An-Najah National University
Faculty of Graduate Studies

Iron Deficiency Anemia among Pregnant Women in Nablus District; Prevalence, Knowledge, Attitude and Practices

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Dedication

To My Beloved Parents, Husband

To My Sister Ansam

For their Patience and Encouragements

To My Children

With Love and Respect

Acknowledgments

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Last, my sincere thanks are to my family and husband for their continuous support during my years of study.

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List of Abbreviations

KAP: Knowledge, Attitudes, and Practices

IDA: Iron Deficiency Anemia

CBC: Complete Blood Count

Hb: Hemoglobin

Hct: Hematocrit

SF: Serum ferritin

Serum transferring receptor: TFR

IUD: Intra Uterine Device

BMI: Body Mass Index

WHO: World Health Organization

UNRWA: United Nation Relief and Work Agency

CDC: Centers for Disease Control and Prevention

MOH: Ministry of Health

MCH: Mother and Child Health

WB: West Bank

GS: Gaza Strip

OPT: Occupied Palestinian Territory

SPSS: Social Package of Statistical Sciences

NIS: New Israeli Sheqalim

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Abstract

The current study aimed to estimate the prevalence of iron deficiency anemia (IDA) among pregnant women who attend governmental antenatal care centers in Nablus district and to explore and assess knowledge, attitude, and practices of pregnant women towards IDA. The study was conducted during the period June- August, 2006 and the sample consisted of 207 pregnant women (207; 110 second trimester, 97 third trimesters) in the age group (17-41) years. Out of 207 participants 137 were city inhabitance and 70 were village residence. Blood samples were collected from each pregnant woman and a questionnaire was completed at the time of blood collection. Hemoglobin (Hb), and serum ferritin were determined, and the collected data was analyzed using SPSS.

The overall prevalence rate of iron deficiency anemia was (21.7%). Iron deficiency anemia was most prevalent in the third trimester (69%) compared to second trimester pregnancy (31%). The prevalence rate among city inhabitance (25.5%) was higher that found among village inhabitance (14.3%), however differences in the prevalence rates were of no statistically significant value ($\boldsymbol{P} = 0.$).

Younger age group (≤ **24**) shows the highest prevalence rate of IDA (35.6%) among IDA group. Years of education, working status, number of family members and monthly income seems to have no effect on the status of IDA as working women, those with more years of education, high monthly income and those with large number of family members were with lower prevalence of IDA. Slight increase in the prevalence rates of IDA was found with increased number of pregnancies; however, increased years of spacing did not show this effect. Neither smoking status, nor previous history of chronic disease or weight of last born baby seems to show any association with IDA status. Previous and current use of iron supplements as a main preventive measure for IDA seems to have limited effect in lowering the prevalence rate of IDA, a situation that might be due to problems of compliance or any other hidden factors. Early registration and increased number of visits also found to have no effect on improving the status of IDA; a situation might draw the attention to the role and effectiveness of the health care system in the area.

The study showed a high level of knowledge with respect to causes, symptoms, iron rich food sources, importance of iron supplements and iron absorption in relation to IDA among both IDA and non IDA groups. However, poor knowledge was found with respect to the effect of IDA and mother and fetal health and the use of iron supplements and absorption. Highly positive attitudes and practices were also found in respect to the importance of regular visits to maternal care centers, use of iron supplement and multiple pregnancies.

In conclusion, 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 IDA and there is a great need for further health education promotional programs in this respect.

Chapter One
Introduction

1.1 General background

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.[1] The greatest need for increased iron in take 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.[2]

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.[3] 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:

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.

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

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.

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.

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.

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 birth-weight 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.[4]

1.2 Definition

Iron deficiency anemia is generally defined as a decrease in the oxygen-carrying 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.

1.3 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.

1.4 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.

1.5 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. 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.[5]

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.[6]

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.[8] Table 1.1 represents the criteria for anemia in pregnancy (maximum hemoglobin and hematocrit values for anemia).[8, 9]

Table 1.1 Criteria for cutoff values for Hb and Hct for anemia in pregnancy

Stage of pregnancy	Hb level g/dl Lower average	Hct(%)
First	11.0	33.0
Second	10.5	32.0
Third	11.0	33.0

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. 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. [10]

1.6 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. Data presented in table 1.2 shows the most common available iron salts in the market; however, ferrous sulphate is the most common from used by the Palestinian Ministry of Health and provided by Mother and child health (MCH) care centers.[9]

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.[11] 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.

Table 1.2 Iron salts available in Palestinian market

Oral salt	Amount	Content of ferrous iron
Ferrous fumarate	200mg	65mg
Ferrous gluconate	300mg	35mg
Ferrous succinate	100mg	35mg
Ferrous sulphate	300mg	60mg
Ferrous sulphate (dried)	200mg	65mg

1.7 Prevention of IDA among pregnant women

Iron supplementation beginning at the first prenatal visit. The Centers for Disease Control and Prevention[11] recommends starting low-dose (30mg/day) supplements of iron at the first prenatal visit, with twin pregnancy, a larger dose needed.[3] 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.[12] 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. [12]

1.8 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.[7] Such situation renders both mother and fetal neonatal risks.

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).[13] 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.

1.9 Prevalence of iron deficiency anemia worldwide

Iron deficiency anemia is a serious public health problem affecting more than 700 million people in the world.[14] It is considerably more prevalent in the developing regions (59.0%) than in the industrialized world (14.0%).[15] Pregnancy, delivery, and lactation constitute a major drain on the iron reserves of women.[16, 17] Previous studies on iron deficiency anemia have revealed a prevalence of 39.7% in Kuwait[14], 78.0% in Liberia[18], 73.9% in Guyana[19], 61.0% in Jamaica[20], 50.0% in Bahrain[21], 22.1% in Egypt[22], and 19.8% in Northern Ireland.[23] Data presented in table 1.3 below shows the worldwide prevalence rate of ID and IDA.[24]

Table 1.3 Worldwide prevalence rate of ID and IDA

Regions	**Population with IDA (millions)**	**Prevalence of anemia in pregnant women (%)**
Africa	206	52
The Americas	94	40
Europe	27	18
Eastern Mediterranean	149	50
Southeast Pacific	616	74
Western Pacific	1058	40
Developed Countries		18
Developing Countries		56
Total	2150	51

1.10 Prevalence of iron deficiency anemia among women in Palestine

In the Gaza Strip, iron deficiency (Hb< 11g/dl) among pregnant women who attended government MCH clinics in 2003 reported to be 20.9%. However, a higher percentage (38.3%) reported among pregnant women attending UNRWA antenatal clinics.[25]

In 2002, a study conducted in the West Bank area of Palestine showed that the incidence of anemia seems to increase with age and women aged 40-49 are four times more likely to suffer from anemia than women did in the adolescent age. Childbirth and close birth spacing most likely affect the incidence of anemia.[25] According to the Palestinian Bureau of Statistics, a middle child born within 18 months of an older and a younger sibling was significantly more likely to become anemic. The report also showed that anemia increases with number of pregnancies, reaching 48% in women with 11 or more pregnancies. The prevalence of anemia among women aged 15-49 years taking iron was only 7.1%.[25] Data presented in table 5.1 shows the prevalence of anemia among pregnant women in both of the West Bank and Gaza areas for the year 2002 according to Palestinian

Central Bureau of statistics and the study conducted by Al Quds University and Johns Hopkins University. [25]

Table 1.4 Prevalence of anemia among pregnant women in both of the West Bank and Gaza areas for the year 2002

Date	**Sample size**	**% Anemia Pregnant < 11 g/dL Non-pregnant <12 g/dL**			
			West Bank	**Gaza**	**Total**
2002 [1]	3,257	Pregnant			31.1
		Non-pregnant	32.8	38.5	34.8
2002 [2]	1,534	Non-pregnant	43.9	52.8	47.0

Anemia continues to be a major public health problem in the OPT (WHO consider that anemia above 40% in women and young children is a severe and between 20-39.9% as moderate public health problem), despite the fact that the MOH has protocols on the management of iron deficiency anemia provides iron supplements free of charge to women.[25]

1.11 Management of iron deficiency anemia in Palestine

1.11.1 Screening

All pregnant women should be screened for anemia at their first antenatal care visit and re-screened during the third trimester (at 28-36 weeks). The present policy provides one screening at 30 weeks and one at 36 weeks, in addition to screening in the first week postpartum. Women who were anemic during pregnancy or had multiple deliveries screened for anemia at 4-6 weeks postpartum.

