24), women with three parity or more, those with close birth spacing (≤ 2 years) and women in their third trimester were at risk of IDA. Women who intake substantial amount of tea, coffee and brown bread had lower SF; those who consumed white fortified flour bread, fruit juice and food rich in iron, were found to have higher SF concentrations. In 2001, the Bahrain government commenced a program for the fortification of flour with iron and folic acid. A study conducted six months after that program, showed little improvement in the prevalence of IDA. Women with anemia during pregnancy are at risk of having perinatal mortality and morbidity. The mortality rate ranges from 27 in India to 194 per 100000 live births deaths in Pakistan. A study showed that maternal mortality rate in women with Hb less than 10g/dL was 70/10000 deliveries compared with 19.7/10000 in non-anemic women. According to WHO, more than one quarter of the sample had anemia of which 27.5% had IDA compared to 41.9% and 40% have anemia and IDA respectively in previous studies in Bahrain. This improvement could
be due to the health care services offered by the MOH in Bahrain during the past few years as well as free iron supplementation to pregnant women. It may also be related to a woman’s quality standard of living, proper sanitation and the improvement in the quality of food. None of the studied pregnant women were found to have severe anemia, which is similar to other studies from Saudi Arabia and Kuwait. SF dropped significantly with increasing age. This finding could be related to the increasing number of pregnancies with increasing age, which would lead to depletion of the iron storage. IDA was more prevalent among non-Bahraini pregnant women, which could be related to the nutritional habits of this population who mainly depend on carbohydrates in their feeding. Those who were less educated had significantly lower SF as they did not have sufficient knowledge regarding nutrition, especially food rich in iron, compared to those who had higher education. Beard reported that adolescent women are at higher risk of developing IDA, which is similar to our study. Moreover, iron requirements are high in adolescent girls because of the adolescent growth and the nutritional need of the fetus. Women with more than two pregnancies and/or deliveries were found to show higher prevalence of IDA. Women with close birth spacing are at higher risk of IDA. Similar findings were reported in other studies. It was also found that IDA was more prevalent among third trimester pregnant women. This could be due to increased requirement as the gestational age progressed. Pregnant women who ate three meals regularly that contained fruits for more than one time per week had higher SF. SF decreases when iron is consumed with milk, dairy product and antacids, which interfere with iron and calcium absorption. IDA was found more in women who indulged themselves in pica (desire for eating strange non-nutrient substances), which is a known cause for IDA. Although reports exist about what is being done and what should be done globally to address maternal anemia prevention and treatment (USAID, 2011), maternal mortality and anemia prevalence around the world including Sierra Leone continues to remain high (Stoltzfus & Dreyfuss, 1998; Torlesse & Hodges, 2001; Galloway, 2004; WHO 2005, 2007). In Sierra Leone, where the population was 4.96 million (Government of Sierra Leone, 2008), the prevalence of anemia was considered severe at 59.7%. At the time, there were approximately 160,000 anemic pregnant women (de Benoist, McLean, Egli, & Cogserll, 2008; USAID, 2011). In a previous study, estimated anemia prevalence in Sierra Leone was documented to be as high as 68% (WHO, 2004; Hamsire, 2004). Cited reasons as to why iron deficiency anemia is high in nations such as Sierra
Leone, include malaria that is endemic in the region (Mateli, Donato, & Shein, 1994; Lamina, 2003), possible poor health provider knowledge about nutrient values (Hamsire, 2004; USAID, 2011), lack of knowledge about maternal anemia, and lack of participation by pregnant women in activities or behaviors that improve their anemia status (USAID, 2011), all of which pose challenges to addressing the maternal anemia issue. In addition, women often have low iron bioavailability, low use of intermittent preventive treatment for pregnant women (IPTp) and low consumption of iron supplements during pregnancy due to unavailability of the tablets or the undesirable side effects experienced (USAID). In Ethiopia, higher magnitudes of anemia were reported from Arsi (36.6%), Addis Ababa (33%) and around Gilgel Gibe dam area in southwest Ethiopia (53.9%), Eastern Sudan (62.6%). This might be due to variation in sample size and presence of high malaria infection. For instance the prevalence of malaria in the study done around Gilgel Gibe area (11.6%) and eastern Sudan (reported 13.7% of *P. falciparum* malaria) were relatively high which might have contributed to the high prevalence of anemia.

