

**Deanship of Graduate Studies  
Al-Quds University**



**Determinants of anemia among pregnant women attending  
the UNRWA healthcare clinics in Jerusalem**

**A Follow-Up Study**

**Munera Kamal Eddin Ismail AlAbed**

**M.Sc. Thesis**

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**Determinants of anemia among pregnant women attending  
the UNRWA healthcare clinics in Jerusalem**

**A Follow-Up Study**

**Prepared By:**

**Munera Kamal Eddin Ismail AlAbed**

**B.Sc. in Medicine – Al-Quds University /Palestine**

**Supervisor: Dr. Nuha El-Sharif**

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### **Thesis Approval**

**Determinants of anemia among pregnant women attending the  
UNRWA healthcare clinics in Jerusalem: A Follow-Up Study**

**Prepared By: Munera Kamal Eddin Ismail AlAbed**

**Registration number: 22010762**

**Supervisor: Dr. Nuha El Sharif**

**Master thesis submitted and accepted: 2/6/2024**

**The names and signatures of the examining committee members are  
as follows:**

**1- Head of Committee: Dr. Nuha El Sharif      Signature:**

**2- Internal Examiner: Dr. Maha Nahal      Signature:**

**3- External Examiner: Dr. Saedah Jaber      Signature:**

Three handwritten signatures in blue ink are visible on the right side of the page, corresponding to the three committee members listed. The signatures are written in a cursive style.

**Jerusalem – Palestine**

**1445 / 2024**

## **Dedication**

*To*

*My Beloved Parents, My Husband*

*My lovely Sisters and Brothers*

*For their patience, encouragement, and support*

*My children: Sara, Omar, and Yazan*

*My Supervisors and Teachers*

*My friends and colleagues*

*My beloved country, Palestine*

*To all of them, I dedicate this work with love and respect*

*Munera Kamal Eddin Ismail AlAbed*

*June, 2024*

**Declaration:**

I certify that this thesis submitted for the degree of Master in Public Health is the result of my own research, except where otherwise acknowledged, and that this study (or any part of the same) has not been submitted for a higher degree to any other university or institution.

**Signed:**

A handwritten signature in blue ink, appearing to read 'Munera Kamal Eddin Ismail AlAbed', is written over a horizontal line.

**Munera Kamal Eddin Ismail AlAbed**

**Date: 2/6/2024**

## **Acknowledgments**

As a start, I would like to express my deep thanks to my God who gave me the strength, patience, and motivation to complete this work.

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To All, Thank you

# **Determinants of anemia among pregnant women attending the UNRWA healthcare clinics in Jerusalem: A Follow-Up Study**

## **Abstract :**

**Background:** In Palestine, the prevalence of anemia among normal and high-risk pregnant women was 27.6 % and 30.3 % respectively. Many risk factors are responsible for increasing the risk of anemia. This study aims (1) to identify the factors associated with maternal anemia in the pre-conception and during pregnancy periods and (2) to determine the compliance and affectivity of the micronutrient intervention program implemented at the UNRWA primary health care clinics of Jerusalem in the year 2022.

**Study methodology:** A follow-up study design of 400 women was done using interview questionnaires. Also, data regarding their hemoglobin level was extracted from their medical file. Descriptive statistics and bivariate analysis were done and a p-value  $<0.10$  was considered statistically significant. The chi-square test and T-test were used as needed to calculate the difference between the anemic and non-anemic groups regarding all variables in the study. The multivariate logistic regression model was done and the adjusted risk Ratio and its 95% Confidence Interval (CI) were reported for controlling for study confounders and study risk factors. The study was approved by the UNRWA and by the Al Quds University research ethical committee and women had a sign consent forms before participation.

**Results:** Our study results indicate significant associations between anemia at 24 weeks, women's age, the location of the clinic, and place of residence ( $p <0.10$ ). The history of past pregnancies anemia, history of anemia in the last pregnancy, history of anemia at registration, and history of iron intake for six months determined the incidence of anemia at 24 weeks of pregnancy ( $p$ -value  $<0.10$ ). Also, the occurrence of anemia at 24 weeks was significantly associated with meal frequency /day, history of a healthy diet, history of changes in eating habits, tea /coffee consumption during/after meals, iron intake compliance, minimum dietary diversity for women (MDD-W), grains, white root, nut, milk, yogurt, meat, and fish intake, lower intake of vitamin A-rich fruit and vegetables and sweet food, ( $p <0.10$ ).

Concerning health education and counseling, our study showed that receiving information about iron and multivitamin supplements, doctor's confirmation of daily iron and multivitamin intake, and health staff counseling about iron side effects are significant factors for anemia occurrence. Also, encouragement of iron-rich foods such as red meat and green leafy vegetables, taking iron with juice, taking iron supplements at bedtime, avoidance of taking iron supplements with antacid tablets or with milk, dairy products, or calcium supplements, and avoidance of drinks that affects iron absorption such as tea and coffee, and women perceive that iron intake for a long time is boring were factors that determined the incidence of anemia at 24 weeks of pregnancy ( $p < 0.1$ ).

Moreover, the prevalence of anemia among pregnant women in the 1<sup>st</sup> trimester ( $Hb < 11.0$  g/dl) was 20%. While in the 2<sup>nd</sup> trimester of pregnancy, this percentage had increased to 32% ( $Hb < 10.5$  g/dl).

**Conclusions:** This study results showed that women's age, history of anemia in past pregnancies, being anemic in the first trimester, and low iron compliance were significant determinants of anemia in pregnancy. While, obtaining iron information counseling, eating a healthy diet, and increasing meat and fish intake were significantly associated with a lower risk of anemia at 24 weeks of pregnancy. This is the first study in UNRWA healthcare clinics in the Jerusalem Area, to demonstrate the primary healthcare system factors—nutritional habits, and mother's health before and throughout pregnancy. Also, health education and counseling were significantly associated with anemia in pregnancy. The study recommends advocating for an awareness campaign about anemia in pregnancy and adopting a healthy lifestyle for women before and during pregnancy. Proper implementation of preconception care, antenatal care, postnatal care, and family planning should be emphasized in the UNRWA's policies and guidelines, especially among women who are highly susceptible to anemia.

## عوامل خطر الإصابة بفقر الدم لدى النساء الحوامل المتابعات في عيادات الرعاية الصحية التابعة للأونروا

في القدس :دراسة متابعة

اعداد: منيرة كمال الدين العبد

إشراف : د. نهى الشريف

### ملخص الدراسة

**خلفية الدراسة :** في فلسطين، بلغ معدل انتشار فقر الدم بين الحوامل العاديات والحوامل بحمل عالي الخطورة 27.6% و30.3% على التوالي. هنالك العديد من عوامل الخطر المسؤولة عن زيادة خطر الإصابة بفقر الدم. تهدف هذه الدراسة إلى (1) تحديد العوامل المرتبطة بفقر الدم لدى الامهات أثناء فترة ما قبل الحمل وأثناء فترة الحمل و (2) تحديد مدى الامتثال والفعالية لبرنامج التدخل في المغذيات الدقيقة المطبق في عيادات الرعاية الصحية الأولية التابعة للأونروا في القدس في عام 2022 .

**منهجية الدراسة:** تم تصميم دراسة متابعة لـ 400 امرأة باستخدام استبيانات المقابلة. كما تم استخراج البيانات المتعلقة بمستوى الهيموجلوبين من الملف الطبي الخاص بهن. تم إجراء إحصائيات وصفية وتحليل ثنائي المتغير واعتبرت القيمة  $p > 0.10$  ذات دلالة إحصائية. تم استخدام اختبار (Chi square) واختبار (T- test) لحساب الحاجة لحساب الفرق بين المجموعات المصابة بفقر الدم وغير المصابة بفقر الدم فيما يتعلق بجميع المتغيرات في الدراسة. تم إجراء نموذج الانحدار اللوجستي متعدد المتغيرات وتم الإبلاغ عن نسبة الخطر المعدلة وفاصل الثقة 95% (CI) للتحكم في عوامل إرباك الدراسة وعوامل خطر الدراسة. تمت الموافقة

على الدراسة من قبل وكالة الغوث ولجنة أخلاقيات البحث في جامعة القدس، وكان لدى النساء نموذج الموافقة للتوقيع قبل المشاركة.

**نتائج الدراسة:** تشير نتائج دراستنا إلى وجود علاقات ارتباط مهمة بين فقر الدم عند 24 أسبوعاً من الحمل مع عمر المرأة، وموقع العيادة، ومكان الإقامة ( $P > 0.10$ ). وقد حدد فقر الدم في حالات الحمل السابقة، وتاريخ فقر الدم في الحمل الأخير، وتاريخ فقر الدم عند التسجيل، وتاريخ تناول الحديد لمدة ستة أشهر تأثير معدل حدوث الإصابة بفقر الدم عند 24 أسبوعاً من الحمل ( $P > 0.10$ ).

كما أن حدوث فقر الدم عند 24 أسبوعاً كان مرتبطاً إلى حد كبير بتكرار الوجبات /اليوم، وتاريخ اتباع نظام غذائي صحي، وتاريخ التغيرات في عادات الأكل، واستهلاك الشاي/القهوة أثناء الوجبات وبعدها، والامتثال لتناول الحديد ، والحد الأدنى من التنوع الغذائي للنساء ( MDD-W ) والحبوب والجزور البيضاء والجزور والحليب واللبن واللحوم والأسماك، وتناول كميات أقل من الفواكه والخضروات الغنية بفيتامين أ والأطعمة الحلوة ( $P > 0.10$ ).

وفيما يتعلق بالتنقيف والإرشاد الصحي، أظهرت الدراسة أن الحصول على معلومات حول مكملات الحديد والفيتامينات المتعددة، وتأكيد الطبيب على تناول الحديد والفيتامينات المتعددة يومياً، والحصول على الاستشارة من قبل العاملين الصحيين حول الآثار الجانبية للحديد، وتشجيع الأطعمة الغنية بالحديد مثل اللحوم الحمراء والخضروات الورقية الخضراء، تناول الحديد مع العصير، وتناول مكملات الحديد عند النوم، وتجنب تناول مكملات الحديد مع أقراص مضادات الحموضة أو مع الحليب أو منتجات الألبان أو مكملات الكالسيوم، وتجنب المشروبات التي تؤثر على امتصاص الحديد مثل الشاي والقهوة، وشعور النساء أن تناول الحديد لفترة

طويلة أمرممل هي من العوامل ذات الصلة الهامة في تحديد نسبة الإصابة بفقر الدم عند الأسبوع 24 من الحمل ( $P < 0.1$ )

كان معدل انتشار فقر الدم بين النساء الحوامل في الأشهر الثلاثة الأولى (نسبة خضاب الدم أقل من 11.0 جم/ديسيلتر) 20%. بينما في الثلث الثاني من الحمل، ارتفعت هذه النسبة إلى 32% (نسبة خضاب الدم > 10.5 جم/ديسيلتر).

**الخلاصة :** بينت نتائج هذه الدراسة أن عمر المرأة وتاريخ الإصابة بفقر الدم في حالات الحمل السابقة، وفقر الدم في الأشهر الثلاثة الأولى من الحمل ، وانخفاض الامتثال لآخذ مكملات الحديد، هي عوامل هامة في تحديد فقر الدم أثناء فترة الحمل. في حين أن الحصول على المشورة بشأن المعلومات المتعلقة بالحديد، وتناول طعام صحي، وزيادة كمية اللحوم والأسماك التي يتم الحصول عليها، كانت مرتبطة ارتباطاً كبيراً بانخفاض خطر الإصابة بفقر الدم عند 24 أسبوعاً من الحمل .هذه هي الدراسة الأولى في عيادات الرعاية الصحية التابعة للأونروا في منطقة القدس التي توضح دور عوامل نظام الرعاية الصحية الأولية في الانزوا مثل العادات التغذوية وتأثيرها على صحة الأم قبل الحمل وطوال فترة الحمل .كما أن الدراسة بينت دور التنقيف والمشورة الصحية وتأثيرها على حدوث فقر الدم أثناء فترة الحمل .

توصي نتائج الدراسة بالعمل على القيام بحملة توعوية بشأن فقر الدم أثناء الحمل واعتماد أسلوب حياة صحي للمرأة قبل الحمل وأثناءه. ولذلك ينبغي التشديد في سياسات الأونروا ومبادئها التوجيهية على التنفيذ السليم للرعاية قبل الحمل، والرعاية قبل الولادة، والرعاية بعد الولادة، وتنظيم الأسرة، ولا سيما بين النساء المعرضات بشدة للإصابة بفقر الدم .