1.11.2 Diagnosis

Initial diagnosis of anemia is usually based on laboratory test of Hb or Hct levels in blood and the cutoff values are shown in Table 1.5.[26] 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. Table 1.6 shows the recommended weight gain during pregnancy.[26]

Table 1.5 Classification of anemia

Classification of anemia	HB level (g/dL)
Mild	> 9.5-10.9 g/dL
Moderate	7-9.5 g/dL
Severe	< 7 g/dL

Table 1.6 weight gain recommendations for pregnancy

Pre-pregnancy weight category	Recommended total gain	
	Kilograms	Pounds
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

BMI = body mass index (kg/m^2)

Pre pregnancy Body Mass Index (BMI) is a measure of weight for height expressed as wt (kg)/ht (m^2) 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.[27] 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. [27]

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.

1.11.3 Treatment

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.

1.12 Aims of the study

The current study aimed to estimate the prevalence of iron deficiency anemia among pregnant women attending governmental antenatal care centers in Nablus district and to explore and assess knowledge, attitude, and practices of pregnant women towards IDA.

Chapter Two
Methodology

2.1 Research design

The study was designed to estimate the prevalence of IDA and to explore and assess knowledge, attitude, and practices of pregnant women who attend antenatal care at MCH government center towards iron deficiency anemia.

2.2 Sampling method and study limitations

The study sample included all pregnant women in the second and third trimester (total 207; 110 second trimester, 97 third trimesters) in the age group (17-41) years, who attend antenatal care at governmental MCH centers in Nablus district (207; 137 Nablus city, 70 villages).

All pregnant women enrolled in the centers in Nablus city were selected. Centers in villages were selected based on presence of laboratory services in those villages. Table 2.1 shows the selected centers and their distribution in Nablus district. Data were collected during the period June –August, 2006. Unfortunately we were unable to cover other districts due to difficulties in reaching these areas under the prevailing political situation an other obstacle was financing such project for large sample number.

Table 2.1 Distribution of the study sample in the Nablus district

MCH center in Nablus city	**Number of cases**
Al -Makhfiya	15
Al -Reaya Al-Markazeyah	61
Ras Al-ein	18
Habs Al dam	14
Balata	29
Total	137
MCH center in villages	**Number of cases**
Asira Ash-Shamaliya	2
Sabastiya	2

Jammaen	1
Huwwara	10
Burin	1
Tell	2
Al-Sawya	2
Urif	5
Einabus	1
Beit Furik	10
Aqraba	2
Deir Al-Hatab	3
Qabalan	2
Awarta	2
Roujeb	3
Beit Dajan	1
Talfit	2
Qaryut	2
Azmut	5
Beit Iba	4
Deir Sharaf	3
Qusin	4
An-Naqura	1
Total	70

2.3 Ethical consideration

Permission obtained from the Palestinian Ministry of Health to carry out the study. Consent obtained from each pregnant woman after discussing with each of them the purpose of the study and all related matters to the research purpose. All the women informed that obtained data is confidential and only for research purposes.

2.4 Instrument of data collection

The study utilized two main types of research instruments:

2.4.1 Questionnaire

A specially designed questionnaire was prepared [see Appendices]. The questionnaire was divided into four main areas covering; demographic

data, knowledge, attitude and practices of pregnant women towards iron deficiency anemia. For verifying the consistency random samples were distributed and reused for this purpose. Modifications were also made based on the recommendations of the supervisors and other specialists in the field concerning validity of the questionnaire.

2.4.2 Blood tests and procedures

Blood samples were collected from all participants and complete blood count (CBC) was conducted for all pregnant women. Based on hemoglobin level, all samples with a value less than 10.5 g/dL (second trimester) and less than 11 g/dL (third trimester) were considered to be at risk and were subjected to serum ferritin test. Blood sample collection and blood tests were performed as described later on the procedure section. Table 2.2 represents the adopted cutoff values for the used blood tests for iron deficiency anemia.

Table 2.2 Hemoglobin levels (Hb) g/dL and serum ferritin level ng/ml

Pregnant women (trimester)	Hb level g/dL Lower average	Serum ferritin ng/ml
Second	10.5	3.5-223.5
Third	11.0	

Serum ferritin range adopted from DRG Ferritin ELISA kit for the quantitative determination of ferritin in the serum

2.4.2.1 Procedure

Blood sampling and analysis was carried out as follows:

1. Blood samples were drawn by the researcher
2. Blood samples were then transferred by ice-box under appropriate conditions, in order to avoid exposure to high temperature, to An-Najah National University central lab for further analysis
3. CBC was performed on all samples

4. Serum ferritin test were carried out for samples with hemoglobin less than 10.5g/dL for pregnant women in second trimester, and with hemoglobin less than 11g/dL for pregnant women in third trimester to confirm IDA.

CBC was carried out using Cell Dyne 1800 (Auto analyzer) and serum ferritin was carried out using Stat Fax 1100 (ELISA), using DRG Ferritin ELISA for the quantitative determination of ferritin in the serum as described by the manufacturer (DRG Ferritin ELISA test kits).

2.5 Data analysis

Data of the questionnaire and results of blood tests were analyzed using software program statistical package for social sciences (SPSS). Frequencies and percentages were calculated and chi-square test was performed to investigate the significance in the association of the different variables and the prevalence of IDA. Correlations were considered significant if the observed significance level (***P***-value was < 0.05).

Chapter Three
Results and Discussion

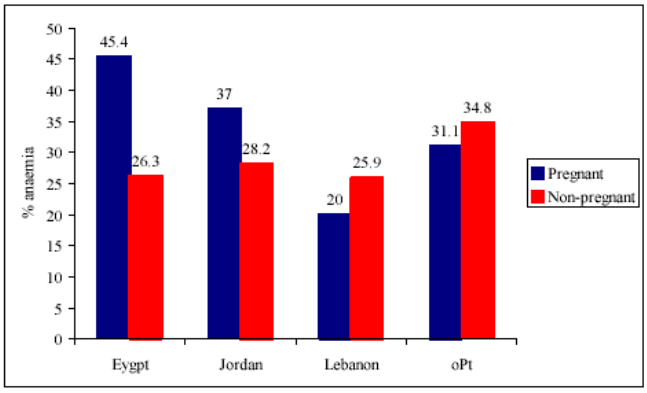
3.1 Prevalence of IDA among study population

Iron-deficiency anemia is the most common nutritional deficiency in the world.[28] It is most prevalent in pregnant women, infants, and children. Reports from WHO estimated the number of affected people around five billion of which, two billion people suffer from anemia. Approximately 50% of all anemia cases seem to be due to iron deficiency.

Despite the fact that the Palestinian Ministry of Health has protocols for management of iron deficiency anemia that involves free iron supplements, the prevalence of anemic mothers who visited the governmental Mother and Child Health (MCH) for antenatal care was 24.9% among the inhabitance of Gaza strip and 46% among the inhabitance of the West Bank area.[29] Such alarming high prevalence encouraged us to evaluate the status of IDA among pregnant women using internationally recognized tests of evaluation as well as the use of other confirmatory tests, especially for pregnant women who received iron supplementations. We also tried to explore and assess knowledge, attitude, and practices of pregnant women towards IDA in the study area.