Heavy infection with soil-transmitted helminthes (STHs), particularly the hookworms, predisposes pregnant women and individuals with low iron store to anemia. In this study, more than a third of the pregnant women were infected with intestinal parasites, *Ascaris lumbricoides* and the Hook worms being predominant. Pregnant women with IPIs were 2.5 times more likely to be anemic compared to their non-infected counterparts. Other local studies also documented similar findings. A significantly higher prevalence of anemia was found among pregnant women who were from rural areas. Pregnant women from rural areas were more than three times more likely to be anemic than their urban counterparts. Association of rural residence with anemia has also been reported earlier. The higher prevalence of anemia among pregnant women from rural areas is likely related to lack of information about adequate nutrition during pregnancy, economic factors and inaccessibility of health care centers.

Pregnant women with a history of heavy cycle were more anemic than those with normal menstruation cycle. In this study pregnant women with a history of heavy cycle were 2.7 times more likely to be anemic than those who had normal menstruation cycle (AOR = 2.7, 95% CI: 1.3-1.7).
2.10.4 In Sudan the Khartoum state, iron deficiency (Hb < 11g/dl) among pregnant women who attended Khartoum teaching hospital antenatal unit in March 2012 reported that prevalence of anemia (Hb < 11.0 g/dl) was 33.8% among the study group, the majority (85.2%) of these anemic patients were mildly anemic, whereas (11.1%) were moderately anemic. There was only one case of severe anemia (3.7%). Most of those anemic pregnant women (74%) were found to have IDA, while (25.9%) had other types of anaemia. IDA had been found in high percentage in the third trimester (50%). This high prevalence of IDA among pregnant women may be due to malnutrition and lack of iron medications during pregnancy so strong recommendations provision of free iron and folate to antenatal care in health centre.
Chapter three

Methodology
3. Materials & Methods

3.1: Study design

This descriptive hospital-based study will be conducted among pregnant women who attend antenatal unit aimed to assess knowledge and attitude regarding iron deficiency in El-Ribat university hospital and Samir health center- Khartoum State-Sudan, during the period from (September to December 2014).

3.2 Study area

The study was conducted in Samir Health care center, it was located at Khartoum locality, Imtidad area, it was established at 1964, it included antenatal care unit, family planning unit, vaccination unit.

Table 3. Manpower of Samir health center:

<table>
<thead>
<tr>
<th>Job</th>
<th>NO.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medical director</td>
<td>1</td>
</tr>
<tr>
<td>Obstetrician</td>
<td>4-5</td>
</tr>
<tr>
<td>Sister</td>
<td>1</td>
</tr>
<tr>
<td>Health visitor</td>
<td>2-3</td>
</tr>
<tr>
<td>Nutritionist and vaccinator</td>
<td>6-7</td>
</tr>
</tbody>
</table>

El-Ribat university hospital was located at Burri area, Khartoum locality near Ribat University and Sahiroon Hospital. It includes approximately 25 department’s obstetrics and gynecology department one of them, which include modern labor rooms, family planning and antenatal unit, vaccination which provides its services for all children in the area.

Table 3.2 El-Ribat university hospital manpower:

<table>
<thead>
<tr>
<th>Job</th>
<th>No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specialist</td>
<td>40-45</td>
</tr>
<tr>
<td>Doctor</td>
<td>90-100</td>
</tr>
<tr>
<td>Sister</td>
<td>450-500</td>
</tr>
<tr>
<td>Midwife</td>
<td>15-20</td>
</tr>
</tbody>
</table>
3.3 Study Population

This study was carried out among pregnant women who attending antenatal unit at Samir healthcare center and El-Ribat university Hospital, during the period from September to December 2014.

<table>
<thead>
<tr>
<th>شهر</th>
<th>حوامل</th>
<th>النوع</th>
</tr>
</thead>
<tbody>
<tr>
<td>سبتمبر</td>
<td>1192</td>
<td>الشرطة</td>
</tr>
<tr>
<td>سبتمبر</td>
<td>59</td>
<td>مدني</td>
</tr>
<tr>
<td>أكتوبر</td>
<td>935</td>
<td>الشرطة</td>
</tr>
<tr>
<td>أكتوبر</td>
<td>40</td>
<td>مدني</td>
</tr>
<tr>
<td>نوفمبر</td>
<td>1221</td>
<td>الشرطة</td>
</tr>
<tr>
<td>نوفمبر</td>
<td>50</td>
<td>مدني</td>
</tr>
<tr>
<td>ديسمبر</td>
<td>1211</td>
<td>الشرطة</td>
</tr>
<tr>
<td>ديسمبر</td>
<td>55</td>
<td>مدني</td>
</tr>
</tbody>
</table>

3.3.1 Inclusion criteria:
All available pregnant women attending antenatal unit at Samir healthcare center and El-Ribat university Hospital, during the period from September to December 2014.