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## List of abbreviations:

<b>Abbreviation</b>	<b>Definition</b>
WHO	World Health Organization
IDA	Iron Deficiency Anemia
MoH	Ministry of Health
CI	Confidence Interval
RR	Risk Ratio
OR	Odds Ratio
UNRWA	United Nations Refugee Work Agency
HIV	Human Immunodeficiency Virus
UTI	Urinary Tract Infection
BMI	Body Mass Index
GDM	Gestational Diabetes Mellitus
NICU	Neonatal Intensive Care Unit
Hb	Hemoglobin level
CBC	Complete Blood Count
GA	Gestational Age
DM	Diabetes Mellitus
TB	Tuberculosis
RBC	Red Blood Cell
MCV	Mean Corpuscular Volume
MCH	Mean Corpuscular Hemoglobin
HMB	Heavy Menstrual Bleeding
ANC	Antenatal Care
GPAQ	Global Physical Activity Questionnaire
PPAQ	Pregnancy Physical Activity Questionnaire
MDD-W	Minimum Dietary Diversity-Women
FO	Field Office
SPSS	Statistic Package for Social Science
SD	Standard Deviation
PPH	Postpartum hemorrhage
LBW	Low Birth Weight
IUD	Intrauterine device
D +C Surgery	Dilation and Curettage
PCOS	Polycystic ovary syndrome
C.S	Cesarean section
TPA	Total Physical Activity
MET	Metabolic Equivalent of Tasks

# Chapter One: Introduction

---

## 1.1 Background:

Anemia is a serious global public health problem, affecting 43% of children younger than 5 years, 38% of pregnant women, and 29% of non-pregnant women worldwide (Pasricha & Drakesmith, 2016). It is generally defined based on hemoglobin levels, which may vary according to many factors most importantly age and gender. According to the World Health Organization (WHO) guidelines, anemia in pregnancy is defined as a hemoglobin level < 11.0 g/dl (WHO, 2011).

In normal pregnancy, the red blood cell mass increases by 20–50% while the plasma volume increases by 40–60%. As a result, a physiologic anemia develops. Hemoglobin levels lower than 10 g/ dL raise the possibility of a pathogenic condition, such as a nutritional deficit. Anemia during pregnancy is more common in the second and third trimesters, rising from 8% in the first to 12% and 34%, respectively.(Al-Khaffaf et al., 2020)

Iron deficiency is the most common cause of anemia, accounting for around 50% of cases. The prevalence of iron deficiency anemia (IDA) varies among countries, reflecting variations in socioeconomic factors, nutritional habits, medical care, and the frequency of parasitic illnesses (Breyman et al., 2011). Because of the increased iron needs during pregnancy, pregnant women are recognized as the most vulnerable group to IDA. In the Eastern Mediterranean region, the WHO estimates the prevalence of anemia to be 32.4% in non-pregnant and 44.2% in pregnant women. The fetal demand for iron increases maternal daily iron needs around 10-fold throughout pregnancy, increasing from 6 mg/day to 22 mg/day in the first and third trimesters of pregnancy. This increased demand for iron is covered mostly by maternal iron stores, which puts pregnant women at higher risk of developing iron deficiency and IDA (Srour et al., 2018).

Several risk factors increase the risk of developing anemia during pregnancy. These risk factors include maternal age, low socioeconomic status, low educational level, multiparity, and short birth spacing(Woldegebriel et al., 2020). Moreover, many nutritional determinant factors were associated with anemia in pregnancy such as irregular intake of iron supplements, low weekly intake of meat and fruits, and frequent daily tea consumption (Eweis et al., 2021). In addition, having a history of anemia was identified as a predisposing factor for anemia during pregnancy

(Gari et al., 2020), and anemia was often worsened by the presence of other maternal chronic communicable and non-communicable diseases (Gangopadhyay et al., 2011).

The consequences of anemia during pregnancy are often serious and long-lasting for both the mother and her fetus. Several studies showed that a mother's anemia during pregnancy was associated with an increase in the risk of prematurity, spontaneous abortions, low birth weight, and fetal deaths (Sifakis & Pharmakides, 2000). The anemic mothers usually experience breathing difficulties, fainting, tiredness, palpitations, and sleep difficulties. They also have an increased risk of developing a perinatal infection, pre-eclampsia, and bleeding. Also, maternal anemia is contributed as a risk factor for post-partum cognitive impairment and behavioral difficulties. Moreover, there was evidence indicating that maternal iron deficiency reduces fetal iron stores, which may persist for up to one-year-old and result in IDA in infants and growth abnormalities (Abu-Ouf & Jan, 2015)

## **1.2 Study justification:**

In the West Bank, as reported by the Ministry of Health, the prevalence of anemia (hemoglobin less than 11g/dl) among normal and high-risk pregnant women was 27.6 % and 30.3 % respectively, and it has a prevalence of 34.7 % among infants (Ministry of Health, 2023). However, the Ministry of Health (MoH) has protocols for IDA management and prevention that involve free iron supplements for pregnant women. These data revealed a high prevalence of anemia among pregnant women and infants in Palestine.

A study was carried out by Khader et al. between the years 2004-2006 on the prevalence and correlated social and biological determinants of anemia among pregnant women attending the UNRWA clinics in Palestine. The overall prevalence of anemia was 38.6% in pregnant women. Anemia prevalence was found to increase with women's age, parity, and trimester of gestation. There was a threefold risk of developing the disease in the second and third trimesters of gestation as opposed to the first (second trimester *versus* first semester: OR = 3.2, 95 % CI 2.2, 4.6; third trimester *v.* first: OR = 3.3, 95 % CI 2.2, 4.8). (Khader et al., 2009a). However, this study did not investigate the role of women's nutrition before or in pregnancy, and the risk of developing anemia throughout pregnancy.

### **1.3 Problem statement:**

Published data on the prevalence of anemia in pregnancy in Palestine reveals a high prevalence of anemia, which may vary by many factors such as socio-economic factors, nutritional habits, and mother's health before and during pregnancy. In addition, studies showed that maternal IDA is a risk factor for many maternal and infant health abnormalities during and after pregnancy including (prematurity, low birth weight, infant growth abnormality, maternal perinatal infection, pre-eclampsia, and postpartum depression) (Srouf et al., 2018)

To date, few published studies in Palestine have investigated the association between anemia, obesity, nutrition status, and women's reproductive health before pregnancy and anemia throughout pregnancy. Furthermore, the previous studies were conducted among pregnant women who attend the MOH primary health care clinics in Nablus and Hebron cities. However, UNRWA has its protocol and intervention program regarding maternal and antenatal care which differs from the MOH primary health care system. Only two studies were conducted at UNRWA clinics. No studies were conducted at UNRWA clinics in the Jerusalem Area. Also, the determinants of anemia among Palestinian pregnant women who attend UNRWA clinics in the Jerusalem area have not been investigated yet.

### **1.4 Aims of the study:**

1. To identify the factors associated with maternal anemia in the pre-conception and during pregnancy periods among the pregnant women who are registered for antenatal care at Jerusalem area primary healthcare clinics between May 1st, 2022, and July 30th, 2022
2. To determine compliance to the micronutrient intervention program implemented at the UNRWA among the pregnant women who are registered for antenatal care at Jerusalem area primary healthcare clinics between May 1st, 2022, and July 30th, 2022

### **1.5 Study Objectives:**

- 1) To determine the association between a mother's socioeconomic status and the occurrence of anemia during pregnancy
- 2) To determine the association between a mother's reproductive health and the occurrence of anemia during pregnancy
- 3) To determine the association between a mother's iron deficiency anemia before pregnancy and the occurrence of anemia during pregnancy
- 4) To determine the association between a mother's chronic medical conditions and the occurrence of anemia during pregnancy
- 5) To determine the association between mother's nutrition and lifestyle and the occurrence of anemia during pregnancy
- 6) To determine the compliance of pregnant women with the intervention program implemented at these clinics and the occurrence of anemia during pregnancy

### **1.6 Study's Expected outcome:**

This research investigated the factors attributed to anemia during pregnancy. We also examined mothers' compliance with the program implemented by the UNRWA to control anemia among pregnant women. This study results will help workers at the UNRWA clinics to identify the gaps in the implemented program and modify it if needed, considering the Palestinian context in food availability and supplementation compliance. In addition, it might help to recommend an intervention program that can be applied in the Palestinian community to increase awareness of the importance of a mother's health before and during pregnancy which will directly affect mothers and their infants' health.

## 1.7 Thesis structure:

This thesis will be presented in 6 chapters as follows:

- **Chapter one:** contains the background of the study, study justification, problem statement, study aims, objectives, and expected outcomes.
- **Chapter two** includes a literature review of international, regional, and national studies and research conducted.
- **Chapter three:** includes the study conceptual framework.
- **Chapter four:** includes the study area, study methods, population, sampling method, sample size, ethical consideration, data collection, processing, and analysis.
- **Chapter five:** presents the results of the study.
- **Chapter six:** includes a discussion, study limitations, conclusions, and multi-level recommendations.

## **Chapter Two: Literature review:**

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### **2.1.Introduction**

In this chapter, studies that investigated the prevalence and risk factors for anemia in pregnancy will be presented, at the international and local level. Also, health education and interventional programs and anemia in pregnancy will be presented too.

### **2.2 Mother's socioeconomic status and anemia during pregnancy:**

Several studies showed that lower socioeconomic status, poor literacy levels of the mother, and large family size were the determinants factors of anemia during pregnancy. A follow-up study in Northern Tanzania showed that the main risk factors for anemia during pregnancy were the pregnant woman's place of residence and education level (Stephen et al., 2018). Another cross-sectional study in Northwest Ethiopia showed that urban residence was unexpectedly found to be a predisposing factor for anemia during pregnancy (Gari et al., 2020). A similar Ethiopian study showed that the residence and educational status of the mother were statistically significant predictors for maternal anemia during pregnancy (Gebre & Mulugeta, 2015). Also, A cross-sectional study on 743 pregnant women in Northwest Ethiopia showed that pregnant women in rural areas, farmers in occupation, and illiterate women were significantly associated with an increased risk of anemia during pregnancy (Hailu et al., 2019). A similar study showed that low family income and large family size were associated with anemia during pregnancy (Melku et al., 2014).

Moreover, a cross-sectional study in Northern Ghana showed that women's knowledge about anemia and pregnancy trimester were the independent determinants of anemia during pregnancy (Wemakor, 2019). A similar study in Ethiopia showed that anemia was significantly related to education and occupation (Mekonnen et al., 2018). Also, an observational study in India showed that poor literacy levels, rural background, and lower socioeconomic status affect the degree of anemia during pregnancy (Hooja et al., 2020). In addition, a cross-sectional study in Bengal showed that low socioeconomic status, multigravida, and delayed time of 1<sup>st</sup> antenatal visit were significantly related to anemia during pregnancy (Sinha et al., 2021). A similar study in

Yemen showed that low socioeconomic status, short pregnancy intervals, and having other health problems were determinant factors of anemia (Al-Aini et al., 2020). Additionally, a cross-sectional study in Ethiopia showed the determinant factors that were associated with increased risk of anemia during pregnancy which include: maternal age, belonging to the poorest wealth index, number of household members is four to six, number of under-five children being two, the head of the household being a female, no terminated pregnancy, and an age of 13–17 years at the first sexual intercourse (Woldegebriel et al., 2020).

Moreover, a cross-sectional study in Yemen showed that increased maternal age, low income, low educational level, and inadequate nutrition intake were significantly related to anemia in pregnancy (Alflah et al., 2017). Finally, a study in Saudi Arabia showed that having a larger family size with low income was a determinant of anemia (Alreshidi & Haridi, 2021).

### **2.3 Mother's reproductive health and anemia during pregnancy:**

Several reproductive health factors affect anemia in pregnancy, Multiparity, short pregnancy intervals, frequency of antenatal care visits and others were shown to be risk factors for anemia in pregnancy. A study in Ethiopia showed that the absence of the history of abortion was identified as a protective variable of anemia during pregnancy (Gari et al., 2020). Another Ethiopian study showed that pregnancy trimester, the number of under-five children, previous history of abortion, breastfeeding practices, and the frequency of antenatal care visits were independent determinants of anemia during pregnancy (Alemu & Umeta, 2015). Also, a cross-sectional study in Bengal showed that multigravida and delayed time of 1<sup>st</sup> antenatal visit were significantly related to anemia during pregnancy (Sinha et al., 2021).

Furthermore, a cross-sectional study in Ethiopia showed that having a birth interval of fewer than 2 years was significantly associated with maternal anemia. (Kejela et al., 2020). A similar study in Yemen showed that short pregnancy intervals were a determinant factor of anemia (Al-Aini et al., 2020). Another study showed that short birth intervals and a history of blood loss during pregnancy were significantly related to anemia during pregnancy (Abdu et al., 2021). A similar study in Abidjan showed that gestational age and multiparity were determinant factors of anemia during

pregnancy (Vanié et al., 2021). Another study in Yemen showed that gestational age, gravidity, and reduced birth spacing raised the risk of anemia. (Alflah et al., 2017).

Additionally, a cross-sectional study conducted in Egypt revealed that increasing maternal age, lower maternal BMI, multiparity, shorter pregnancy intervals, and lack of antenatal care visits are the main causes of anemia in pregnancy (Rezk et al., 2015). Another study in Saudi Arabia revealed longer menstrual periods and bleeding during pregnancy were significantly associated with anemia in pregnancy (Alreshidi & Haridi, 2021).