Based on Hb and serum ferritin levels, the prevalence of 21.7% for IDA was found among our study population (see Table 3.2). This rate is much lower than that previously reported by the Palestinian Ministry of Health and WHO for the area. The discrepancy in the prevalence rates might be attributed to the fact that previous estimates were based on Hb levels only (level below 11g/dL) without other confirmatory tests. Thinking of the strategies adopted by MCH in the area one should expect a much lower rate of IDA than that observed in the current study and this might be contributed to the effectiveness of the adopted strategy.

When compared with neighboring countries one can see that IDA prevalence among pregnant women in the Lebanon (20%) and OPT (31.1%), is much better than that reported for Egypt, 45.4% and Jordan, 37% (see Figure 3.1).[30]



Sources: *(Department of Statistics 2003; El Zanaty and Way 2001; Hwalla and Adra 1998; Palestinian Central Bureau of Statistics *et al.* 2003)

Figure 3.1 Anemia among pregnant women in Egypt, Jordan, Lebanon and OPT.

3.2 Demographic data and IDA among study population

Data presented in table 3.1 shows the prevalence of IDA in association with age, place of residence, years of education, working status, number of family members and income. Out of 207 participants, 45 pregnant women were found to suffer from IDA with a total prevalence rate of (21.7%). Among this group 32% were in their thirds trimester and 12.7% were in the second trimester. Differences in the prevalence rates in second and third trimester were statistically significant ($\boldsymbol{P} = 0.001$ at $\alpha = 0.05$). Hemoglobin or Hematocrit levels drop during the first and second trimester because of blood volume expansion. Among pregnant women who do not take iron supplements Hb and Hct remain low during the third trimester.[27] Our data is consistent with reports of the nutritional survey conducted in Gaza in collaboration with the CDC.[31] Although, our study sample seems to take

iron supplements during second trimester, the prevalence of IDA among third trimester group is still high.

All participants are attending maternal health care centers and receiving similar health services, however, a higher prevalence rate of IDA was found among city inhabitance 35 out of 137 (25.5%) compared to 10 out of 70 (14.3%) among villages inhabitance [see Table 3.1]. Differences in the prevalence rates were not significant ($\boldsymbol{P}$ = 0.063 at α = 0.05). Such differences might be due to the fact that rural communities with different eating habits and social beliefs as our data exclude problems associated with compliance to iron supplements, knowledge, attitudes and practices of pregnant women living in these areas. Our findings in this respect are inconsistent with those reported from various regions in Jordan as a rural area was reported to show a higher prevalence rates for IDA**.** [32]

Younger age group (≤ **24**) in our study seems to show the highest prevalence rate of IDA (16 out of 60; 26.7%, see Table 3.1). This is in agreement with previous reports among such age groups as adolescent women are at higher risk for developing IDA due to the fact that they must meet their nutritional needs for their growth in addition to the nutritional needs during pregnancy. It is also well known that iron needs are high in adolescent girls because of the increased requirements for expansion of blood volume associated with the adolescent growth spurt and the onset of menstruation.[33] Differences in the prevalence rates among the various age group were of no statistically significant values ($\boldsymbol{P}$ = 0.652 at α = 0.05).

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, and in contrast we found that the prevalence showed increased levels with increased years of education (≤ 6, 20%; 7-11, 19.3%; ≥ 12, 24.5%) [see Table 3.1]. Differences in the prevalence rates among the various educational group were not statistically significant (***P*** = 0.684 at $\alpha = 0.05$).

With respect to the working status one also expect to see higher prevalence rates of IDA among the working group of pregnant women as they might be engaged in their work and may not be able to pay the required attention for their body needs of rest and nutrient. Our data in this respect showed that the prevalence of IDA was much higher among working group (4 out of 15: 26.7%) compared to non working group (41 out of 192: 21.4%) [see Table 3.1]. Differences in the prevalence rates were not statistically significant (***P*** = 0.631 at $\alpha = 0.05$).

Findings with respect to number of family members and family income were also found as with decreased number of family members and increased of monthly income an increased of the IDA prevalence rate was found (see Table 3.1). This finding is inconsistent with that of Scholl & Hediger were iron deficiency anemia in pregnancy was reported to be often associated with low socioeconomic status, multiple pregnancy, extremes of maternal age, and smoking, all of which independently account for the poor pregnancy outcomes.[34]

Table 3.1 Demographic data and IDA among study population

Variables		Mean	IDA		Non IDA		P-value
			No.	%	No.	%	
Place of residence	City	1.37	35	25.5	102	74.5	0.063
	Village		10	14.3	60	85.7	
Age (years)	24 and <	28.57	16	26.7	44	73.3	0.652
	25-29		10	17.2	48	82.8	
	30-34		11	22.4	38	77.6	
	35 and >		8	20	32	80	
Years of education	6 and <	10.47	5	20	20	80	0.684
	7-11		17	19.3	71	80.7	
	12 and >		23	24.5	71	75.5	
Working status	Yes	1.93	4	26.7	11	73.3	0.631
	No		41	21.4	151	78.6	
Family members	5 and <	5.27	27	22	96	78	0.535
	6 and >		18	21.4	66	78.6	
Monthly income (NIS)	700 and <	1394.5	8	16.3	41	83.7	0.507
	701-1100		15	28.3	38	71.7	
	1101-1500		10	19.6	41	80.4	
	1501 and >		12	22.2	42	77.8	

3.3 Clinical data and IDA among study population

Early age at first marriage is considered to be at high risk for IDA due to lower body iron stores in young age.[35] Our findings the youngest age group 14-16 showed the highest prevalence rate 24.3% compared to the rates of 21.6%, 23.5% and 17.8% among age groups 17-19, 20-22 and 23 or more, respectively (see Table 3.2). Differences in the prevalence rates among the various age group were not statistically significant ($\boldsymbol{P}$ = 0.509 at $\alpha = 0.05$). Furthermore, early marriage is known for its association with health problems includes premature pregnancies, which cause higher rates of maternal and infant mortality. A strong correlation between the age of the mother and maternal mortality and morbidity has been established and reported by many authors. For examples girls aged 10-14 are five times more likely to die in pregnancy or childbirth than women aged 20-24; while girls aged 15-19 are twice as likely to die. Majority of these deaths take place within marriage. In Nigeria, Cameroon and Ethiopia, maternal

mortality among adolescents under 16 was found to be six times higher than for young women aged 20-24. Notably, for every woman who dies in childbirth, about 30 more suffer injuries. On the other hand teenage girls are also more vulnerable to sexually-transmitted infections.[36] On the other hand early age at first pregnancy seems to be associated with high prevalence of IDA. Differences in the prevalence rates among the various age group were of no statistically significant values ($\boldsymbol{P}$ = 0.931 at α = 0.05).

Participants with 4 or more pregnancies seems to show lower prevalence rates of IDA as (25 out of 120: 20.8%) of IDA participants were with 4 or more pregnancies compared to (20 out of 87: 23%) for those with 3 pregnancies or less (see Table 3.2). This is contradictory the expectation as irons stores being depleted and exhausted due to frequent and close intervals pregnancies and deliveries.[31] Differences in the prevalence rates were not statistically significant ($\boldsymbol{P}$ = 0.419 at α = 0.05).

Data presented in Table 3.2 also showed that no clear association between pregnancy spacing and IDA as low prevalence rate was found among participants with decreased years of spacing (21.3% among those with 3 years or less of spacing compared 23.3% among those with 3-5 years of spacing). Our findings are inconsistent with previous reports indicating that women with longer birth intervals were more likely to avoid anemia. Women with a history of poor nutritional status, close spacing of pregnancies, twin gestation, or excessive vaginal bleeding may be at risk of developing IDA during pregnancy. [37]

A clear association between IDA and smoking status, among IDA group (31% smokers, 20% nonsmokers). The prevalence of IDA among those suffering from chronic health problems, such as diabetes, GI

problems and urinary tract infections was higher than that of free health problems (26.1% among suffering group compared to 19.6%). No clear association between IDA and weight at birth for the last born baby was found.