3.3.2 Exclusion criteria:
Pregnant women who refuse to participate on this study.

3.4 Sample size
The sample size was consisted of all available pregnant women which consist of(110)

3.5 Data collection tool:
Data was collected by researcher during the period from October to December 2014 by practice and self-administer questionnaire.

3.7 Data analysis
The collected data was analyzed using Statistical Package for Social Sciences (SPSS) program.
3.8 Ethical Consideration

- Official letter was taken from Gezira university and submitted to the research department at the targeted hospital along with a copy of the proposal and the data collection tool. The application was approved by the ethical committee of these institutions.

- The concept of individual autonomy was upheld in this study. All participants were approached with respect and honor. Their participations in the study were solicited, after a verbal consent to participate, an introductory letter carefully as an evidence of voluntary participation after they have understood the purpose of the research.

- No individual was coerced, induced or deceived to participate in the study.

- Participant in the study were assured of the protection of their identity.

- All participants have the right not to answer any part of the questionnaire if they consider it will have adverse effect on them. Privacy and dignity were ensured in this study.
Chapter four

Analysis and Results
4. Analysis and Discussion

Figure (1):

Distribution of study sample according to age groups

Results of figure (1) showed that 49.1% of women aged between 20 - 30 years, 32.7% their ages between 31-40 years, 11.8% less than 20 years and only 6.4% of respondent women their age more than 40 years.
Distribution of the study sample according to their residence

In the above figure, the majority of respondents (93.6%) were living in urban areas, while only (6.4%) were living in rural areas.
Figure (3):

Distribution of the study sample according to educational level

Results of figure (3) showed that 45.4% of respondents were graduated, 37.3% finished their secondary schools, (11.8%) primary school and (5.5%) were illiterate.
Distribution of the study sample according to occupation

Results of figure (4) showed that the majority of respondent women (71.8%) were housewives, 20% employees, 4.5% students, 2.7% free work, and only one woman was worker.
Figure (5):

Distribution of the study sample according to their monthly income

In the above figure the majority of respondent women (63.6%) their monthly incomes between 500-1000 SDG, 13.6% less than 500 and 1000-1500 respectively and 9% their monthly income more than 1500 SDG.
Figure (6): (n=110)

Distribution of the study sample according to the number of pregnancies

Results of figure (6) showed that the majority of respondent women had more than 2 pregnancies, 25.5% one pregnancy, and 15.5% 2 pregnancies.
Figure (7):

Distribution of the study sample according to the number of gravidities

Results of figure (7) showed that the more than half of respondent women had 1-2 gravidity, 26.3% more than four gravidity, and 22.1% had 3-4 gravidity.
Distribution of the study sample according to spacing between 2 pregnancies

Results of figure (8) showed that 39.1\% of respondents said that their spacing periods 2 years, 33.7\% said it is more than 2 years, while 27.2\% said their spacing periods is only one year.
Distribution of the study sample according to their regular visits to the antenatal care center

In the above figure, the majority of respondent women stated that they visits antenatal care center regularly.
Distribution of the study sample according to their usage of iron tablets in previous pregnancies

In the above figure, the majority of respondent women (81.8%) stated that they used iron tablets in their previous pregnancies.
Figure (11)  

\[ N = 110 \]

Distribution of the study sample according to their suffering from complications during pregnancy

In the above figure, the majority of respondent women (78.2%) stated that they didn’t suffer from any complications during their pregnancy, only 21.8 suffered from some complications.
Results of figure (12) showed that the majority of respondents (60%) their hemoglobin levels between 60%-80% (Mild anemia), 33.6% normal (80% and more), only 6.4% of respondent women were suffering from moderate anemia (40%-60%).
Distribution of the study sample according to the sources of information

As shown in the above figure respondent’s information about anemia varies from curriculum 48.2% health center 43.6% radio and TV 40.9% to newspaper 27.3% and courses 7.2%
Table (3) Knowledge of respondents regarding definition of anemia