#### **2.4 Mother's anemia before pregnancy and the risk for anemia during pregnancy**

Several studies have shown that blood iron level; ferritin level and folic acid level before pregnancy are associated with anemia in pregnancy. A follow-up study in Mexico for 35 non-anemic non-pregnant women showed that women started gestation with insufficient iron storage (<20 µg/l) trends to present anemia at significantly earlier gestational ages. Hence, at week 20 of gestation, almost 60% of the women with inadequate storage had anemia compared to only 25% of the women with adequate storage had this condition (Casanueva et al., 2003). A similar prospective cohort study in China showed that preconception hemoglobin and ferritin concentrations are associated with pregnancy outcomes. It showed that preconception anemia, especially IDA was related to reduced child growth and increased risk of adverse pregnancy outcomes (Ronnenberg et al., 2004). Also, a cross-sectional study in Northwest Ethiopia showed that having a history of anemia was identified as a predisposing factor for anemia during pregnancy (Gari et al., 2020). Finally, a cross-sectional study was conducted in Saudi Arabia among 390 pregnant and the results indicated that a prior history of anemia significantly raised the risk of anemia during pregnancy (Alreshidi & Haridi, 2021).

#### **2.5 Mother's chronic medical condition and anemia during pregnancy:**

Several studies showed that maternal chronic communicable and non-communicable diseases were associated with anemia in pregnancy. A study carried out by Gangopadhyay et al showed that the presence of other maternal chronic communicable and non-communicable diseases such as

malaria, HIV, tuberculosis, and diabetes often worsens Anemia. (Gangopadhyay et al., 2011). Another study in Nigeria showed that malaria and bacteriuria were associated with anemia in pregnancy. (Dattijo et al., 2016). Also, a study showed that the main causes of anemia in pregnancy were thalassemia carriers/diseases and iron deficiency anemia. (Sukrat & Sirichotiyakul, 2006). A similar study in Iraq showed that there is a high risk of having anemia during pregnancy that is complicated by UTI (Jabbar et al., 2006). Another study in Rural Jordan showed that underweight women (BMI) and a history of prior surgery were significantly associated with anemia (Al-Mehaisen et al., 2011).

## **2.6 Mother's nutrition and lifestyle and anemia during pregnancy:**

Several nutritional and lifestyle factors such as inadequate intake, low dietary diversity, frequent daily tea consumption, and irregular intake of iron supplements were contributing factors to anemia during pregnancy. A cross-sectional study showed that meal frequency less than three times per day during pregnancy was significantly related to anemia during pregnancy (Abdu et al., 2021). A similar Ethiopian study showed that iron supplementation and meal frequency of the woman per day were statistically significant predictors for maternal anemia during pregnancy. (Gebre & Mulugeta, 2015). Another study in Abidjan showed that inadequate intake, low dietary diversity, and skipping meals were independent determinants factors of anemia during pregnancy (Vanié et al., 2021).

Moreover, a Cross-sectional study in Egypt showed that irregular intake of iron supplements, low weekly intake of meat and fruits, and frequent daily tea consumption were independent risk factors for anemia (Eweis et al., 2021). A similar study in Tanzania showed dietary habits such as consumption of tea or coffee during meal times, eating <3 meals/d and inadequate dietary diversity were determinant factors of anemia in pregnant women (Gibore et al., 2021). Another study showed that the use of a folic acid supplement, dietary folate equivalent, and total iron intake were contributing factors for anemia (Kangalgil et al., 2021). Also, an observational in India showed that tobacco use and consumption of green leafy vegetables contributed to IDA (Mistry et al., 2018). Another cross-sectional study was carried out on 789 pregnant women in China. The result indicated that a high frequency of iron-rich food intake, and moderate physical activity were important factors for the prevention of anemia during pregnancy (Zhang et al., 2021).

Furthermore, a study in Egypt revealed that low intake of foods derived from animal origin, fruits, and vegetables was significantly associated with anemia (Rezk et al., 2015). Another study in Yemen showed that having tea and coffee after meals and consuming fewer proteins is associated with anemia (Alflah et al., 2017).

Additionally, a cross-sectional study of 433 pregnant women in Iran showed that the most common reasons for low compliance with iron /folate supplements were their side effects and forgetfulness. It also showed that age, anemia history, and educational level were all significantly associated with folate compliance; the only factor associated with iron compliance was education level (Siabani et al., 2018). Another study revealed that the main obstacles to iron supplementation compliance were gastrointestinal adverse effects of iron supplements, non-affordability of iron supplements, and forgetfulness. It also showed that compliance was significantly associated with higher educational levels and socioeconomic status (Ugwu et al., 2014).

## **2.7 Health education and interventional programs and anemia in pregnancy:**

A randomized controlled study was conducted in Jordan to assess the effectiveness of a planned health education program on the knowledge and compliance of pregnant anemic women. There were no discernible variations seen in the group's total income, age, gestational age, or health issues. Only education and source of information varied significantly between the groups. Compared to women in the control group, women in the intervention group scored higher on the compliance checklist, knowledge, capacity to choose foods, and hemoglobin level. (Abujilban et al., 2019)

Another randomized controlled trial was carried out in Ethiopia. This study aimed to assess the impact of intensive nutrition education and counseling on hemoglobin levels in pregnancy, which demonstrated that pregnant women's consumption of an iron-rich diet and hemoglobin levels were both improved by the intervention.(Wakwoya et al., 2023). Another quasi-experimental study showed that improved hemoglobin levels, better dietary intake, and enhanced nutritional knowledge of anemia and iron-rich foods were all significantly correlated with the provision of nutrition education and an iron-rich food-based diet plan (Sunuwar et al., 2019).

Moreover, A systemic review study in Ethiopia revealed that good knowledge about anemia and iron /folate supplementation, and obtaining health education regarding the benefits of iron/folate supplementations were associated factors for supplementation compliance (Sendeku et al., 2020).

## **2.8 Effect of mother's anemia during pregnancy on maternal and infant's health:**

Several studies showed that a mother's anemia during pregnancy was associated with an increase in the risk of adverse pregnancy outcomes such as preterm birth, preeclampsia, and low birth weight. A Systematic review and meta-analysis study carried out by Young et al (2019) showed that a mother's anemia was associated with an increase in the risk of adverse maternal outcomes (postpartum hemorrhage, preeclampsia, and blood transfusion) and poor birth outcomes (low birth weight, preterm birth, small-for-gestational-age, stillbirth, and perinatal and neonatal mortality) (Young et al., 2019).

Another study by Malhotra et al (2002) showed that severe anemia contributed to increasing the risk of low-birth-weight babies, induction rates, operative deliveries, and prolonged labor. (Malhotra et al., 2002). A similar Chinese study showed that anemia during pregnancy contributes to an increased risk of adverse pregnancy outcomes, such as preterm birth, hypertensive disorders, and low birth weight (Lin et al., 2018). Also, a study showed that maternal anemia was a risk factor for preterm birth and low birth weight (El Guindi et al., 2004). Furthermore, a study by Tiongco et al, showed that anemia was significantly associated with decreased risk of GDM (Tiongco et al., 2018). Also, a study by Azami et al showed anemia during and after pregnancy significantly increases the risk of postpartum depression (Azami et al., 2019) .

Finally, a cross-sectional study was carried out in Saudi Arabia. The study revealed that anemia in pregnancy negatively affected both the mother's and fetus's health. The most common maternal outcomes were postpartum hemorrhage in mothers with moderate anemia and emergency cesarean section. Low birth weight, NICU admissions, and the development of congenital malformations were the significant fetal outcomes that were associated with maternal anemia (Bukhari et al., 2022)

## 2.9 Anemia in Pregnancy in Palestine

A study carried out by Abu-Hasira, about iron deficiency anemia among pregnant women in the Nablus District showed that the overall prevalence rate of iron deficiency anemia was 21.7%. (Abu-Hasira, 2007). It also showed that Iron deficiency anemia was most prevalent in the third trimester (69%) compared to second-trimester pregnancy (31%). Furthermore, the younger age group ( $\leq 24$ ) showed the highest prevalence rate of IDA among the IDA group. Years of education, working status, number of family members, and monthly income seem to not affect the status of IDA. A slight increase in the prevalence rates of IDA was found with the increased number of pregnancies; however, increased years of spacing did not show this effect. Previous and current use of iron supplements seems to have limited effect in lowering the prevalence rate of IDA (Abu-Hasira, 2007).

Another study was carried out by AL-Tell et al, about the effect of nutritional interventions on anemic pregnant women's health in Nablus City using the health promotion model. It showed a significant association between the perceived risk of anemia and eating practices, and also between changing eating practices and improvement in hemoglobin levels of pregnant women (AL-TELL et al., 2010).

A study carried out by Nadira Samha, about compliance with iron supplementation among pregnant women at UNRWA clinics in West Bank showed that the compliance rate was low (50.4%). It also showed that health education and counseling for proper use of iron supplements, benefits, information about possible side effects, and clear instruction provided by the health staff significant factors for compliance. Moreover, pregnant women's perception, knowledge, and attitude towards iron supplements were associated with compliance while the socio-demographic factors are considered non-significant factors affecting compliance(Samha, 2012a)

In 2018, a study was done in Hebron Governorate at the Ministry of Health's mother and child health clinics. The study aimed to assess the prevalence of anemia and IDA among pregnant women and investigated the association between maternal anemia and pregnancy outcome. The study indicated that IDA is a moderate public health problem among pregnant women in Hebron Governorate. It also showed that maternal Hemoglobin level (Hb)affects pregnancy outcomes. It also showed that newborns of women with low Hb levels tended to have lower birth weight and

height, head circumference, and lower gestational age. (Srouf et al., 2018). However, this study did not investigate the risk factors for IDA among these pregnant women.

Another local retrospective study was carried out in the primary health facilities of the MoH in North Palestine in 2024. This study aimed to assess the epidemiology of anemia, gestational diabetes, and gestational hypertension between 2018 and 2020. According to the study, anemia was more common overall in the second trimester (16.2%) than in the first trimester (11.2%), with women who were anemic in the first trimester having a higher probability of becoming anemic in the second (OR = 8.223, P-value<0.001). Anemia was more common in the second trimester (OR = 1.352, P-value<0.001) among refugees, although it was less common in the first trimester (OR = 0.768, P-value = 0.006) compared to women residing in urban areas (Damiri et al., 2024).

## 2.10 The UNRWA antenatal care guidelines

At the UNRWA clinics, antenatal care service is defined as a comprehensive antepartum care program that involves a coordinated approach to medical care and psychological support that optimally begins before conception and extends throughout the antepartum period. Regular monitoring to improve the quality of antenatal care and reduce maternal and perinatal mortality and pregnancy complications, WHO issued 2016 a new guideline on antenatal care. The new guidelines increase the number of contacts a pregnant woman has with health providers throughout her pregnancy from four to eight. Complete Blood Count (CBC) testing was carried out during the first antenatal care visit and at 24 weeks of gestation(UNRWA, 2020c). The Hb threshold for diagnosing anemia is 11.0 g/dL in the first and third trimesters and 10.5 g/dL in the second trimester of pregnancy. Furthermore, the severity of anemia is classified according to hemoglobin level as shown in Table 2.1 (UNRWA, 2020b).

**Table 2.1: Classification of anemia by Hemoglobin level (g/dl) (UNRWA, 2020b)**

<b>Population</b>	<b>Mild</b>	<b>Moderate</b>	<b>Sever</b>
Non-pregnant women ( $\geq 15$ yrs.)	11.0 – 11.9	8.0 – 10.9	< 8.0
Pregnant women	10.0 – 10.9	7.0 – 9.9	< 7.0

During antenatal care provision family health team members are requested to counsel and advise pregnant women to maintain a balanced and varied diet to increase iron intake. Therefore, pregnant women should take the recommended dose of 0.4 mg daily of folic acid from three months before conception and throughout pregnancy. This reduces the risk of having a child with neural tube defects and maternal anemia with related adverse outcomes. Iron supplementation should be given to pregnant women throughout pregnancy and for three months after delivery to provide sufficient iron to meet the requirements of pregnancy, and lactation, and to protect pre-existing iron stores to prevent maternal anemia. Non-anemic pregnant women should routinely receive iron supplementation one tablet with 60 mg of elemental iron daily while pregnant women who are anemic should receive one tablet with 120 mg of elemental iron per day until their Hb concentration rises to normal (Hb 11.0 g/dl or higher) according to UNRWA's prevention and treatment guidelines for micronutrient deficiencies (UNRWA, 2020b).