Previous and current use of iron supplements seems to affect the status of IDA as lower prevalence rates were observed among those reported the current and previous use compared to other group (previous; 20.9% compared to 25%; current; 20.8% compared to 33.3%). This is an expected observation as iron supplement is a major treatment option. Dose differences of iron supplements seem to have no effect on the status of IDA among the study population and the reason behind such observation could be due to either non compliance of the participants or other problems associated with absorption. It is important to note that some of the participants reported non compliance due to various observed side effects of iron tablets due to high dose. Heart burn, vomiting and constipation were among the most commonly reported side effects. One also should not exclude other factors including diets and healthy practices for pregnant women. A recommended strategy recommended by WHO to prevent iron deficiency anemia in pregnant women is to provide universal supplementation of iron (60mg per day) and folic acid (400μg/day) as soon as possible after gestation starts-no later than the third month-and continuing for the rest of pregnancy.

According to the WHO, a pregnant woman should pay at least 4-6 antenatal visits to a health facility in order for the visits to be effective. In the Palestinian territories, UNRWA maternal health policy advocates early registration of women for antenatal care as early as possible after the

establishment of pregnancy status in order to ensure early assessment of the risk status and carry out effective and timely intervention, as and when necessary. A clear association between early registration, of gestational age, and IDA was found among participants. This is clear from the findings among those registered at more than 5 months of gestation (83.3% suffering from IDA) compared to those registered at earlier gestational ages (20% or less). No clear association between number of visits and the status of IDA.

Pre-pregnancy BMI is a determinant of weight gain during pregnancy and birth weight. The lower a woman's weight-for-height or BMI the more likely she is to be undernourished. Women who are underweight prior to pregnancy are at a higher risk for having low birth weight infant, fetal growth problems, pre-natal mortality and other pregnancy complications as shown earlier in Table 1.6.

With respect to BMI in the current pregnancy of the respondents, the prevalence of IDA was 29.2% among normal body weight respondents - BMI= 19.8-26, while lowest prevalence rates of 12.8% and 14.3% were found among overweight and underweight groups, respectively. Differences in the prevalence rates were statistically significant values ($\boldsymbol{P}$ = 0.021 at α = 0.05). Our findings in this respect is contradictory to internationally reported data and this is most likely due to the limited number of cases involved in the current study which might not reflect the actual status.

Table 3.2 IDA and clinical data among study population

Variables		Mean	IDA		Non IDA		P-value
			No.	%	No.	%	
Age at marriage/y	14-16	20.20	9	24.3	28	75.7	0.509
	17-19		16	21.6	58	78.4	
	20-22		12	23.5	39	76.5	
	23 and >		8	17.8	37	82.2	
Age at first pregnancy/y	15-17	20.87	10	22.7	34	77.3	0.931
	18-19		17	23.6	55	76.4	
	21-23		10	20.8	38	79.2	
	24 and >		8	18.6	35	81.4	
Number of pregnancies	3 and <	4.30	20	23	67	77	0.419
	4 and >		25	20.8	95	79.2	
Spacing/y	< 3 years	2.64	34	21.3	126	78.7	0.844
	3 – 5 years		7	23.3	23	76.7	
	> 5 years				1	100	
Birth weight of last baby/Kg	< 3	3.00	9	19.6	37	80.4	0.940
	3 – 3.500		21	21.6	76	78.4	
	> 3.500		8	19.5	33	80.5	
Stage of pregnancy	2nd trimester	6.21	14	12.7	96	87.3	0.001
	3rd trimester		31	32	66	68	
Suffering from health problems	Yes	1.66	18	26.1	51	73.9	0.284
	No		27	19.6	111	80.4	
Smoking	Yes	1.84	10	31	22	69	0.156
	No		35	20	140	80	
Previous use of iron supplements	Yes	1.10	36	20.9	136	79.1	0.674
	No		5	25	15	75	
Current use of iron supplements	Yes	1.07	40	20.8	152	79.2	0.258
	No		5	33.3	10	66.7	
Dose of iron supplements	Tablet/65mg	1.08	35	19.7	143	80.3	0.154
	Two tablets		5	35.7	9	64.3	
Number of visits	Less than 4	3.81	9	11.4	70	88.6	0.165
	4 and more		6	37.5	10	62.5	
Gestational age at first visit / m	1-3 months	2.96	26	20.2	103	79.8	0.312
	3.1-5 months		14	19.4	58	80.6	
	> 5 months		5	83.3	1	16.7	
BMI at the beginning of present pregnancy	< 19.8	37.77	2	14.3	12	85.7	0.021
	19.8-26.0		33	29.2	80	70.8	
	> 26.0-29.0		10	12.8	68	87.2	

* BMI< 19.8 = Underweight, 19.8-26.0 = Normal weight, >26.0-29.0 = Overweight

3.4 Knowledge, attitude, practices towards IDA among study population

3.4.1 Knowledge towards IDA

Data presented in table 3.3.1 represent a set of questions asked in order to evaluate knowledge of the respondents of the current study. High level

of knowledge was reported by IDA group of the participants with regard to the definition of anemia as 64.7%, 67.6% and 88.2% were able to link anemia with poor nutrition, iron deficiency and low 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 88.9%, 84.5%, 93.3%, 75.6% and 80% of the participants reported that IDA is associated with the following symptoms fatigue, general weakness, dizziness and fainting, headaches and pallor of face, lips and nail beds, respectively.

High level of knowledge was also found among the study population regarding causes of IDA as 88.9%, 53.3%, 71.1% and 44.5% of them reported that poor nutrition, bleeding, multiple pregnancy and spacing and use of contraceptives as main causes, respectively. 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. 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.

Knowledge regarding iron supplements and its effect on mother and fetal health was also at high level as 85% and 88% of IDA participants answered with yes for the effect of iron supplements on mother and baby's health, respectively. However, knowledge regarding the preventive role of iron supplements for anemia was at low level (45.2%).

In general one can see a poor knowledge regarding the impact of anemia on women's health. This is obvious from the finding of 17.8%, 46.6%, 31%, 40% and 37.8% of the IDA group of the study population

were aware of IDA that cause preterm birth, low weight birth, susceptibility to infections, fetal death and abortion, respectively.

A high level of knowledge was also found among IDA group of the study population with respect to iron rich foods 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 meat proteins is efficient. Absorption of heme iron ranges from 15% to 35%, and is not significantly affected by diet.[45] In contrast, 2% to 20% of non heme iron in plant foods such as rice, maize, black beans, soybeans and wheat is absorbed.[38] Non heme iron absorption is significantly influenced by various food components.[39, 40, 41]

Knowledge on the importance of use of iron tablets after meals and its effect on reduction of heartburn, and vomiting were at low level as only 31.1% of IDA group was aware of this fact. On the other hand, knowledge regarding the effect of tea, coffee, and milk on iron absorption was at high level as 73.4% of IDA was aware of this fact. Knowledge on the role of fruit juice and its role in improvement of iron absorption was at low level as only 46.7% of IDA group was aware of this fact. Absorption of iron is inhibited by tea and coffee but enhanced by ascorbic acid, which is present in orange juice and fresh fruit.[12] Knowledge regarding anti acids use and its effect in reducing iron absorption was also at low level as only 20% of IDA was aware of this fact.

Maternal health care centers seems to play a very limited educational role regarding IDA as only 44.4% of IDA group reported to gain their information from these center. In this respect, media seems to be the main

source of information as 60% of the IDA group reported that their knowledge was based on media. The role of lectures and leaflets also seems to have limited effect as a source of knowledge.