<table>
<thead>
<tr>
<th>Item</th>
<th>Yes</th>
<th>No</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F</td>
<td>%</td>
<td>F</td>
</tr>
<tr>
<td>Anemia is Malnutrition</td>
<td>92</td>
<td>83.6%</td>
<td>18</td>
</tr>
<tr>
<td>Anemia is iron deficiency</td>
<td>96</td>
<td>87.3%</td>
<td>14</td>
</tr>
<tr>
<td>A decrease in the rate of blood</td>
<td>96</td>
<td>87.3%</td>
<td>14</td>
</tr>
</tbody>
</table>

Result of the above table showed that the majority of the study sample responded with correct answer regarding definition of anemia (87.3%) reported anemia is iron deficiency and decrease in the rate of blood 83.6 anemia is malnutrition.
Table (4) Knowledge of respondents regarding symptoms of anemia

<table>
<thead>
<tr>
<th>Item</th>
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<th></th>
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<th></th>
<th>Total</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F</td>
<td>%</td>
<td>F</td>
<td>%</td>
<td>F</td>
<td>%</td>
</tr>
<tr>
<td>Difficulty in breathing</td>
<td>39</td>
<td>35.5%</td>
<td>71</td>
<td>64.5%</td>
<td>110</td>
<td>100%</td>
</tr>
<tr>
<td>Fatigue and exhaustion</td>
<td>88</td>
<td>80%</td>
<td>22</td>
<td>20%</td>
<td>110</td>
<td>100%</td>
</tr>
<tr>
<td>General weakness</td>
<td>97</td>
<td>88.2%</td>
<td>13</td>
<td>11.8%</td>
<td>110</td>
<td>100%</td>
</tr>
<tr>
<td>Loss of appetite / dizziness</td>
<td>90</td>
<td>81.8%</td>
<td>20</td>
<td>18.2%</td>
<td>110</td>
<td>100%</td>
</tr>
<tr>
<td>Headache</td>
<td>79</td>
<td>71.8%</td>
<td>31</td>
<td>28.2%</td>
<td>110</td>
<td>100%</td>
</tr>
<tr>
<td>Pale in the face</td>
<td>94</td>
<td>85.5%</td>
<td>16</td>
<td>14.5%</td>
<td>110</td>
<td>100%</td>
</tr>
</tbody>
</table>

As shows in the table the majority of study sample responded with correct answers regarding symptoms of anemia 88.2%, mentioned general weakness,85.5% mentioned pale in face, 81.8% reported loss of appetite/ dizziness, 80% reported fatigue and exhaustion, 71.8% headache as the main symptoms of anemia only 35.5% mentioned difficulty in breathing as a symptoms of anemia.
Table (5) Knowledge of respondents regarding causes of anemia

<table>
<thead>
<tr>
<th>Item</th>
<th>Yes</th>
<th>%</th>
<th>No</th>
<th>%</th>
<th>Total</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malnutrition</td>
<td>103</td>
<td>93.6%</td>
<td>7</td>
<td>6.4%</td>
<td>110</td>
<td>100%</td>
</tr>
<tr>
<td>Bleeding during pregnancy</td>
<td>82</td>
<td>74.5%</td>
<td>28</td>
<td>25.5%</td>
<td>110</td>
<td>100%</td>
</tr>
<tr>
<td>Convergence of pregnancy</td>
<td>58</td>
<td>52.7%</td>
<td>52</td>
<td>47.3%</td>
<td>110</td>
<td>100%</td>
</tr>
<tr>
<td>Age at pregnancy</td>
<td>22</td>
<td>20%</td>
<td>88</td>
<td>80%</td>
<td>110</td>
<td>100%</td>
</tr>
<tr>
<td>Contraceptive use</td>
<td>16</td>
<td>14.5%</td>
<td>94</td>
<td>85.5%</td>
<td>110</td>
<td>100%</td>
</tr>
</tbody>
</table>

when discussing knowledge of respondents about causes of anemia the majority mentioned malnutrition 93.6% bleeding during pregnancy 74.5% as the main causes of anemia during pregnancy 52.7% mentioned convergence of pregnancy, and only 20% and only 14.5% reported age at pregnancy and contraceptive use.
Table (6) Knowledge of respondents regarding treatment of anemia