## **Chapter Three: Theoretical and Conceptual Framework**

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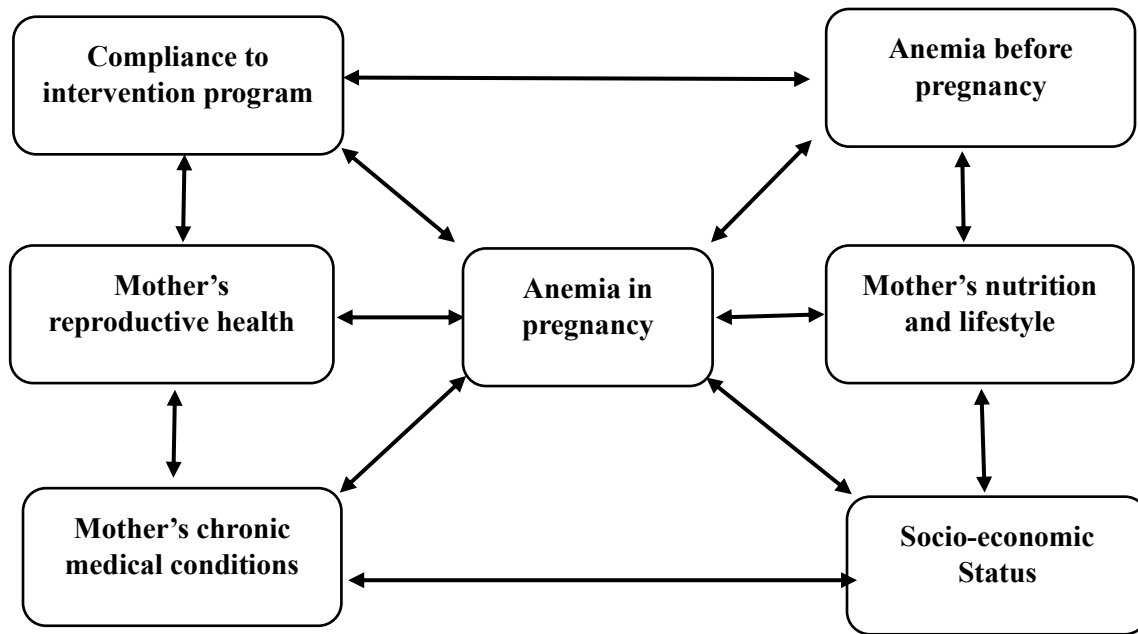
### **3.1 Introduction**

In this chapter, the mechanism that describes the association between anemia in pregnancy and its risk factor is presented. Including their biological definitions, conceptual framework, study variables, and operational definitions and concepts.

### **3.2 Study Conceptual Framework**

According to a literature review and after reviewing all models suggested determinants of anemia in pregnancy. The determinants of anemia are summarized as follows:

- History of anemia before pregnancy
- Socio-demographic factors such as age, occupation, residence, level of income, education, and family size
- Mother's reproductive health factors include: age of marriage, history of parity and gravidity, abortions, age at first childbirth, breastfeeding practice, pregnancy interval, and frequency of antenatal care visits
- Mother's chronic medical conditions such as the history of malaria, TB, AIDS, DM, and UTI and previous history of surgery, BMI
- Mother's nutrition and lifestyle factors: smoking habits, alcohol drinking, eating habits, iron supplements, intake of meat and fruits, frequent daily tea consumption, etc
- Health education and counseling through UNRWA interventional program



**Figure 3.1: Study Conceptual Framework, anemia in pregnancy is the dependent variable and all other groups of variables in the figure are the independent variables in our study.**

### 3.3 Study conceptual module variables

#### 3.3.1 Change in hematological variables and physiological anemia

Many physiological changes occur in the mother's hematopoietic system to accommodate the development of the fetus and placenta. Table (3.1) summarizes these changes

**Table 3.1: Hematologic changes in normal pregnancy (Fisher & Nemeth, 2017)**

	Change
Plasma volume	Increases 30–50%
RBC mass	Increases 20–30%
Hemoglobin concentration	Decreases
RBC life span	Decreases slightly
Erythropoietin	Increases

During a healthy pregnancy, physiological anemia occurs as a consequence of a higher rise in plasma volume compared to an increase in red blood cell mass. The hemoglobin concentration and hematocrit in women who do not take iron supplements fall gradually at roughly 28–36 weeks (on

average, ~2 g/dL lower than pre-pregnancy hemoglobin concentrations). Between 26 and 38 weeks, there is a slight drop in the mean corpuscular volume. This is probably due to the highest intensity of placental iron transport at this time, which lowers the amount of iron available for maternal erythropoiesis. It has been found that women who take iron supplements have hemoglobin concentrations that are approximately 1 g/dL higher at term than women who do not take iron supplements. (Fisher & Nemeth, 2017).

### 3.3.2 Iron requirement during pregnancy

The physiological needs for iron rise significantly during pregnancy to support fetoplacental development and maternal adaptation to pregnancy. Table (3.2) summarizes the iron requirement during pregnancy. Both dietary iron absorption and the mobilization of iron from stores elevate to meet these iron requirements.

**Table 3.2: Iron balance in pregnancy ( all values are means)(Fisher & Nemeth, 2017)**

Iron fate	Amount/mg
Fetal iron	270
Placental iron	90
Baseline maternal body iron mass	230
Expansion of maternal RBC mass	450
Total iron needs during pregnancy	1040
RBC-mass concentration after delivery (450) minus blood lost at delivery (150mg)	-300
Net pregnancy iron loss to the mother	740

### 3.3.3 Gravidity, parity status, and abortion:

Gravidity is defined as the total number of all previous pregnancies, regardless of the outcome including all live births and pregnancies that terminated at <6 months or did not result in a live birth. Parity was defined as pregnancies that resulted in the delivery at ≥6 months gestation, of either alive or dead. (Wernli et al., 2009). Abortion (miscarriage) is defined as the termination of pregnancy before the 20<sup>th</sup> week (Shakhatreh et al., 2022)

Women's bodies contain different amounts of iron stores depending on their gravidity status, and serum ferritin is the best indicator of iron deficiency. A low serum Ferritin level reflects reduced iron storage. Compared to nulliparous women, multiparous women had lower blood ferritin levels because most nulliparous females did not experience the stress of pregnancy, delivery, and subsequent lactation. About 900 mg of iron is lost by the mother to the fetus during a full-term pregnancy. Without iron supplements, the mother's iron store will be reduced and she won't be able to meet the fetus's needs. (Farooq et al., 2011)

Primiparous pregnant women had hemoglobin levels of  $(11.45 \pm 1.45)$  and multiparous  $(8.93 \pm 1.66)$ , respectively, which is highly significant. The hematocrit, MCV, and MCH of primigravida were found to be significantly higher than multigravidas. Iron deficiency anemia during pregnancy is associated with high parity and the incidence of anemia increases with the number of pregnancies. (Shah et al., 2020)

#### *3.3.4 Heavy menstrual bleeding (HMB):*

It is defined as excessive menstrual blood loss  $> 80$  mL per cycle or *bleeding lasting longer than seven days*. (Davies & Kadir, 2017). Anemia linked to blood loss can result from heavy menstrual bleeding. Iron deficiency anemia can occur when the body uses its iron stores to produce more hemoglobin in an attempt to compensate for the loss of red blood cells. Women with HMB lose on average five to six times more iron per menstrual cycle than women with normal blood loss. This can lead to decreased iron store levels. (Mansour et al., 2021)

#### *3.3.5 Birth spacing and family planning.*

Birth interval length is defined as the period between two consecutive live births. WHO recommended a minimum interval of 24 months after a live birth and at least 6 months after a miscarriage or termination before the next pregnancy. (Bhattacharya & Bell, 2017). The association of a short interval between pregnancies with maternal anemia may be due to insufficient time to restore micronutrient storage. (Geta et al., 2022). It has been demonstrated that family planning can aid with anemia. This might be accomplished by delaying conceptions and lengthening or increasing the gaps between the pregnancies. Hemoglobin levels differ based on the method of contraception used. (Nagari et al., 2023)

### *3.3.6 Antenatal care visits:*

Women who had a history of ANC follow-up visits were less likely to be anemic than those who had never had an ANC visit. This could be because ANC visits offer health education as well as access to health care services like iron-folic acid supplements. (Geta et al., 2022)

### *3.3.7 Maternal nutrition and dietary diversity*

Maternal anemia was significantly associated with low maternal dietary diversity and nutritional status. A woman's need for nutrients is particularly great throughout her pregnancy. Lack of diversity in a pregnant woman's diet increases the risk of deficiencies in important nutrients such as iron, folate, and vitamin B12, which can result in anemia. (Geta et al., 2022)

### *3.3.8 BMI and chronic medical disease*

Women with low BMI were significantly associated with maternal anemia. This could be because women with low BMI are more likely to be malnourished and to have micronutrient deficiencies. (Naik et al., 2022). women with chronic illnesses are more likely to experience anemia because of their medical conditions which may cause bleeding or interfere with their ability to absorb iron or red blood cell production process (Erythropoiesis). (Madu & Ughasoro, 2017)

### *3.3.9 Coffee and tea consumption*

Women who consume tea or coffee during or after the meal are more likely to have anemia since tea and coffee decrease the bioavailability of iron and inhibit its absorption. (Lee, 2023).

### *3.3.10 Citrus juice intake*

According to the studies, citrus fruits and juice improve iron absorption by changing non-heme iron into a more absorbable form. Consequently, women who take iron with citrus juice show improvement in their anemia status. (Takatera et al., 2012)

### 3.4 Variables operational definition:

In this study, we recategorized the following variables to facilitate the data analysis. The dependent variable in this study is the anemia status among pregnant women in the 2<sup>nd</sup> trimester. It was measured based on their hemoglobin levels (Hb) at 24 weeks of pregnancy. This Classification is according to the WHO definition.

#### 3.4.1 Dependent variable:

##### ○ **Anemia at 24 weeks of pregnancy**

In this study, the anemia status of the pregnant women regarding their hemoglobin level at 24 weeks of pregnancy (2<sup>nd</sup> trimester) was classified into two categories:

1. Anemic: hemoglobin level at 24 weeks of pregnancy < 10.5 g/L
2. Non-anemic: hemoglobin level at 24 weeks of pregnancy  $\geq$  10.5 g/L

#### 3.4.2 Independent variables

##### ○ **Anemia at registration:**

In this study, the anemia status of the pregnant women regarding their hemoglobin level at registration of pregnancy (1<sup>st</sup> trimester) was classified into two categories:

1. Anemic: hemoglobin level registration of pregnancy < 11.0 g/L
2. Non-anemic: hemoglobin level at registration of pregnancy  $\geq$  11.0 g/L

##### ○ **Clinic Area:** They were divided into three groups according to their geographical distributions:

1. Ramallah: which includes: Amari and Jalazone clinics
2. North, North-west Jerusalem: which includes: Kalandia and Biddo clinics
3. North-west Ramallah: which includes: Deir Ammar, Beit our, Ein Arik, Bodros clinics

##### ○ **Age:** The ages of sample populations were divided into three groups

1. Pregnant women who were 15-24 year

2. Pregnant women who were 25-34year
  3. Pregnant women who were 34-49 year
- **Women's education level:** It was classified into:
    1. Pregnant women who complete  $\leq 10$  years of education
    2. Pregnant women who complete 11-12 years of education
    3. Pregnant women who complete  $> 12$  years of education (college, university)
  - **Husband education level:** It was classified into:
    1. Husbands who complete  $\leq 10$  years of education
    2. Husbands who complete 11-12 years of education
    3. Husbands who complete  $> 12$  years of education (college, university)
  - **Family income:** In this study, the average earned money by both husband and wife was considered as the monthly income of the family. The monthly income was classified into:
    1. Less than 2000 NIS
    2. 2001-3000 NIS
    3. 3001-5000 NIS
    4. More than 5000 NIS
  - **Marriage age:** It was classified into:
    1. Marriage age  $\leq 18$  years
    2. Marriage age  $>18$  years
  - **pregnancy age:** It was classified into:
    1. Pregnancy age  $\leq 18$  years
    2. Pregnancy age  $>18$  years
  - **periods days:** It was classified into:
    1. Normal period (2-7 days)
    2. Heavy period ( $> 7$  days)

○ **Numbers of pregnancy (gravidity):** It was classified into:

1. primigravida (her current pregnancy is her first pregnancy)
2. 2-3 pregnancies
3.  $\geq 4$  pregnancies

○ **Numbers of live babies (parity):** It was classified into:

1. No live babies
2. 1-2 live babies
3.  $\geq 3$  live babies

○ **Numbers of abortions:** It was classified into:

1. No abortions
2. 1-2 abortions
3.  $\geq 3$  abortions

○ **Number of children under five:** It was classified into:

1. No children  $< 5$  years
2. One child  $< 5$  years
3.  $\geq 2$  children  $\geq 5$  years

○ **Pregnancy space:** It was classified into:

1. First pregnancy
2.  $< 2$  years pregnancy space
3.  $\geq 2$  years pregnancy space

○ **Breastfeeding duration:** It was classified into:

1. Three months or less
2. Six months or less
3. Seven months -one year
4. One to two years

5. No breastfeeding history
  - **Family planning methods:** It was classified into:
    1. Pills, injection, and IUD
    2. Condom and natural methods
  
  - **BMI:** It was classified into:
    1. Underweight  $< 18.5$
    2. Normal  $18.5 - < 25$
    3. Overweight  $25 - < 30$
    4. Obese  $\geq 30$
  
  - **Number of meals:** It was classified into:
    1.  $< 3$  meals per day
    2.  $\geq 3$  meals per day

## Chapter Four: Study Methodology

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### 4.1 Study setting:

The study was conducted at UNRWA's health care centers in the Jerusalem area out of the separation wall. These clinics provide preventive and curative primary health care to Palestinian refugees. Jerusalem Area Health Department has nine major health centers that serve the Palestinian refugees five days per week and four health points that work just for two days per week. The major healthcare centers are (Jerusalem Town, Shufat, *Al-Amari*, Kalandia, AL-Jalazon, Biddo, Deir Ammar, Ein AL-Sultan, and Aqbat Jaber) while the health points are (Bodros, Beit Our, Ein Arik, and AL-Auja). Five major healthcare centers (*Al-Amari*, Kalandia, AL-Jalazon, Deir Ammar, and Biddo) and three health points (Beit Our, bodros, and Ein Arik) were included in the study since they are considered the largest healthcare centers and points according to their workload and the number of Palestinian refugees they serve. They are located in Jerusalem out of the separation wall and in Ramallah city. Health centers and points in Jerico City have been excluded from this study to minimize differences in the study sample.