It is important to note that high level of knowledge was also found, for all aspects related to IDA, among non IDA group of the study population, thus reflected an acceptable level of knowledge among the study population in general (see Table 3.1.1). It is important to note that differences in knowledge between IDA and non IDA groups were statistically significant for several of the tested variables.

Table 3.3.1 Knowledge towards IDA among study population

Question		**IDA**		**Non IDA**		***P*-value**
		No.	**%**	**No.**	**%**	
Q1. What's anemia?						
Poor Nutrition	Yes	22	64.7	105	85.4	**0.024**
	No	8	23.5	11	8.9	
	Don't know	4	11.8	7	5.7	
Iron deficiency	Yes	23	67.6	97	78.9	**0.392**
	No	4	11.8	9	7.3	
	Don't know	7	20.6	17	13.8	
Low Hb level	Yes	30	88.2	108	87.8	**0.829**
	No	2	5.9	10	8.1	
	Don't know	2	5.9	5	4.1	
Q2. Symptoms of anemia						
Exceptional shortness of breath	Yes	13	28.9	53	32.7	**0.793**
	No	15	33.3	46	28.3	
	Don't know	17	37.8	63	39	
Fatigue	Yes	40	88.9	142	87.7	**0.703**
	No	1	2.2	8	4.9	
	Don't know	4	8.9	12	7.4	
General weakness	Yes	38	84.5	143	88.2	**0.515**
	No	2	4.4	9	5.6	
	Don't know	5	11.1	10	6.2	
Loss of appetite	Yes	20	44.4	98	60.5	**0.082**
	No	12	26.7	23	14.2	
	Don't know	13	28.9	41	25.3	
Dizziness and fainting	Yes	42	93.3	151	93.2	**0.932**
	No	1	2.2	5	3.1	

	Don't know	2	4.5	6	3.7	
Headache	Yes	34	75.6	147	90.7	**0.025**
	No	6	13.3	8	5.0	
	Don't know	5	11.1	7	4.3	
Pallor of face, lips and nail beds	Yes	36	80	143	88.2	**0.321**
	No	5	11.1	9	5.6	
	Don't know	4	8.9	10	6.2	
Q3. Causes of anemia						
Poor nutrition	Yes	40	88.9	148	91.3	**0.865**
	No	3	6.7	9	5.6	
	Don't know	2	4.4	5	3.1	
Bleeding during pregnancy	Yes	24	53.3	103	63.6	**0.393**
	No	10	22.2	32	19.8	
	Don't know	11	24.5	27	16.6	
Multiple pregnancies, and spacing	Yes	32	71.1	129	79.6	**0.269**
	No	8	17.8	15	9.3	
	Don't know	5	11.1	18	11.1	
Age at pregnancy	Yes	11	24.4	74	45.7	**0.003**
	No	27	60	52	32.1	
	Don't know	7	15.6	36	22.2	
Uses of contraceptives	Yes	20	44.5	54	33.3	**0.251**
	No	15	33.3	53	32.7	
	Don't know	10	22.2	55	34	
Q4. Importance of iron supplements						
Woman health	Yes	36	85.7	153	96.8	**0.011**
	No	4	9.5	2	1.3	
	Don't know	2	4.8	3	1.9	
Prevent anemia	Yes	19	45.2	114	72.1	**0.005**
	No	15	35.7	29	18.4	
	Don't know	8	19.1	15	9.5	
Baby's health	Yes	37	88	148	93.7	**0.318**
	No	1	2.4	4	2.5	
	Don't know	4	9.5	6	3.8	
Q5. Impact of anemia in women						
Postpartum anemia	Yes	28	62.2	121	74.7	**0.257**
	No	9	20	22	13.6	
	Don't know	8	17.8	19	11.7	
Preterm birth	Yes	8	17.8	54	33.3	**0.010**
	No	20	44.4	37	22.8	
	Don't know	17	37.8	71	43.9	
Low birth weight	Yes	21	46.6	96	59.3	**0.201**
	No	12	26.7	26	16	
	Don't know	12	26.7	40	24.7	
Complications during delivery	Yes	42	93.3	144	88.9	**0.279**
	No	2	4.5	4	2.5	
	Don't know	1	2.2	14	8.6	
Susceptibility to	Yes	14	31.1	64	39.5	**0.121**

infections	No	14	31.1	28	17.3	
	Don't know	17	37.8	70	43.2	
Fetal death	Yes	18	40	86	53.1	**0.074**
	No	15	33.3	29	17.9	
	Don't know	12	26.7	47	29	
Abortion	Yes	17	37.8	100	61.7	**0.000**
	No	15	33.3	17	10.5	
	Don't know	13	28.9	45	27.8	
Q6. Iron-rich food sources						
Red meat	Yes	36	80	127	78.4	**0.901**
	No	4	8.9	13	8.1	
	Don't know	5	11.1	22	13.5	
Liver	Yes	43	95.6	149	92	**0.692**
	No	1	2.2	5	3.1	
	Don't know	1	2.2	8	4.9	
Chicken	Yes	14	31.1	91	56.2	**0.011**
	No	16	35.6	40	24.7	
	Don't know	15	33.3	31	19.1	
Fish	Yes	34	75.5	114	70.4	**0.346**
	No	3	6.7	24	14.8	
	Don't know	8	17.8	24	14.8	
Eggs	Yes	27	60	98	60.5	**0.970**
	No	13	28.9	48	29.6	
	Don't know	5	11.1	16	9.9	
Legumes	Yes	36	80	139	85.8	**0.507**
	No	4	8.9	13	8.1	
	Don't know	5	11.1	10	6.1	
Fruits	Yes	35	77.8	117	72.2	**0.705**
	No	6	13.3	30	18.5	
	Don't know	4	8.9	15	9.3	
Vegetables	Yes	44	97.8	161	99.4	**0.143**
	No			1	0.6	
	Don't know	1	2.2			
Q7. Iron supplements / absorption and side effects						
Use of iron after meal decreases heartburn and vomiting	Yes	14	31.1	55	34	**0.190**
	No	18	40	43	26.5	
	Don't know	13	28.9	64	39.5	
Tea, coffee, and milk reduce iron absorption	Yes	33	73.4	113	69.8	**0.455**
	No	2	4.4	17	10.5	
	Don't know	10	22.2	32	19.7	
Fruit juice increase iron absorption	Yes	21	46.7	94	58	**0.333**
	No	9	20	30	18.5	
	Don't know	15	33.3	38	23.5	
Anti-acids reduce iron absorption	Yes	9	20	42	26	**0.166**
	No	9	20	16	9.8	
	Don't know	27	60	104	64.2	

Q8. Spacing						
Best Period	< 2 years	2	4.9	19	13.5	**0.131**
	2 years	31	75.6	105	74.5	
	3 years	5	12.2	16	11.3	
	>3 years	3	7.3	1	0.7	
Q9. Source of information about anemia						
Maternal care centers	Yes	20	44.4	80	49.7	**0.534**
	No	25	55.6	81	50.3	
Leaflets (MCH)	Yes	15	33.3	64	40	**0.434**
	No	30	66.7	97	60	
Media	Yes	27	60	109	67.3	**0.363**
	No	18	40	53	32.7	
Lectures	Yes	7	15.6	26	16	**0.936**
	No	38	84.4	136	84	

3.4.2 Attitudes towards IDA among study population

Data presented in Table 3.3.2 represent a set of questions used to evaluate the attitude of pregnant women enrolled in the current study towards IDA. A high positive attitude concerning the importance of visits to MCH centers was observed. This was clear from the findings of 97.8% (IDA group) and 99.4% (non- IDA group) of the participants agreeing with the importance of such visit. As mentioned earlier regular multiple visits to health care centers and early registration for antenatal care ensure early assessment of risk status and results in effective intervention when necessary.