<table>
<thead>
<tr>
<th>Item</th>
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<th>No</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F</td>
<td>%</td>
<td>F</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>%</td>
<td></td>
</tr>
<tr>
<td>Food rich in iron</td>
<td>105</td>
<td>95.4%</td>
<td>5</td>
</tr>
<tr>
<td>Iron tablets</td>
<td>45</td>
<td>40.9%</td>
<td>65</td>
</tr>
<tr>
<td>Blood transfusion</td>
<td>20</td>
<td>18.2%</td>
<td>90</td>
</tr>
</tbody>
</table>

In the above table the vast majority of the study sample 95.4% responded with correct answer regarding intake of food rich in iron as a treatment of anemia only 40.9% and 18.2% mentioned intake of iron tabs and blood transfusion respectively as method of treatment of anemia during pregnancy.
Table (7) Knowledge of respondents regarding benefits of iron tablets

<table>
<thead>
<tr>
<th>Item</th>
<th>Yes</th>
<th></th>
<th>No</th>
<th></th>
<th>Total</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F</td>
<td>%</td>
<td>F</td>
<td>%</td>
<td>F</td>
<td>%</td>
</tr>
<tr>
<td>Good for the health of the mother</td>
<td>106</td>
<td>96.4%</td>
<td>4</td>
<td>3.6%</td>
<td>105</td>
<td>100%</td>
</tr>
<tr>
<td>Prevents anemia</td>
<td>102</td>
<td>92.7%</td>
<td>8</td>
<td>7.3%</td>
<td>105</td>
<td>100%</td>
</tr>
<tr>
<td>Good for children's health</td>
<td>104</td>
<td>94.5%</td>
<td>6</td>
<td>5.5%</td>
<td>105</td>
<td>100%</td>
</tr>
</tbody>
</table>

Almost more than 90% of the study sample responded with correct answer regarding benefits of iron tablets.
Table (8) Knowledge of respondents regarding food rich in iron

<table>
<thead>
<tr>
<th>Item</th>
<th>Yes</th>
<th>No</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F</td>
<td>%</td>
<td>F</td>
</tr>
<tr>
<td>Red meat</td>
<td>93</td>
<td>88.2%</td>
<td>17</td>
</tr>
<tr>
<td>Liver</td>
<td>103</td>
<td>93.6%</td>
<td>7</td>
</tr>
<tr>
<td>Green vegetables</td>
<td>99</td>
<td>90%</td>
<td>11</td>
</tr>
<tr>
<td>Fish</td>
<td>75</td>
<td>68.2%</td>
<td>35</td>
</tr>
<tr>
<td>Legumes</td>
<td>75</td>
<td>68.2%</td>
<td>35</td>
</tr>
<tr>
<td>White meat</td>
<td>84</td>
<td>76.4%</td>
<td>26</td>
</tr>
</tbody>
</table>

In table above the majority of the study sample responded with correct answer regarding food rich in iron, 93.6% mentioned liver, 90% mentioned green vegetables, 88.2% reported red meat, and 68.2% mentioned fish and legumes.
As shown in the above table the majority of respondents had a positive attitude to avoid anemia during pregnancy, where 96.4% eat legumes, 92.7% eat fruits, 90% eat white meat, 89.1% eat green vegetables, also respondents showed a highly positives attitude towards having iron tablets after eat (90.9%), having iron tablets daily (85.5%).
Chapter five

Discussion, Conclusion & Recommendation
5. Discussion

Referring to the demographic data most of respondent were less than 40 years (82.7%) and 93.6% of them were living in urban areas, with high educational level (82.7%) also the majority of respondent (71.8%) were housewives, and 77.2% with low monthly income (less than 1000 SDG). Increased educational levels is expected to improve knowledge and hence is expected to reflect more awareness regarding heath problems, however, in the current study it was difficult to see any link between educational level and the prevalence of IDA among the study population. Results of the study revealed that the majority of respondents (59.1%) had more than 2 pregnancies, (25.5%) one pregnancy, and (15.5%) 2 pregnancies. The study showed that more than half of respondent (51.6%) had 1-2 gravidity, 26.3% More than 4 gravidity, and 22.1% had 3-4 gravidity.

39.1% of respondents said that their spacing periods 2 years, 33.7% said it is more than 2 years, while 27.2% said their spacing periods is only one year. This similar to the study conduct in Bahrain which showed that the prevalence of anemia among pregnant women was reported those who had birth interval of less than two years tend to develop IDA (Beard2000) (Moosa etal2001).