These health centers offer many health services to their beneficiaries as they focus on many health programs like maternal and child health which includes (preconception care, antenatal care, postnatal care, family planning, infant and child care, vaccinations), prevention and treatment of non-communicable diseases (mainly Diabetes and Hypertension), mental and psychosocial support program which aim to address and enhance the psychological well-being of the individuals and their communities. In addition, a wide range of general outpatient care is provided (UNRWA, 2020a).

### 4.2 Study population:

The target population of this study is the pregnant women who registered for antenatal care at the (*Al-Amari*, Kalandia, AL-Jalazon, Deir Ammar, Biddo, Beit Our, Bodros, and Ein Arik) clinics from May 1st, 2022 to July 30th, 2022.

### 4.3 Study design:

A follow-up study design was used for this study, as we want to determine the factors associated with anemia during pregnancy.

The study design consists of three stages:

- **Stage 1:** The pregnant mothers who are registered at the targeted clinics between May 1st,2022 to July 30th,2022 were approached and invited to participate. Data was collected from the mother's files and an interview baseline- questionnaire.
- **Stage 2:** Collect the data retrospectively from the mother herself and from the mother's file about her past medical history, and previous blood count (CBC) to determine if she was previously anemic or not.
- **Stage 3:** These women were followed during pregnancy. A follow-up questionnaire was used to collect data at week 24 of gestation. Data was also collected from their medical files every 4 weeks (GA: 24, 28, 32, 36, and 40 weeks of gestation) to assess their medical situation.

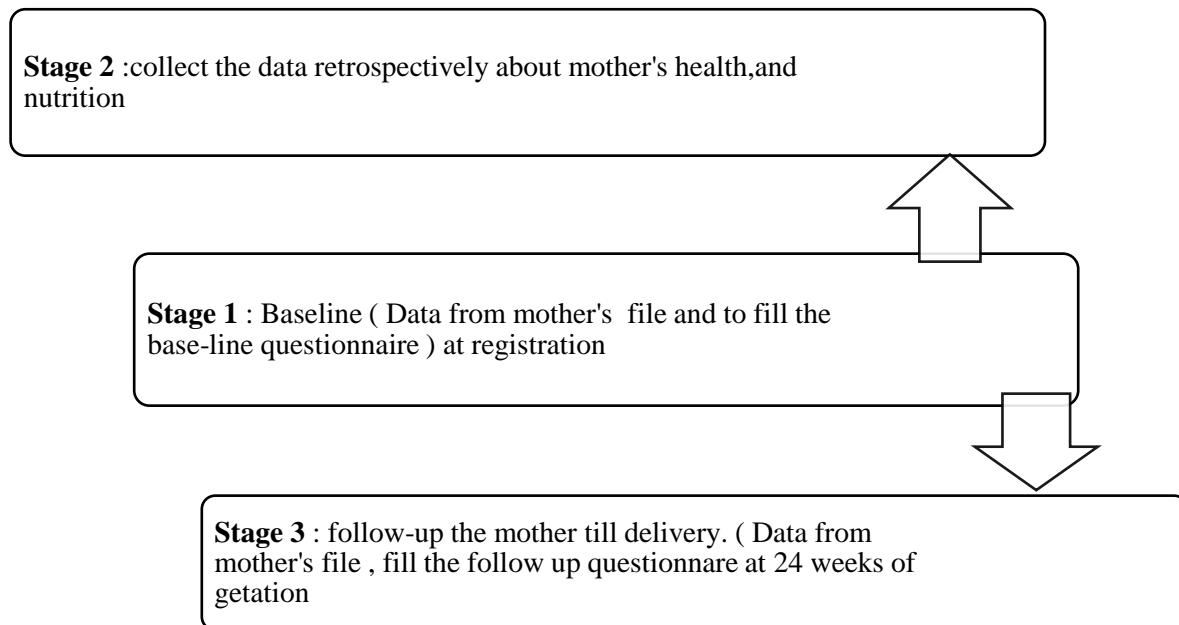


Figure 4.1: Study Design

#### 4.4 Sample frame

The sample of this study was the pregnant women who registered for antenatal care at the (Al-Amari, Kalandia, AL-Jalazon, Deir Ammar, Biddo, Beit Our, Bodros, and Ein Arik) clinics from May 1<sup>st</sup>, 2022 to July 30<sup>th</sup>, 2022, and they met the study inclusion-exclusion criteria.

#### 4.5 Sampling method and sample size

Five major healthcare centers (Al-Amari, Kalandia, AL-Jalazon, Deir Ammar, and Biddo) and three health points (Beit Our, Bodros, and Ein Arik) were included in the study. These major healthcare centers are considered the largest healthcare centers in the Jerusalem area and health points are selected according to their workload and the number of Palestinian refugees they serve.

Inside the health care clinics, the pregnant women who registered for antenatal care at the chosen health care clinics between May 1<sup>st</sup>,2022 to July 30<sup>th</sup>,2022, and met inclusion-exclusion criteria were included in the study. So, these women were followed up through the year 2022 until they delivered.

According to the workload of these centers, 418 registered pregnant women have participated in this study. Unfortunately,18 pregnant women have been excluded from the study due to abortion and inability to follow up. So, our study sample was 400 pregnant women.

#### 4.6 Inclusion-Exclusion Criteria

- **Inclusion Criteria:** The pregnant women who register for antenatal care at the (Al-Amari, Kalandia, AL-Jalazon, Deir Ammar, Biddo, Beit Our, Bodros, and Ein Arik) clinics from May 1<sup>st</sup>, 2022 to July 30<sup>th</sup>, 2022. Also, they don't have anemia due to chronic diseases or aren't thalassemia carriers/diseases.
- **Exclusion Criteria:** The pregnant women who register for antenatal care at the (Al-Amari, Kalandia, AL-Jalazon, Deir Ammar, Biddo, Beit Our, Bodros, and Ein Arik) clinics from May 1<sup>st</sup>, 2022 to July 30<sup>th</sup>, 2022. and they have anemia due to chronic diseases or they are thalassemia carriers/diseases.

## **4.7 Study Tool**

### **4.7.1 Structured interview base-line questionnaire**

A face-to-face structural interview questionnaire was developed by the researcher after reviewing similar studies and previously validated questionnaires: i.e. similar study questionnaire used in the study of the prevalence of anemia and associated risk factors among pregnant women in Saudi Arabia (Alreshidi & Haridi, 2021), Global Physical Activity Questionnaire (GPAQ) (WHO, 2021) And Minimum Dietary Diversity for Women (MDD-W) questionnaire (FAO, 2021). And from the previous master thesis questionnaire (khateeb, 2018).

The questionnaire consisted of 95 questions, categorized into four main sections to cover the study objectives (Appendix 1). The following sections are:

- Section one: The socio-demographic and economic characteristics, included questions about the participant 's age, occupation, education, residence area, level of income, family size, head of the family, etc. (Question1 to Question 10)
- Section two: Reproductive health, included questions about the participant 's age of marriage, history of parity and gravidity, abortions, age at first childbirth, breastfeeding practice, pregnancy interval and frequency of antenatal care visits, etc. (Question11 to Question 37)
- Section three: Present and past medical history, included questions about the health status of the participants: weight, height, history of chronic diseases, past surgical history, etc. (Question 38 to Question 45)
- Section four: The nutrition and lifestyle section included questions about smoking habits, alcohol drinking, physical activity, eating habits, iron supplements, intake of meat and fruits, frequent daily tea consumption, etc. (Question 46 to Question 95)

### **4.7.2 Structured Follow-up Questionnaire:**

A face-to-face structural interview questionnaire was developed by the researcher after reviewing similar studies and previously validated questionnaires. i.e pregnancy physical activity questionnaire (PPAQ)(Papazian et al., 2020)Minimum Dietary Diversity for Women (MDD-W) questionnaire (FAO, 2021), and from previous master thesis questionnaire ((Samha, 2012b)

The questionnaire consisted of 58 questions, categorized into two main sections to cover the study objectives (Appendix 2). The following sections are:

- Section one: Health education/ Diet counseling for pregnant women from health care providers in UNRWA clinics. (Question 1 to Question 21)
- Section two: The nutrition and lifestyle section included questions about smoking habits, alcohol drinking, physical activity, eating habits, intake of meat and fruits, frequent daily tea consumption, and compliance with the UNRWA micronutrient intervention program and iron supplement. (Question 22 to Question 58)

#### **4.7.3 Mother's medical files**

All information about the mother who participated in the study was extracted from their files including hemoglobin levels at registration and 24 weeks, and current pregnancy medical situation.

In case the needed information regarding the mother is not available in the files, we contacted the targeted woman by a phone call from the UNRWA health center and we asked her permission to collect the needed data.

#### **4.8 Questionnaire Validation**

The questionnaire was validated for content validations by Obstetrician-gynecologists, a field Family Health Officer in UNRWA's West Bank FO, UNRWA Head Quarter in Amman Health Department, and two experts in the field of women's health. The questionnaire was modified according to their suggestions and editions. Then the questionnaires were translated into Arabic language by an expert in medical and public health terminology translation. Then, the questionnaires were reviewed by the Family Health Officer in UNRWA's West Bank FO. This facilitates pregnant women to understand and answer it.

#### **4.9 Pilot study**

The pilot study was conducted to evaluate both baseline and follow-up questionnaires. Twenty-five women were interviewed in various UNRWA clinics before finalizing the questionnaire structure. After the pilot study was completed, the procedure was revised, leading to additional additions, deletions, and changes to some questions. This pilot data was not included in the study.

Cronbach's alpha for reproductive health variable: 0.96, for medical history:0.67, for physical activity at 24 weeks: 0.646, for health education variables:0.76, for the maternal perception of iron:0.74, nutrition: 0.67, iron side effect: 0.78, iron and supplements intake 0.75

#### **4.10 Data collection**

The extraction form was prepared to collect the needed data:

- The Baseline questionnaire was collected from selected clinics by interviewing the participants who registered for antenatal care in the clinic, and after getting their approvals. The interview took about 10-15 minutes to fill out the questionnaire.
- We extracted all information for all the pregnant women who registered for antenatal care at the (Al-Amari, Kalandia, AL-Jalazon, Deir Ammar, Biddo, Beit Our, Bodros, and Ein Arik) clinics from May 1st, 2022 to July 30th, 2022 and they were selected as a case according to inclusion-exclusion criteria from their medical files at registrations.
- We collected the data retrospectively from the mother herself and the mother's file about her past medical history, and previous CBC if available to determine if she was previously anemic or not.
- These women were followed during pregnancy, their medical files were opened every 4 weeks (GA: 24,28,32,36, and 40 weeks) to assess their medical situation.
- Each participating woman was contacted by the clinic midwives to book an appointment to visit the clinic in her 24 weeks of gestation to fill out the follow-up questionnaire and to do a CBC laboratory test. The interview took about 10-15 minutes to fill out the questionnaire.
- In case the needed information regarding the mother is not available in the files, we contacted the targeted woman by phone call from the UNRWA health center and asked for her permission to collect the needed data.

#### **4.11 Training of study team**

The UNRWA approved the participation of midwives in the data collection process. Therefore, the study researcher implemented a training program for the midwives to ensure reliability and accuracy in data collection. The interviewers were trained on how to ask the study questions. The

researcher and the trained team needed to stay in constant phone contact to monitor the data collection process and address any issues.

#### **4.12 Data entry and statistical analysis:**

The data was entered, cleaned, and analyzed using the Statistical Package for Statistical Analysis (SPSS version 25). Descriptive statistics was used to summarize the data. Bivariate analysis was done and a P-value  $<0.10$  was considered statistically significant. We increase the power of the P-value from 0.05 to 0.1 to include all the borderline variables. The chi-square test and T-test were used as needed to calculate the difference between the anemic and non-anemic groups regarding all variables in the study. Multivariate analysis was used as needed to develop the study's final model. Conditional forward logistic regression was done and all variables that have a p-value less than 10% in the bivariate analysis were included in the model. Risk Ratio with its 95% Confidence Interval (CI) was used to measure the strength of the association between anemia and exposure variables (sociodemographic, economic, nutrition, and reproductive health characteristics), as well as the association between anemia and adverse pregnancy.

#### **4.13 Ethical consideration**

This proposal was submitted to Al Quds University /School of Public Health's Ethical Review Board committee for discussion and approval (Appendix 4). The permission to conduct the study was obtained from the UNRWA (Appendix 5). The permission to join the study was also obtained from the woman herself through the consent form which illustrated all the procedures of this study and to open her maternal file to get the needed data (Appendix 3). Also, permission was obtained in case we contact her by phone call from the UNRWA health center to collect the needed data. Ethical considerations also were taken for data collection and opening of the patients' files. All the participants were assured that all information would be kept strictly confidential and would only be used for research purposes.

To fulfill the requirements for appropriate storage, use, or disclosure of data, all files were stored on a password-protected computer until data analysis, report writing, and research publication were finalized. During analysis, an anonymous file without the woman's name and file number was used. Only researchers can access the data. It is expected to keep the data for 1 year after that it will be destroyed.