A highly positive attitude was also found with respect to the daily use of iron supplements during pregnancy and as recommended by the specialists. This was clear from the findings among IDA group (97.8%) and among non IDA group (96.3%) that approve the use of iron supplements. A highly negative attitude towards early marriage was reported by both groups (97.8%; IDA group and 94.4%; non IDA group disapprove of early marriage).

A positive attitude towards disapproval of multiple pregnancies was reported by both study groups (97.7%; IDA and 95.7% among non IDA group). Positive attitude towards the use of family planning methods was also found among these study groups (73.3%; IDA and 84.6% among non IDA group).

A positive attitude towards pregnancy in older age was evident from the findings in both IDA (91.2%) and non IDA (84%) groups. Such finding reflects lack of knowledge regarding complications associated with pregnancy at this age.

A highly positive attitude was also found with respect to the importance of iron supplements on both mother and fetal health was found. This was evident from the findings among IDA group (82.2%) and among non IDA group (89.5%) that recognize the importance of iron supplements on mother and fetal health. Both groups also seem to have positive attitude towards the need for regular visits to MCH centers after delivery (84.4%, IDA; 89.5% non-IDA approve visits at this stage). A positive attitude towards the disapproval of the use of tea in association with meals was also clear as 91.1% and 88.9% of the IDA and non IDA groups disapprove tea use, respectively.

A negative attitude was reported with respect to the use of iron supplements in association with fruit juice was observed as only 44.4% of the IDA and 50% of the non IDA approve the use of fruit juice in association with iron supplements, thus, reflecting a poor knowledge regarding the role of fruit juice in enhancing the absorption of non-heme iron in particular.

Positive attitude towards the approval of taking iron supplements after eating was also clear from the findings of 86.6% and 93.2% who approve this use among IDA and non IDA groups, respectively. Positive attitude with respect to the use of three regular meals was also reported by both study groups (86.7; IDA) and (91.4%; non IDA group).

Table 3.3.2 Attitudes towards IDA among study population

Attitudes		**IDA**		**Non IDA**		**P-value**
		No	**%**	**No**	**%**	
Q1. Importance of regular visits to MCH centers	Yes	44	97.8	161	99.4	0.363
	No	1	2.2	1	0.6	
Q2. Use of iron supplements daily approval	Yes	44	97.8	156	96.3	0.627
	No	1	2.2	6	3.7	
Q3. Approval of early marriage	Yes			9	6.6	0.046
	No	44	97.8	153	94.4	
	Don't know	1	2.2			
Q4. Approval of multiple pregnancies	Yes	1	2.3	6	3.7	0.781
	No	43	97.7	155	95.7	
	Don't know			1	0.6	
Q5. Use of contraceptives	Yes	33	73.3	137	84.6	0.219
	No	9	20	19	11.7	
	Don't know	3	6.7	6	3.7	
Q6. Pregnancy in older age	Yes	41	91.2	136	84	0.312
	No	2	4.4	20	12.3	
	Don't know	2	4.4	6	3.7	
Q7. Do you agree that iron supplements affect mother and fetus' health	Yes	37	82.2	145	89.5	0.084
	No	2	4.5	10	6.2	
	Don't know	6	13.3	7	4.3	
Q8. Importance of regular visits to MCH centers after delivery	Yes	38	84.4	145	89.5	0.606
	No	5	11.1	11	6.8	
	Don't know	2	4.4	6	3.7	
Q9. Approval of tea drinking with meals	Yes	4	8.9	17	10.5	0.824
	No	41	91.1	144	88.9	
	Don't know			1	0.6	
Q10. Approval of taking iron supplements with fruit juice	Yes	20	44.4	81	50	0.343
	No	20	44.4	54	33.3	
	Don't know	5	11.2	27	16.7	
Q11. Approval of taking iron supplements after eating	Yes	39	86.6	151	93.2	0.360
	No	3	6.7	5	3.1	
	Don't know	3	6.7	6	3.7	
Q12. Approval of use of three regular meals	Yes	39	86.7	148	91.4	0.332
	No	6	13.3	14	8.6	

3.4.3 Practices towards IDA among study population

Several questions were asked aiming at evaluating the practices of the study samples towards IDA. With respect to eating strange substances during pregnancy, only 6.6% and 1.9% of the IDA and non IDA were reported to practice this habit, respectively. Research indicates that woman with pica (eating of substances such as ice, freezer frost, cornstarch, laundry starch, baby powder, and clay, dirty and other nonnutritive substances), regardless of substance, tend to have lower hemoglobin levels at birth.[4] Studies have found a link between severe iron-deficiency anemia and cravings for non-food substances such as ice, paper, or clay (a condition known as pica).[42]

With respect to the use of tea during meals, a considerably high percentage seems to practice this habit especially when taking in consideration of those who reported the frequent use of tea (71.2%, IDA; 53.7%, non IDA groups). This is a poor practice that dose not reflect the high level of knowledge regarding the use of tea and its inhibition role of iron absorption. Inhibitors of iron absorption include polyphenols (in certain vegetables), tannins (in tea), phytates (in bran), and calcium (in dairy products).[43, 44]

Taking iron tablets with orange juice or any kind of citrus (vitamin C) increase the absorption of iron. A poor practice was also found with respect to the use of fruit juice with meals in order to improve iron absorption from non heme sources (lack of use 68.9% among IDA and 69.1% among non IDA group).

Regular use of iron supplement was reported by 73.4% of the IDA group and by 74.7% of the non IDA group. Such practice reflects both the observed high level of knowledge and the reported positive attitude of the study population and in agreement with reported data on the effect of iron supplement and its role in improving the iron status of pregnant women.

Taking iron tablets on an empty stomach, make absorption as much of the iron as possible but may experience stomach upset, depending on the dosage. Taking iron supplements with or after meals reduces stomach upset but reduces also iron absorption by up to one-third.[45]

The use of supplements after meals is another good practice reported by the study population as 73.3% and 88.9% of the IDA and non IDA group seems to practice this habit, respectively. The importance of at least three regular meals as a practice for pregnant women seems to be recognized and this is clear from the findings of 68.9% and 72.8% of the IDA and non IDA groups practice this habit, respectively.

Anti-acids use with iron supplements may make the iron supplements less effective. Our data shows that the use of anti-acid is limited, thus, one cannot judge its role on IDA as only 4.5% of IDA group reported the use of anti-acids and only 3.7% of the non IDA reported anti-acids use.

Iron deficiency is more common among women with diets high in calcium and presumably dairy foods.[46] In our study, the practice of taking iron tablets with milk or its products as calcium rich food sources, only 11.1 and 7.4% of the IDA and non IDA reported this practice, respectively. Such findings reflect an acceptable good practice.

Iron deficiency is more common among persons with diets low in vegetables.[47] The practice of using iron rich food sources (heme and non-heme) is reasonably acceptable as 62.2% of the IDA and 66.7% of the non-IDA reported the use of iron rich food sources.

Table 3.3.3 Practices towards IDA among study population

Practices		**IDA**		**Non IDA**		***P*-value**
		No.	**%**	**No.**	**%**	
Q1. Eating of strange substances (pica)	Yes	3	6.6	3	1.9	0.089
	No	42	93.4	159	98.1	
Q2. Drinking tea with meal	Yes	16	35.6	39	24.1	0.097
	No	13	28.8	75	46.3	
	Sometimes	16	35.6	48	29.6	
Q3. Use of iron supplements with fruit juice	Yes			19	11.7	0.022
	No	31	68.9	112	69.1	
	Sometimes	14	31.1	31	19.2	
Q4. Regular use of iron supplements	Yes	33	73.4	121	74.7	0.853
	No	6	13.3	17	10.5	
	Sometimes	6	13.3	24	14.8	
Q5. Use of iron supplements after eating	Yes	33	73.3	144	88.9	0.022
	No	5	11.1	10	6.2	
	Sometimes	7	15.6	8	4.9	
Q6. Use of three regular meals	Yes	31	68.9	118	72.8	0.642
	No	5	11.1	14	8.7	
	Sometimes	9	20	30	18.5	
Q7. Use of anti-acids	Yes	2	4.5	6	3.7	0.604
	No	42	93.3	155	95.7	
	Sometimes	1	2.2	1	0.6	
Q8. Use of iron supplements with milk or with any kind of milk products	Yes	5	11.1	12	7.4	0.113
	No	38	84.5	149	92	
	Sometimes	2	4.4	1	0.6	
Q9. Eating red meat, liver, chicken, fish, eggs, legumes, fruits, vegetables etc..	Yes	28	62.2	108	66.7	0.406
	No	4	9	13	8.0	
	Sometimes	13	28.8	41	25.3	

3.5 Recommendations and concluding remarks

ID during pregnancy is likely to lead to continuation of ID 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 ID during pregnancy.