The study showed, the majority of respondent women stated that they visits antenatal care center regularly. the majority of respondent (81.8%) stated that they used iron tablets in their previous pregnancies, but this is differ from the study reported in Sierra Leone which showed that pregnant women had low use of intermittent preventive treatment and low consumption of iron supplements during pregnancy due to unavailability of the tablets or the undesirable side effects experienced (USAID, 2011) so free provision of iron supplements must be done and health education about side effects.

The study revealed that (78.2%) of the study sample didn't suffer from any complications during their pregnancy, only 21.8 suffered from some complications. When I discussed the hemoglobin level among respondents (60%) their hemoglobin levels between 60%-80% (Mild anemia), 33.6% normal (80% and more), only 6.4% of respondent women were suffering from moderate anemia (40%-60%). When I compared this result with study mentioned in India the study revealed that it is the one of the countries with high prevalence of anemia It is widely prevalent in all age groups, nearly 58% in pregnant women due to many causes, the most important were
poor cognitive development and decreased work productivity. So they put” National Guidelines for Control of Iron Deficiency Anemia” which include the following
• Identification of anemic women during pregnancy
• Bringing these identified women to institutions for diagnosis and treatment
• Ensure follow-up visits
• Dietary counseling of pregnant women (increase intake of iron-rich foods such as green leafy vegetables, whole pulses, jiggery, meat, poultry and fish. Advice to take fruits and vegetables containing vitamin C in diet as these enhance the absorption of iron in the diet, high protein diet, including items such as black gram, groundnuts, ragi, whole grains.

High level of knowledge was reported by the participant with regard the definition of anemia as (87.3%, 87.3%, 83.6%) were able to link anemia with iron deficiency, low hemoglobin level, and poor nutrition, respectively. This similar to (Abu-Hasira, 2007) were high level of knowledge was reported by IDA group of participant with regard to the definition of anemia as (64.7%, 67.6%, 88.2%) were able to link anemia with poor nutrition, iron deficiency and HB levels respectively. Knowledge concerning symptoms associated with IDA was also found to be at high level and this is evident from the finding of 88.2% mentioned general weakness, 85.5% mentioned pale in face, 81.8% reported loss of appetite / dizziness, 80% reported fatigue and exhaustion, 71.8% headache as the main symptom of anemia.

High level of knowledge was also found among the study population regarding causes of IDA as (93.6%, 74.5% and 52.7% ) of them reported that poor nutrition, bleeding, during pregnancy and convergence of pregnancy, respectively. Poor knowledge was reported regarding age at pregnancy and contraceptive use as 80% and 85.8% fail to link age at pregnancy and contraceptive use as a possible cause of IDA. It is well known that women who use intrauterine device to prevent pregnancy may experience more bleeding and have a greater risk of developing an iron deficiency. This is partially different from the study of (Bukari, 2009) were poor knowledge was reported regarding age at pregnancy as a cause of IDA as 60% fail to link age at pregnancy as a possible cause of IDA.
Also it is different from study conducted in Ethiopia which showed that Higher magnitudes of anemia were reported from Arsi (36.6%), Addis Ababa (33%), and around Gilgel Gibe dam area in southwest Ethiopia (53.9 %), Eastern Sudan (62.6%).
This might be due to variation in sample size and presence of high malaria infection. For instance, the prevalence of malaria in the study done around Gilgel Gibe area (11.6%) and eastern Sudan (reported 13.7% of P. falciparum malaria) were relatively high which might have contributed to the high prevalence of anemia.

Heavy infection with soil-transmitted helminthes (STHs), particularly the hookworms, predisposes pregnant women and individuals with low iron store to anemia. In this study, more than a third of the pregnant women were infected with intestinal parasites, Ascaris lumbricoides and the Hook worms being predominant.

A high level of knowledge was also found among participants with respect to iron rich food including heme and non heme sources. This was based on the yes answers reported by this group.

Iron absorption is also influenced by the type of dietary iron consumed. Absorption of heme iron from meant proteins is efficient. Absorption of heme iron ranges from 15% to 35%, and is not significantly affected by diet. In contrast, 2% to 20% of non heme iron in plant food such as rice, maize, black beans, soybeans and wheat is absorbed. Non heme iron absorption is significantly influenced by various food components.

A high level of knowledge was also found among responded with respect to benefits of iron tablets were more than 90% of the study sample responded with correct answer regarding benefits of iron tabs.

Knowledge concerning of iron deficiency anemia was also found to be at high level and this is evident from that the finding that the vast majority of the study sample 95.4% responded with correct answer regarding intake of food rich in iron as treatment of anemia.