## Chapter Five: Result And Analysis:

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### 5.1 Introduction

In this chapter results are presented in three parts: a description of study cases, the bivariate analysis, and the multivariate analysis in the following sections.

### 5.2 Descriptive analysis

#### 5.2.1 Hemoglobin levels at registration and 24 weeks

Our study sample consisted of 400 pregnant women interviewed at five major health centers and three health points in the Jerusalem Area (response rate was 100%). Of the participants women, only 20 % had been diagnosed with IDA based on their hemoglobin levels (Hb) at registration (Hb level in the 1<sup>st</sup> trimester < 11.0 g/dl) (Figure 5.2.1). In the second trimester of pregnancy, this percentage had increased to 32% of the participant pregnant women who were diagnosed with IDA based on their hemoglobin level at 24 weeks of pregnancy (Hb < 10.5 g/dl) (Figure 5.2.2).

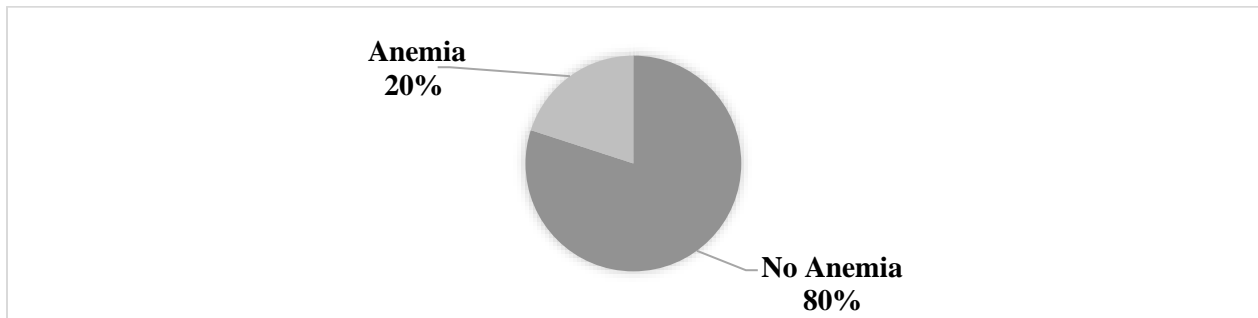


Figure 5.2.1: Prevalence of IDA among study population at registration

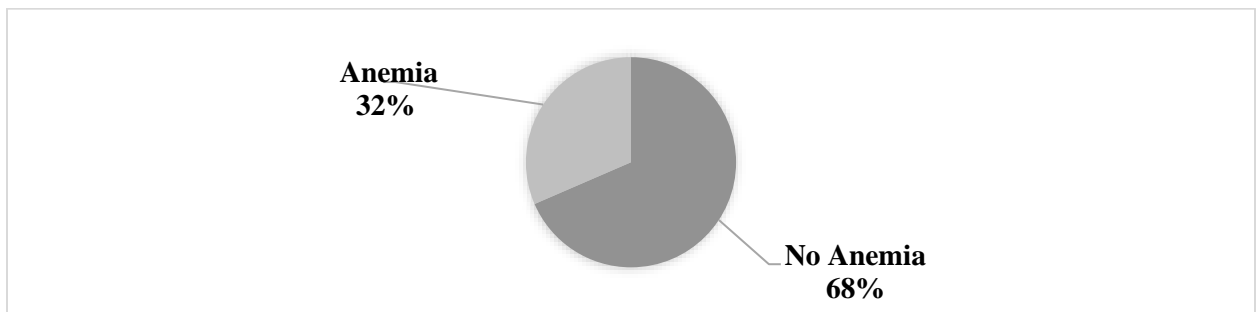


Figure 5.2.2: Incidence of IDA among study population at 24 weeks of pregnancy

As shown in Table 5.2.1, the mean of hemoglobin levels for the participant women in the 1<sup>st</sup> trimester ( $11 \pm 1.11$ ) was higher than the mean at 24 months of registration ( $11.01 \pm 1.196$ ). After comparing the hemoglobin levels between the 2<sup>nd</sup> and the 1<sup>st</sup> trimester the mean was -0.83 with a standard deviation of 0.98. In Table 5.2.2, it was demonstrated that there is a significant positive association between hemoglobin levels for the participant women at registration and hemoglobin levels at 24 weeks ( $r = 0.640$ ,  $p < 0.05$ ).

**Table 5.2.1: descriptive analysis of hemoglobin level (Hb)**

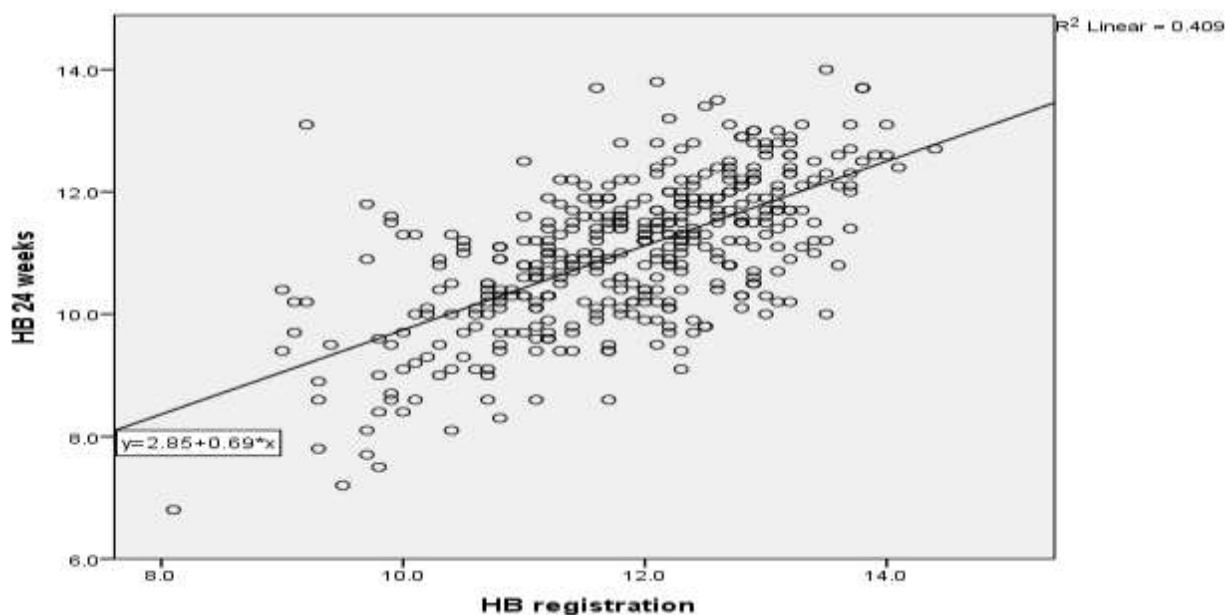
	N	Minimum	Maximum	Mean	Std. Deviation
Hb registration	400	8.1	14.4	11.839	1.1107
Hb 24 weeks	400	6.8	14.0	11.011	1.1968
Anemia compares	400	-3.50	3.90	-.8285	.98242

**Table 5.2.2: Correlation between Hb at registration and Hb at 24 weeks**

Correlations			
		HB registration	HB 24 weeks
Hb registration	Pearson Correlation	1	.640**
	Sig. (2-tailed)		.000
	N	400	400
Hb 24 weeks	Pearson Correlation	.640**	1
	Sig. (2-tailed)	.000	
	N	400	400

As shown in Figure 5.2.3, there is a linear correlation between hemoglobin levels for the participant women at registration and hemoglobin levels at 24 weeks.  $R^2 = 0.409$  which means that about 41% of the change in the hemoglobin level at 24 weeks can be explained by a change in the hemoglobin level at registration. Consequently, the prediction equation is

$$\text{Hb at 24 weeks} = 2.85 + 0.69 * \text{Hb registration.}$$



**Figure 5.2.3: Correlation between Hb at registration and Hb at 24 weeks**

*5.2.2 Demographic characteristics of the study sample:*

According to Table 5.2.3, 49.8% were registered in Ramallah clinic, 56.0% were in the age group of 25-34 years, 60.0% had an educational level of more than 12 years, 39.5% lived in the villages, 56.8% lived in an apartment, 66.0% had 3-5 family size members, 42.5% their husband educational level of fewer than 10 years, 46.5% had an average monthly income of 2001-3000 NIS, 63.5% had no history of past work, 88.8% had no history of current work and 71.3 % had no parental consanguinity.

**Table 5.2.3: Descriptive analysis of the demographic characteristics of the study population**

		<b>Total N%</b>
<b>Clinic Region</b>	Ramallah *	49.8%
	North, North-west Jerusalem **	41.3%
	North-west Ramallah ***	9.0%
<b>Age</b>	15-24 years	33.8%
	25-34 years	56.0%
	35-49 years	10.3%
<b>Women's education level</b>	≤ 10 years	12.0%

	11-12 years	28.0%
	> 12 years	60.0%
<b>Residency</b>	City	24.5%
	Village	39.5%
	Camp	36.0%
<b>House type</b>	Separate house	43.3%
	Apartment	56.8%
<b>Family size (members)</b>	2	22.3%
	3-5	66.0%
	≥6	11.8%
<b>Husband's education level</b>	≤ 10 years	42.5%
	11-12 years	28.0%
	> 12 years	29.5%
<b>Income</b>	≤2000	17.8%
	2001-3000	46.5%
	3001-5000	24.3%
	> 5000	11.5%
<b>Past work</b>	Yes	36.5%
	No	63.5%
<b>Current work</b>	Yes	11.3%
	No	88.8%
<b>Parental consanguinity</b>	No consanguinity	71.3%
	First-degree relatives (cousins)	21.8%
	From the same family	7.0%

\*Ramallah region: Amari and Jalazone

\*\* North, North-west Jerusalem: Kalandia, Biddo

\*\*\* North-west Ramallah: Deir Ammar, Beit our, Ein Arik and Bodros

## 5.3 Bivariate analysis

### 5.3.1 Association between anemia at 24 weeks and socio-demographic variable

The occurrence of anemia at 24 weeks was significantly associated with the age of the women, the location of the clinic, and the place of residence, ( $p < 0.10$ ). Other sociodemographic variables did not show any significant association with the incidence of anemia at the 24 weeks of pregnancy (Table 5.3.1)

Among the anemic, 55.6 % were from Ramallah camps, 50.8 % of women were in the age group 25-34 years, 55.6 % had >12 years of education, 41.3% lived inside the refugee camp, 57.9 % lived in an apartment, 65.1% had 3-5 family members, 40.5% their husband education  $\leq$  10 years of education, 44.4% had a family income 2001-3000 Nis. Additionally, among anemic women 63.5% had no past work, 86.5% didn't work currently and 67.5 had no parental consanguinity as illustrated in (Table 5.3.1).

**Table 5.3.1: Association between anemia at 24 weeks and socio-demographic variable**

		Anemia 24 weeks (cat)				P value
		No Anemia		Anemia		
		Count	N %	Count	N %	
<b>Clinic Region</b>	Ramallah	129	47.1%	70	55.6%	<b>.081</b>
	North, North-west Jerusalem	115	42.0%	50	39.7%	
	North-west Ramallah	30	10.9%	6	4.8%	
<b>Age</b>	15-24 years	97	35.4%	38	30.2%	<b>.000*</b>
	25-34 years	160	58.4%	64	50.8%	
	35-49 years	17	6.2%	24	19.0%	
<b>Women's education level</b>	$\leq$ 10 years	28	10.2%	20	15.9%	.232
	11-12 years	76	27.7%	36	28.6%	
	> 12 years	170	62.0%	70	55.6%	
<b>Residency</b>	City	64	23.4%	34	27.0%	<b>.096</b>
	Village	118	43.1%	40	31.7%	
	Camp	92	33.6%	52	41.3%	
<b>House type</b>	Separate house	120	43.8%	53	42.1%	.745
	Apartment	154	56.2%	73	57.9%	
<b>Family size (members)</b>	2	61	22.3%	28	22.2%	.921
	3-5	182	66.4%	82	65.1%	
	$\geq$ 6	31	11.3%	16	12.7%	
<b>Husband's education level</b>	$\leq$ 10 years	119	43.4%	51	40.5%	.382
	11-12 years	71	25.9%	41	32.5%	
	> 12 years	84	30.7%	34	27.0%	
<b>Income</b>	$\leq$ 2000	50	18.2%	21	16.7%	.502
	2001-3000	130	47.4%	56	44.4%	
	3001-5000	67	24.5%	30	23.8%	
	> 5000	27	9.9%	19	15.1%	
<b>Past work</b>	Yes	100	36.5%	46	36.5%	.998

	No	174	63.5%	80	63.5%	
<b>Current work</b>	Yes	28	10.2%	17	13.5%	.336
	No	246	89.8%	109	86.5%	
<b>Parental consanguinity</b>	No consanguinity	200	73.0%	85	67.5%	.525
	First-degree relatives (cousins)	56	20.4%	31	24.6%	
	From the same family	18	6.6%	10	7.9%	

### 5.3.2 Association between anemia at 24 weeks and reproductive health variable

Our study showed that there is no significant association between reproductive health variables and the incidence of anemia at the 24 weeks of pregnancy, ( $p < 0.1$ ). (Tables 5.3.2a-d).