The observed prevalence rates of IDA found in this study is similar to those found in comparable overseas countries. It is apparent that iron deficiency will be seen often enough to require a clear set of guidelines for recognition and management as the adopted strategies seems to lack good management. The findings also suggest a degree of uncertainty amongst those health professionals who deal with pregnant women as to its clinical consequences and the best policy regarding identification and prevention.

We recommend a more direct reliance on hemoglobin and serum ferritin levels as a screening tool, for pregnant women in their second and third trimesters, for the whole area, along with a more aggressive approach to the level of iron stores at which iron supplementation should be prescribed.

As iron-rich diet is the cornerstone of any approach to prevention or treatment of ID and diet is a cheaper, safer and much more palatable option than iron supplementation, it is essential that physician or other health professionals must pay more attention to teach pregnant woman good long-term dietary habits as a part of an overall approach to health promotion, however, once ID is established, a period of iron supplementation is almost certainly necessary in order to improve the iron status of the mother and prevent further consequences of ID.

It is also of great importance to encourage women for early registration during pregnancy and also to attend postnatal visits during lactation for close supervision and effective follow-up.

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Appendices

فقر الدم والناتج عن نقص الحديد لدى النساء الحوامل
في منطقة نابلس: نسبة الإصابة، المعرفة،
الاتجاهات والسلوكيات

رقم الاستبيان:
مركز رعاية الأمومة والطفولة:
تاريخ الزيارة:

أولا:البيانات الشخصية:

1. مكان السكن: □ مدينة □ قرية
2. العمر: (سنة)
3. عدد سنوات التعليم: (سنة)
4. هل تعملين؟ □ نعم □ لا

إذا كان الجواب نعم ما هي مهنتك:
□ مدرسة □ طبيبة □ ممرضة □ غير ذلك، حددي.....

5. الدخل الشهري للأسرة بالشيكل: (شيكل)
6. العمر عند الزواج: (سنة)
7. العمر عند الحمل الأول: (سنة)
8. عدد مرات الحمل: (مرة)
9. عدد الولادات: (ولادة)
10. عدد مرات الإجهاض: (مرة)
11. عدد الأطفال اللذين ولدوا أحياء:(طفل)
12. عدد أفراد الأسرة المقيمون في المنزل: (فرد)

13. ما هو متوسط التباعد بين الأحمال؟

1. الحمل الأول و الحمل الثاني	شهر
2. الحمل الثاني و الحمل الثالث	شهر
3. الحمل الثالث و الحمل الرابع	شهر
4. الحمل الرابع و الحمل الخامس	شهر
5.الحمل الخامس و الحمل السادس	شهر
6.الحمل السادس و الحمل السابع	شهر
7.الحمل السابع و الحمل الثامن	شهر
8.الحمل الثامن و الحمل التاسع	شهر

14. ما هو ترتيب الحمل الحالي؟.....
15. وزن الطفل الأخير عند الولادة: (كغم)
16. المدة الحالية للحمل:(شهر)
17. هل تعانين من مشاكل صحية أثناء الحمل الحالي؟ □ نعم □لا

إذا كان الجواب نعم:
□ السكري □ ضغط الدم □ أمراض القلب □ الجهاز التنفسي □ الجهاز الهضمي
□غير ذلك، حددي.....

18. هل تدخنين(سجائر، ارجيلة) أثناء الحمل الحالي؟ □ نعم □ لا □ أحيانا
19. هل تناولت أقراص الحديد في الأحمال السابقة؟ □ نعم □ لا
20. هل تتناولين قرص الحديد أثناء الحمل الحالي؟ □ نعم □ لا

إذا كان نعم، كم مرة في اليوم.....

21. عدد الزيارات لمركز رعاية الأمومة والطفولة أثناء الحمل الحالي.....

22. كم كانت مدة الحمل لدى الزيارة الأولى لمركز رعاية الأمومة والطفولة أثناء الحمل الحالي.....شهر

مقاييس تخص الحامل:

23. الوزن(كغم) في بداية الحمل الحالي.....
24. الطول(سم).....

BMI…….

25. مستوى Hb أثناء الحمل الحالي.....
26. مستوى Serum Ferritin أثناء الحمل الحالي.....

ثانيا: المعرفة:

1. هل تعرفين ما هو فقر الدم؟

□ نعم □لا

إذا كان الجواب نعم، ماذا يعني لك فقر الدم ؟

الرقم	التعريف	نعم	لا	لا اعرف
1.	سوء تغذية			
2.	نقص الحديد			
3.	انخفاض في نسبة الدم			
4.	غير ذلك، حددي:			

2. ما هي أعراض فقر الدم ؟

الرقم	أعراض فقر الدم	نعم	لا	لا اعرف
1.	صعوبة في التنفس			
2.	تعب وإرهاق			
3.	ضعف عام			
4.	فقدان للشهية			
5.	دوار / دوخة			
6.	صداع			
7.	شحوب الوجه والشفاه والأظافر			
8.	غير ذلك، حددي:			

3. ما هي أسباب فقر الدم ؟

الرقم	أسباب فقر الدم	نعم	لا	لا اعرف
1.	سوء التغذية			
2.	النزف خلال الحمل			
3.	الحمل المتكرر, تقارب فترات الحمل			
4.	العمر عند الحمل			
5.	استعمال موانع الحمل(الحبوب، اللولب) كوسيلة تنظيم للنسل			
6.	غير ذلك، حددي:			

4.هل من الضروري تناول أقراص الحديد يوميا أثناء الحمل؟ □نعم □لا

إذا كانت الإجابة نعم, ما هي أهمية تناول أقراص الحديد أثناء الحمل؟

الرقم	أهمية تناول أقراص الحديد أثناء الحمل	نعم	لا	لا اعرف
1.	جيد لصحة الأم الحامل			
2.	يمنع فقر الدم			
3.	جيد لصحة الطفل			

.4	غير ذلك، حددي:

5. ما هي الآثار السلبية لفقر الدم؟

الرقم	الآثار السلبية	نعم	لا	لا اعرف
.1	استمرارية فقر الدم بعد الولادة وأثناء الرضاعة			
.2	ولادة مبكرة			
.3	ولادة طفل قليل الوزن			
.4	تعريض حياة الأم للخطر أثناء الولادة			
.5	زيادة التعرض للالتهابات بعد الولادة			
.6	موت الجنين			
.7	الإجهاض			
.8	ولادة أطفال معوقين			
.9	غير ذلك، حددي:			

6. ما هو الغذاء الغني بالحديد:

الرقم	الغذاء الغني بالحديد	نعم	لا	لا اعرف
.1	اللحوم الحمراء			
.2	الخضار (سبانخ، ملوخية،بقدونس)			
.3	الفواكه			
.4	البيض			
.5	السمك			
.6	البقوليات(عدس،فول،حمص)			
.7	الدجاج			
.8	الكبدة			
.9	غير ذلك، حددي:			