Poor knowledge was reported regarding intake of iron tabs and blood transfusion were only 40.9% and 18.2% mentioned intake of iron tabs and blood transfusion respectively as the methods of treatment of anemia during pregnancy.

Data presented in table(7) represent a set of questions used to evaluate the attitude of pregnant women enrolled in the current study towards IDA.

As the majority of respondents showed a positive attitude to avoid anemia during pregnancy, where 96.4% eat legumes, 92.7% eat fruits, eat white meat, 89.1% eat green vegetables, also respondents showed a highly positive attitude towards having iron tablets after eat (90.9%), having iron tabs daily (85.5%). this differ from study conducted in Bahrain which revealed that IDA was more prevalent among non-Bahraini
pregnant women, which could be related to the nutritional habits of this population who mainly depend on carbohydrates in their feeding.
6.1 Conclusion

Based on the result of the study conducted that iron deficiency during pregnancy is likely to lead to continuation of iron deficiency during lactation and long term, as it takes time to replete iron stores once they have been exhausted. For this reason alone, it is important to prevent the development of iron deficiency anemia during pregnancy.

Results of the current study showed a high levels of knowledge among the study group regarding definition, symptoms, were their knowledge level about causes, treatment seems to be inadequate specially when regarding important causes of iron deficiency anemia.
6.2 Recommendation

1- The study recommended that physician and health professionals must pay attention to teach pregnant women about dietary habits as a part of overall approach to health promotion.

2- Raising pregnant women awareness through awareness programs, educational programs.

3- Regular follow up, check of hemoglobin, for early detect of IDA.

4/ provision of iron supplement and folate free to heath centre
References
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32. Palestinian national authority, MOH (2004), Health system development project, Quality improvement program: Palestinian guidelines for diagnosis and management of anemia. First edition.
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Appendix
جامعة الجزيرة - كلية العلوم الطبية التطبيقية - شعبة التمريض

برنامج ماجستير صحة المجتمع

إستبيان عن معرفة وسلوكيات النساء الحوامل تجاه فقر الدم الناتج عن نقص الحديد أثناء فترة الحمل

مستشفى الرباط الوطني ومركز صحي سمير بمدينة الخرطوم - ولاية الخرطوم - السودان

في الفترة من سبتمبر الي ديسمبر 2014

1 - العمر:
أقل من 20 سنة ( ) 21 - 30 ( ) 31 - 40 ( ) أكثر من 40 سنة ( )

2 - مكان السكن:
المدينة ( ) الريف ( )

3 - المستوى التعليمي:
أمي ( ) محو الأمية ( ) أساس ( ) ثانوي ( ) جامعي ( )

4 - الوظيفة:
رقبة منزل ( ) موظفة ( ) عاملة ( ) اعمال حرة ( ) أخرى حددي ( )

5 - الدخل الشهري:
أقل من 500 جنيه ( ) 501 - 1000 ( ) 1001 - 1500 ( ) 1501 - 2000 ( ) أكثر من 2000 جنيه ( )

6 - عدد مرات الحمل: مرة ( ) مرتين ( ) أكثر من مرتين ( )

7 - عدد الولادات: واحد ( ) إثنين ( ) أكثر من إثنين ( )

8 - متوسط الفترة بين الحمل وآخر: سنة ( ) ستة ( ) أكثر من ستة ( )

9 - هل تزورين المركز بانتظام: نعم ( ) لا ( )

10 - هل كنت تستخدمين اقراص الحديد في فترات الحمل السابقة: نعم ( ) لا ( )

11 - هل تعانيين من مضاعفات أثناء الحمل: نعم ( ) لا ( )

12 - إذا كانت الأجابة نعم حددي ( )

13 - مستوي الهيموجلوبين الحالي

14 - ما هي مصادر المعلومات:
ما هو فقر الدم:

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<thead>
<tr>
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17 -تناول أقراص الحديد يوميا أثناء الحمل:

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18 - الغذاء الغني بالحديد:

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<td>الكبد</td>
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<td>الخضار (رجلة - بقدونس - ملوخية)</td>
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<tr>
<td>السمك</td>
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<td>الببقوليات</td>
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<td>اللحوم البيضاء</td>
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19 - السلوكيات:

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<th>لا</th>
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<tr>
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هل تتناولين اللحوم البيضاء - الكبدة