In Table 5.3.2a, the reproductive characteristics of the pregnant women are presented. Interestingly, none of the variables were associated with anemia at 24 weeks. The majority of anemic women married for the first time and got pregnant at an age older than 18 years, with 77.7 % and 84.1 % of them doing so, respectively. Among anemic women, 79.4% had regular periods, 96.0% had normal period duration (2-7 days) and 61.9% of them didn't have heavy periods in nature. Also, in anemic women, the vast majority of the women didn't have any history of ovarian cysts, uterine fibroid, uterine abnormalities, or ectopic pregnancies.

**Table 5.3.2a: Association between anemia at 24 weeks and past reproductive health variables**

		Total N%	Anemia 24 weeks (cat)				P value
			No Anemia		Anemia		
			Count	N %	Count	N %	
<b>Age at first marriage</b>	<= 18 years	20.3%	52	19.0%	29	23.0%	.351
	> 18 years	79.8%	222	81.0%	97	77.0%	
<b>Period type</b>	regular	82.5%	230	83.9%	100	79.4%	.263
	not regular	17.5%	44	16.1%	26	20.6%	
<b>Period duration (days)</b>	normal period (2-7 days)	96.0%	263	96.0%	121	96.0%	.982
	heavy period (>7 days)	4.0%	11	4.0%	5	4.0%	

<b>Period nature (Heavy)</b>	Yes	33.3%	85	31.0%	48	38.1%	.163
	No	66.8%	189	69.0%	78	61.9%	
<b>History of ovarian cyst</b>	Yes	13.8%	35	12.8%	20	15.9%	.403
	No	86.3%	239	87.2%	106	84.1%	
<b>History of uterine fibroid</b>	Yes	2.8%	6	2.2%	5	4.0%	.312 <sup>b</sup>
	No	97.3%	268	97.8%	121	96.0%	
<b>History of uterine abnormality</b>	Yes	0.8%	1	0.4%	2	1.6%	.188 <sup>b,c</sup>
	No	99.3%	273	99.6%	124	98.4%	
<b>History of ectopic pregnancy</b>	Yes	2.0%	5	1.8%	3	2.4%	.712 <sup>b</sup>
	No	98.0%	269	98.2%	123	97.6%	
<b>Age at first pregnancy</b>	<= 18 years	14.0%	36	13.1%	20	15.9%	.464
	> 18 years	86.0%	238	86.9%	106	84.1%	

Furthermore, as illustrated in Table 5.3.2b, 44% of women had 2-3 pregnancy numbers with an incidence of IDA 39.7%, 50.3% had 1-2 live babies with an incidence of IDA 48.4%, 67.5 % had no history of abortion with an incidence of IDA 69.8%. In addition, among anemic women, only 6.3 % of women had a history of antenatal bleeding, 3.2% had a history of PPH, 5.6% had a history of preterm delivery, 4.8% history of stillbirth, 7.9% history of LBW baby and 4.8% have a history of baby abnormalities. However, in anemic women, 75.4% of women have taken iron and folic acid supplementation in their last pregnancies.

**Table 5.3.2b: Association between anemia at 24 weeks and reproductive health variables related to prior pregnancies**

		<b>Total N%</b>	<b>Anemia 24 weeks (cat)</b>				<b>P value</b>
			<b>No Anemia</b>		<b>Anemia</b>		
			<b>Count</b>	<b>N %</b>	<b>Count</b>	<b>N %</b>	
<b>Current pregnancy number</b>	Primigravida	19.8%	52	19.0%	27	21.4%	.498
	2-3 pregnancies	44.0%	126	46.0%	50	39.7%	
	>=4 pregnancies	36.3%	96	35.0%	49	38.9%	
<b>Numbers of pregnancies of live baby</b>	No live babies	23.5%	64	23.4%	30	23.8%	.863
	1-2 live babies	50.3%	140	51.1%	61	48.4%	
	>=3 live babies	26.3%	70	25.5%	35	27.8%	
<b>Numbers of abortions</b>	No Abortion	67.5%	182	66.4%	88	69.8%	.690
	1-2 Abortions	29.8%	85	31.0%	34	27.0%	

	>=3 Abortions	2.8%	7	2.6%	4	3.2%	
<b>History of antenatal bleeding</b>	Yes	6.8%	19	6.9%	8	6.3%	.975
	No	69.8%	191	69.7%	88	69.8%	
	Never been pregnant	23.5%	64	23.4%	30	23.8%	
<b>History of PPH</b>	Yes	4.5%	14	5.1%	4	3.2%	.687
	No	72.0%	196	71.5%	92	73.0%	
	Never been pregnant	23.5%	64	23.4%	30	23.8%	
<b>History of preterm labor</b>	Yes	4.8%	12	4.4%	7	5.6%	.865
	No	71.8%	198	72.3%	89	70.6%	
	Never been pregnant	23.5%	64	23.4%	30	23.8%	
<b>History of Stillbirth</b>	Yes	3.5%	8	2.9%	6	4.8%	.636
	No	73.0%	202	73.7%	90	71.4%	
	Never been pregnant	23.5%	64	23.4%	30	23.8%	
<b>History of LBW baby</b>	Yes	7.3%	19	6.9%	10	7.9%	.926
	No	69.3%	191	69.7%	86	68.3%	
	Never been pregnant	23.5%	64	23.4%	30	23.8%	
<b>History of baby abnormality</b>	Yes	2.8%	5	1.8%	6	4.8%	.241
	No	73.8%	205	74.8%	90	71.4%	
	Never been pregnant	23.5%	64	23.4%	30	23.8%	
<b>History of iron intake in past pregnancies</b>	Yes	75.0%	205	74.8%	95	75.4%	.275
	No	5.8%	19	6.9%	4	3.2%	
	Never been pregnant	19.3%	50	18.2%	27	21.4%	
<b>History of folic acid intake in past pregnancies</b>	Yes	77.5%	215	78.5%	95	75.4%	.755
	No	3.3%	9	3.3%	4	3.2%	
	Never been pregnant	19.3%	50	18.2%	27	21.4%	

In Table 5.3.2c, 44.8 % had one child under 5 years old with an incidence of IDA 41.3%, 49.0% had pregnancy intervals between the current and the last pregnancy less than two years with an incidence of IDA 48.4%, 72.8% had a history of breastfeeding with an incidence of IDA 71.4%, 26.3 of them had a breastfeeding duration of 1-2 years with an incidence of IDA 25.4%. Moreover,

52.5% of the participating women used the family planning method between the current and last pregnancy with an incidence of IDA 50%. Regarding family planning methods type, only 19.5% of women used pills, injections, and IUD for family planning with an incidence of IDA 19.8%, while 29.3% used condoms or natural methods with an incidence of IDA 31.7%. According to the type of delivery, 59.0% of women had experienced NVD in the last pregnancy with an incidence of IDA 57.1%.

**Table 5.3.2c: Association between anemia at 24 weeks and reproductive health variables related to family planning and breastfeeding**

		Total N%	Anemia 24 weeks (cat)				P value
			No Anemia		Anemia		
			Count	N %	Count	N %	
<b>Breastfeeding</b>	Yes	72.8%	201	73.4%	90	71.4%	.758
	No	3.8%	9	3.3%	6	4.8%	
	No breastfeeding history	23.5%	64	23.4%	30	23.8%	
<b>Breastfeeding duration in the last pregnancy</b>	Three months or less	11.3%	30	10.9%	15	11.9%	.933
	Six months or less	14.8%	43	15.7%	16	12.7%	
	Seven months - one year	20.5%	55	20.1%	27	21.4%	
	one to two years	26.3%	73	26.6%	32	25.4%	
	No breastfeeding history	27.3%	73	26.6%	36	28.6%	
<b>Number of children under five</b>	No children <5 year	38.5%	102	37.2%	52	41.3%	.631
	one child <5 year	44.8%	127	46.4%	52	41.3%	
	>=2 children <5 year	16.8%	45	16.4%	22	17.5%	
	1st pregnancy	19.3%	50	18.2%	27	21.4%	.736
	<=2 years	49.0%	135	49.3%	61	48.4%	

<b>Pregnancy interval between current and last pregnancy</b>	>2 years	31.8%	89	32.5%	38	30.2%	
<b>using family planning methods between the current and last pregnancy</b>	Yes	47.5%	127	46.4%	63	50.0%	.497
	No	52.5%	147	53.6%	63	50.0%	
<b>Family planning methods (pills, injection, IUD)</b>	Yes	19.5%	53	19.3%	25	19.8%	.907
	No	80.5%	221	80.7%	101	80.2%	
<b>Family planning methods (condom, natural methods)</b>	Yes	29.3%	77	28.1%	40	31.7%	.457
	No	70.8%	197	71.9%	86	68.3%	
<b>Type of delivery</b>	NVD	59.0%	164	59.9%	72	57.1%	.832
	C.S	17.5%	46	16.8%	24	19.0%	
	Never been pregnant	23.5%	64	23.4%	30	23.8%	

According to their current pregnancy, as shown in Table 5.3.2d, 52% of women were in the 3<sup>rd</sup> month of pregnancy with an incidence of IDA 52.4%. Noted that 57.5% of women were planned for this pregnancy with an incidence of IDA 55.6%. However, 77.3% of women didn't receive any preconception care with an incidence of IDA 76.2%. Also, only 19.5% of women had vaginal bleeding in their current pregnancy with an incidence of IDA 21.4%. Among anemic women, only 4.0% had a history of aspirin intake in current pregnancy while 3.2% had a history of intake of clexan.

**Table 5.3.2d: Association between anemia at 24 weeks and reproductive health variables related to current pregnancy**

		Total N%	Anemia 24 weeks (cat)				P value
			No Anemia		Anemia		
			Count	N %	Count	N %	
<b>planned pregnancy (current pregnancy)</b>	Yes	57.5%	160	58.4%	70	55.6%	.594
	No	42.5%	114	41.6%	56	44.4%	
<b>received preconception care</b>	yes	22.8%	61	22.3%	30	23.8%	.732
	No	77.3%	213	77.7%	96	76.2%	
	2nd month	48.0%	132	48.2%	60	47.6%	.918

<b>current pregnancy month</b>	3rd month	52.0%	142	51.8%	66	52.4%	
<b>History of vaginal bleeding during the current pregnancy</b>	Yes	19.5%	51	18.6%	27	21.4%	.509
	No	80.5%	223	81.4%	99	78.6%	
<b>Aspirin intake during current pregnancy</b>	Yes	4.5%	13	4.7%	5	4.0%	.728
	No	95.5%	261	95.3%	121	96.0%	
<b>Clexan intake during the current pregnancy</b>	Yes	3.5%	10	3.6%	4	3.2%	.810 <sup>b</sup>
	No	96.5%	264	96.4%	122	96.8%	

### 5.3.3 Association between anemia at 24 weeks and mother's anemia before pregnancy

The history of past pregnancies anemia, history of anemia in the last pregnancy, and history of anemia at registration determined the incidence of anemia at 24 weeks of pregnancy (p-value <0.10). (Table 5.3.3)

As shown in Table 5.3.3, among anemic women, 64.3% of women had no history of anemia. However, there was a significant difference between anemic and nonanemic women concerning having anemia in past pregnancies (p<0.1).47.0% of women had a history of anemia in past pregnancies with an incidence of IDA 58.7%. Also, there was a significant difference between anemic and nonanemic women regarding having anemia in the last pregnancy (p<0.1). 43.0% of women had a history of anemia in the last pregnancy with an incidence of IDA 51.6%. According to hemoglobin level at registration of current pregnancy, there was a significant difference between anemic and nonanemic women concerning hemoglobin level at registration(p<0.1). 80% of women who were non-anemic in the registration have an incidence of IDA 52.4%

**Table 5.3.3: Association between anemia at 24 weeks and mother's anemia before pregnancy**

		Total N%	Anemia 24 weeks (cat)				P value
			No Anemia		Anemia		
			Count	N %	Count	N %	
<b>History of anemia</b>	Yes	37.8%	106	38.7%	45	35.7%	.569
	No	62.3%	168	61.3%	81	64.3%	
<b>History of past pregnancies anemia</b>	Yes	47.0%	114	41.6%	74	58.7%	<b>.001*</b>
	No	29.5%	96	35.0%	22	17.5%	

	Never been pregnant	23.5%	64	23.4%	30	23.8%	
<b>History of anemia in the last pregnancy</b>	Yes	43.0%	107	39.1%	65	51.6%	<b>.023*</b>
	No	33.5%	103	37.6%	31	24.6%	
	never been pregnant	23.5%	64	23.4%	30	23.8%	
<b>anemia.regesration</b>	No Anemia	80.0%	254	92.7%	66	52.4%	<b>.000*</b>
	Anemia	20.0%	20	7.3%	60	47.6%	

#### 5.3.4 Association between anemia at 24 weeks and past medical history variables

The occurrence of anemia at 24 weeks was significantly associated with the history of iron intake for six months, ( $p < 0.10$ ). Other medical history variables did not show any significant association with the incidence of anemia at 24 weeks of pregnancy (Table 5.3.4).