7أجيبي على كل من الأسئلة التالية:

الرقم	السؤال	نعم	لا	لا اعرف
.1	اخذ قرص الحديد بعد تناول الوجبة يقلل من الشعور بالاستفراغ والحرقة في المعدة			
.2	الشاي والقهوة والحليب من المواد التي تقلل امتصاص الجسم للحديد بطريقة سليمة			
.3	أخذ قرص الحديد مع عصير البرتقال أو أي نوع من الحمضيات يزيد من امتصاص الجسم للحديد			
.4	أخذ قرص الحديد متزامنا مع مضادات الحموضة تعيق من امتصاص الجسم للحديد			
.5	أخذ قرص الحديد قبل تناول الوجبة يمكن أن يؤدي إلى الشعور بالاستفراغ والحرقة في المعدة			

8. هل تعلمين ما هي الفترة الزمنية التي يجب أن تكون بين الحمل والآخر؟

□ نعم □ لا

إذا كانت الإجابة نعم, ما هي الفترة الزمنية التي يجب أن تكون بين الحمل والآخر؟ :(سنة)

9. ما هو مصدر معلوماتك عن فقر الدم؟

الرقم	المصدر	نعم	لا
.1	مركز رعاية الحوامل		
.2	دورات أو ندوات تتعلق بفقر الدم		
.3	الإعلام		
.4	نشرات تتعلق بفقر الدم أثناء الحمل		
.5	غير ذلك، حددي:		

رابعا: الاتجاة:

الرقم	الاتجاه	نعم	لا	لا رأي/لا اعرف
.1	هل أنت مع ضرورة الالتزام لزيارة مركز رعاية الأمومة والطفولة أثناء الحمل			
.2	هل أنت مع تناول أقراص الحديد يوميا أثناء الحمل			
.3	هل أنت مع الزواج المبكر			
.4	هل أنت مع الحمل المتكرر والمتقارب			
.5	هل أنت مع استعمال وسائل منع الحمل(الحبوب، اللولب) كوسيلة تنظيم للنسل بعد الولادة			
.6	هل أنت مع تجنب الحمل كلما تقدمت في السن			
.7	هل تشعرين أن لتناول أقراص الحديد تأثير هام على صحة الحامل والجنين			
.8	هل أنت مع ضرورة الالتزام لزيارة مركز رعاية الأمومة والطفولة بعد الولادة			
.9	هل أنت مع شرب الشاي مع وجبة الطعام			
.10	هل أنت مع تناول قرص الحديد مع عصير البرتقال أو مع أي نوع من الحمضيات			
.11	هل أنت مع تناول قرص الحديد قبل الأكل			
.12	هل أنت مع تناول قرص الحديد بعد الأكل			
.13	هل أنت مع تناول وجبة الإفطار يوميا			
.14	هل أنت مع تناول وجبة الغداء يوميا			
.15	هل أنت مع تناول وجبة العشاء يوميا			

خامسا: السلوك:

الرقم	السلوك أثناء الحمل الحالي	نعم	لا	أحيانا
.1	هل تتناولين المواد التالية: الثلج, طحين الذرة, مسحوق الغسيل, baby powder, الطين			
.2	هل تشربين الشاي مع وجبة الطعام؟			
.3	هل تتناولين قرص الحديد مع عصير البرتقال أو مع أي نوع من الحمضيات؟			
.4	هل تتناولين قرص الحديد يوميا ؟			
.5	هل تتناولين قرص الحديد قبل الأكل؟			
.6	هل تتناولين قرص الحديد بعد الأكل؟			
.7	هل تتناولين وجبة الإفطار يوميا؟			
.8	هل تتناولين وجبة الغداء يوميا؟			

.9	هل تتناولين وجبة العشاء يوميا؟			
.10	هل تتناولين مضادات الحموضة متزامنة مع قرص الحديد؟			
.11	هل تتناولين قرص الحديد مع الحليب أو مع أي نوع من مشتقات الحليب الغنية بالكالسيوم؟			
.12	هل تتناولين الخضار (سبانخ، ملوخية، بقدونس)؟			
.13	هل تتناولين الفواكه؟			
.14	هل تتناولين اللحوم الحمراء؟			
.15	هل تتناولين السمك؟			
.16	هل تتناولين الدجاج؟			
.17	هل تتناولين البيض؟			
.18	هل تتناولين البقوليات (عدس، فول، حمص)؟			

جامعة النجاح الوطنية
كلية الدراسات العليا

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قدمت هذه الأطروحة استكمالا لمتطلبات درجة الماجستير في الصحة العامة بكليـــة الدراســـات العليا في جامعة النجاح الوطنية في نابلس، فلسطين.

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الملخص

هدفت الدراسة الحالية إلى تقييم نسبة الإصابة بفقر الدم والعائد لنقص الحديد لدى الحوامل في محافظة نابلس وكذلك تقصي مدى مستوى المعرفة والاتجاهات والسلوكيات لدى النساء الحوامل اتجاه هذا المرض. شملت العينة كافة الحوامل اللواتي يترددن على مراكز الأمومة والطفولة الحكومية في المحافظة. أجريت الدراسة في الفترة ما بين حزيران – آب 2006، حيث شملت 207 امرأة حامل كان من بينها 110 من اللواتي في الثلث الثاني من الحمل و 97 في الثلث الثالث وتراوحت أعمارهن بين (17–41) سنة. تم جمع عينات الدم من كافة الحوامل، وتم جمع المعلومات في الاستبيان المصمم خصيصا لهذا الغرض وبعد ذلك تم تحديد نسبة Hb و Serum ferritin مخبريا واقتصر فحص أل Serum ferritin على الحوامل اللواتي تعاني من نقص وتدني في مستوى الهيموجلوبين. ومن ثم تم تحليل المعلومات إحصائيا باستخدام البرنامج الإحصائي SPSS.

بلغت نسبة انتشار فقر الدم الناتج عن نقص الحديد 21.7%، وكان فقر الدم أكثر انتشارا لدى النساء الحوامل في الثلث الأخير من فترة الحمل 32%. و كانت نسبة انتشاره لدى المصابات والمقيمات في المدينة (25.5%) وبنسبة أعلى من تلك التي لوحظت أكثر من المقيمات في القرى (14.3%)، وكانت أعلى النسب لدى الفئة الأصغر سنا من المصابات حيث بلغت 26.7% لدى الفئة العمرية 24 سنة واقل. ولم يلاحظ أي تأثير ايجابي لكل من متغيرات

عدد سنوات الدراسة، عدد أفراد الأسرة وكذلك الدخل الشهري على نسبة الإصابة. كما لوحظت نسب إصابة مرتفعة لدى الفئة العاملة. بينت الدراسة كذلك وجود علاقة ايجابية بين كل من متغير التدخين والإصابة بالأمراض المزمنة والتسجيل المبكر في مراكز الرعاية وكذلك استخدام أقراص الحديد في حين لم يلاحظ أي تأثير لحجم الجرعة الدوائية.

لوحظ وبشكل عام مستوى عال من المعرفة فيما يتعلق بالمرض، مسبباته، أعراضه، المصادر الغذائية الغنية بعنصر الحديد وكذلك امتصاصه. لوحظ كذلك مستويات ايجابية عالية للاتجاهات والسلوكيات لدى النساء الحوامل حول العديد من المتغيرات ذات العلاقة والتي لها تأثير واضح على فقر الدم الناتج عن نقص الحديد.

على الرغم من وجود برامج وسياسات وضعت بالاعتماد على أسس وتوصيات عالمية إلا أن نسبة الإصابة بهذا المرض لا تزال مرتفعة وان هذه السياسات لم تؤدي إلى أي تحسن ملحوظ الأمر الذي يستدعي الحاجة إلى وضع برامج تثقيفية لتحفيز المرآة الحامل للتخلص من هذا المرض والحد من انتشاره.