The past medical history variables are shown in Table 5.3.4. There was a significant difference between anemic and nonanemic women regarding having a history of iron intake for six months, ( $p < 0.1$ ). 93.5% of women had no history of iron intake for six months with an incidence of IDA 96.8%.

Among anemic women, 46.0% of women had a normal BMI (18.5- <25), 76.2% had no history of chronic disease, 50.0 % had no history of past pregnancy complications, 96.8% had no history of iron intake for six months, and 95.2 % had no history of blood transfusion. 69.8% had no history of any surgeries. Regarding surgery name, among anemic women, only 15.9% underwent C. S delivery and 4.0% for D+C.

**Table 5.3.4: Association between anemia at 24 weeks and past medical history variables**

		Total N%	Anemia 24 weeks (cat)				P value
			No Anemia		Anemia		
			Count	N %	Count	N %	
<b>BMI Categories</b>	<18.5 underweight	5.3%	15	5.5%	6	4.8%	.735
	18.5 - <25 normal	49.0%	138	50.4%	58	46.0%	
	25- <30 overweight	26.5%	72	26.3%	34	27.0%	

	>=30 obese	19.3%	49	17.9%	28	22.2%	
<b>History of chronic disease</b>	Yes	24.8%	69	25.2%	30	23.8%	.768
	No	75.3%	205	74.8%	96	76.2%	
<b>History of past pregnancy disease (complication)</b>	Yes	26.0%	71	25.9%	33	26.2%	.990
	No	50.5%	139	50.7%	63	50.0%	
	Never been pregnant	23.5%	64	23.4%	30	23.8%	
<b>History of iron intake for (six months)</b>	Yes	6.5%	22	8.0%	4	3.2%	<b>.067*</b>
	No	93.5%	252	92.0%	122	96.8%	
<b>History of blood transfusion</b>	Yes	5.0%	14	5.1%	6	4.8%	.882
	No	95.0%	260	94.9%	120	95.2%	
<b>History of surgery</b>	Yes	27.0%	70	25.5%	38	30.2%	.335
	No	73.0%	204	74.5%	88	69.8%	
<b>Surgery name</b>	C.S surgery	15.5%	42	15.3%	20	15.9%	.528
	D+C (ABORTION)	4.5%	13	4.7%	5	4.0%	
	Fibroid removal (myomectomy)	0.3%	0	0.0%	1	0.8%	
	PCOS surgery	0.3%	0	0.0%	1	0.8%	
	Cervical cerclage	0.5%	1	0.4%	1	0.8%	
	ectopic pregnancy surgery	0.3%	1	0.4%	0	0.0%	
	gastric sleeve	0.5%	1	0.4%	1	0.8%	
	Others*	5.3%	12	4.4%	9	7.1%	
	No history of surgery	73.0%	204	74.5%	88	69.8%	

Other surgeries include Appendectomy, cholecystectomy, tonsillectomy, and hernia repair.

### 5.3.5 Association between anemia at 24 weeks and lifestyle variables (at registration)

The occurrence of anemia at 24 weeks was significantly not associated with women’s nutrition and lifestyle variables before pregnancy and at the time of registration. The only factors that showed a significant difference between anemic and non-anemic were lower intake of vitamin A-rich fruit and vegetables and sweet food, ( $p < 0.10$ ). (Tables 5.3.5a-c).

- Physical activity and smoking history before pregnancy

We followed the Global Physical Activity Questionnaire (GPAQ) calculation guidelines described by the World Health Organization (WHO, 2021) to determine Women’s activity levels before pregnancy, and following those calculations, women were classified as having low and moderate physical activity levels. As shown in Table 5.3.5a, among anemic women, 98.4% had low physical activity levels, while 55.6% of them demonstrated that their physical activity had changed and 54.0% of them had a better sleep pattern after pregnancy.

Regarding the smoking profile, 78.0% of anemic women had a history of parent smoking with an incidence of IDA 76.2%, 75.0% of women had no history of hookah smoking with an incidence of IDA 73.0%, 19.0% of women had a history of hookah smoking at an age older than 18 years with an incidence of IDA 19.8%, with 17.3 % of women who smoked hookah for less than 5 years duration with an incidence of IDA 19.0%. while the majority of pregnant women who had smoked before pregnancy have stopped smoking after they got pregnant. (Table 5.3.5a)

**Table 5.3.5a: Association between anemia at 24 weeks and physical activity, smoking before pregnancy**

		Total N %	Anemia 24 weeks (cat)				P value
			No Anemia		Anemia		
			Count	N %	Count	N %	
<b>total physical activity (TPA-MET) minutes/week</b>	Low physical activity	99.3%	273	99.6%	124	98.4%	.188
	Moderate physical activity	0.8%	1	0.4%	2	1.6%	
<b>parent smoking</b>	Yes	78.0%	216	78.8%	96	76.2%	.554

	No	22.0%	58	21.2%	30	23.8%	
<b>smoking hookah</b>	Yes	25.0%	66	24.1%	34	27.0%	.534
	No	75.0%	208	75.9%	92	73.0%	
<b>hookah age</b>	<= 18 years	6.0%	15	5.5%	9	7.1%	.754
	> 18 years	19.0%	51	18.6%	25	19.8%	
	No hookah smoking	75.0%	208	75.9%	92	73.0%	
<b>hookah duration</b>	< 5years	17.3%	45	16.4%	24	19.0%	.799
	>= 5 years	7.8%	21	7.7%	10	7.9%	
	No hookah smoking	75.0%	208	75.9%	92	73.0%	
<b>Stop smoking during pregnancy</b>	Yes	23.5%	65	23.7%	29	23.0%	.170 <sup>a</sup>
	No	1.0%	1	0.4%	3	2.4%	
	doesn't smoke	75.5%	208	75.9%	94	74.6%	
<b>Change in physical activity during pregnancy</b>	Yes	56.0%	154	56.2%	70	55.6%	.903
	No	44.0%	120	43.8%	56	44.4%	
<b>Change in sleep pattern during pregnancy</b>	Yes	54.8%	151	55.1%	68	54.0%	.831
	No	45.3%	123	44.9%	58	46.0%	

- Nutrition and supplements

As shown in Table 5.3.5b, 69.0% of participating women had a meal frequency of fewer than three meals per day with an incidence of IDA 69.8%. Among anemic women, 65.9% had a history of loss of appetite, 65.1% had a history of vomiting and 50 % had a history of tea or coffee consumption after meals, 72%.2 had taken folic acid supplementations, 19% before pregnancy and 27.8% in the 2<sup>nd</sup> month, while 8.7% had taken iron supplements with only 0.8% of them taking it with any type of citrus juice. Moreover, 38.1% of the anemic women had mentioned that they had a change in eating habits while 39.7% had started on a healthy and varied diet. 96.3% of women have no history of pica with an incidence of IDA 95.2%.

**Table 5.3.5b: Association between anemia at 24 weeks and Women's nutrition and supplement intake at registration**

		Total N %	Anemia 24 weeks (cat)				P value
			No Anemia		Anemia		
			Count	N %	Count	N %	
<b>meal frequency /day</b>	< 3 meals/day	69.0%	188	68.6%	88	69.8%	.805
	>= 3 meals/ day	31.0%	86	31.4%	38	30.2%	
<b>History of loss of appetite</b>	Yes	65.5%	179	65.3%	83	65.9%	.915
	No	34.5%	95	34.7%	43	34.1%	
<b>History of vomiting</b>	Yes	65.8%	181	66.1%	82	65.1%	.848
	No	34.3%	93	33.9%	44	34.9%	
<b>tea /coffee consumption during/after meal</b>	Yes	52.8%	148	54.0%	63	50.0%	.455
	No	47.3%	126	46.0%	63	50.0%	
<b>Folic acid intake</b>	Yes	70.3%	190	69.3%	91	72.2%	.558
	No	29.8%	84	30.7%	35	27.8%	
<b>Folic acid intake /month</b>	before pregnancy	22.0%	64	23.4%	24	19.0%	.451
	1 <sup>st</sup> month	16.8%	40	14.6%	27	21.4%	
	2 <sup>nd</sup> month	26.8%	72	26.3%	35	27.8%	
	3 <sup>rd</sup> month	4.8%	14	5.1%	5	4.0%	
	No folic acid intake	29.8%	84	30.7%	35	27.8%	
<b>Iron intake</b>	Yes	8.5%	23	8.4%	11	8.7%	.911
	No	91.5%	251	91.6%	115	91.3%	
<b>Iron intake with juice</b>	Yes	2.3%	8	2.9%	1	0.8%	.347
	No	6.8%	17	6.2%	10	7.9%	
	No iron intake	91.0%	249	90.9%	115	91.3%	
<b>Iron intake with calcium</b>	No	8.8%	24	8.8%	11	8.7%	.992
	No iron intake	91.3%	250	91.2%	115	91.3%	
<b>History of pica</b>	Yes	3.8%	9	3.3%	6	4.8%	.470 <sup>a</sup>
	No	96.3%	265	96.7%	120	95.2%	
<b>History of a healthy diet</b>	Yes	40.0%	110	40.1%	50	39.7%	.930
	No	60.0%	164	59.9%	76	60.3%	
<b>History of changes in eating habits</b>	Yes	38.8%	107	39.1%	48	38.1%	.855
	No	61.3%	167	60.9%	78	61.9%	

outside snack	Yes	12.8%	34	12.4%	17	13.5%	.763
	No	87.3%	240	87.6%	109	86.5%	

- Women’s dietary diversity

Regarding women’s dietary diversity, as shown in Table 5.3.5c, 97.3% of women had grains and white roots food intake with an incidence of IDA 95.2%, 77.8% had no pulses intake with an incidence of IDA 77.0%, 66.5% had no nuts and seeds intake with an incidence of IDA 71.4%, 77.0% 71.8% had a milk and milk products intake with an incidence of IDA 66.7%, 78.5% had meat, poultry and fish intake with an incidence of IDA 81.7%, 84.8% had eggs intake with an incidence of IDA 83.3%, 96.0% had no dark green leafy vegetables intake with an incidence of IDA 95.2%, 81.8% had no intake of vitamin A rich fruits and vegetables with an incidence of IDA 88.1%, 73.0% had an intake of another vegetable intake with an incidence of IDA 69.8%, 69.8% had an intake of other fruits with an incidence of IDA 66.7%. 49.5% had no fried and salty food intake with an incidence of IDA 53.2%, 42.8% had no sweets food intake with an incidence of IDA 50.8% and 70.0% had sweet beverages intake with an incidence of IDA 71.4%. 87.3% had no outside intake with an incidence of IDA 86.5%.

According to the Minimum Dietary Diversity for Women, we followed the *Minimum Dietary Diversity for Women* (MDD-W) questionnaire calculation guidelines (FAO, 2021) to determine Women’s dietary diversity at registration, and following those calculations, 62.5% of women had an MDD-W score  $\geq 5$  with an incidence of IDA of 60.3%. Finally, the only factors that showed a significant difference between anemic and non-anemic were lower intake of vitamin A-rich fruit and vegetables and sweet food. ( $p < 0.1$ ) as illustrated in Table 5.3.5c

**Table 5.3.5c: Association between anemia at 24 weeks and Women’s dietary diversity (at registration)**

		Total N %	Anemia 24 weeks (cat)				P value
			No Anemia		Anemia		
			Count	N %	Count	N %	
<b>Food Group1 (greens, white roots) intake</b>	Yes	97.3%	269	98.2%	120	95.2%	.095 <sup>a</sup>
	No	2.8%	5	1.8%	6	4.8%	

<b>Food Group2 (Bean peas) categories</b>	Yes	22.3%	60	21.9%	29	23.0%	.803
	No	77.8%	214	78.1%	97	77.0%	
<b>Food Group3 (nuts) intake</b>	Yes	33.5%	98	35.8%	36	28.6%	.157
	No	66.5%	176	64.2%	90	71.4%	
<b>Food Group 4 (milk, yogurt) intake</b>	Yes	71.8%	203	74.1%	84	66.7%	.126
	No	28.3%	71	25.9%	42	33.3%	
<b>Food Group 5 (meat, fish) intake</b>	Yes	78.5%	211	77.0%	103	81.7%	.284
	No	21.5%	63	23.0%	23	18.3%	
<b>Food Group 6 (egg) intake</b>	Yes	15.3%	40	14.6%	21	16.7%	.593
	No	84.8%	234	85.4%	105	83.3%	
<b>Food Group 7 (dark green leafy vegetables) intake</b>	Yes	4.0%	10	3.6%	6	4.8%	.598
	No	96.0%	264	96.4%	120	95.2%	
<b>Food Group 8 (vitamin A-rich fruits and veg) intake</b>	Yes	18.3%	58	21.2%	15	11.9%	<b>.026*</b>
	No	81.8%	216	78.8%	111	88.1%	
<b>Food Group 9(other vegetables) intake</b>	Yes	73.0%	204	74.5%	88	69.8%	.335
	No	27.0%	70	25.5%	38	30.2%	
<b>Food Group 10 (fruits) intake</b>	Yes	69.8%	195	71.2%	84	66.7%	.363
	No	30.3%	79	28.8%	42	33.3%	
<b>Minimum dietary diversity for women (MDD-W)</b>	MDD-W score $\geq 5$	62.5%	174	63.5%	76	60.3%	.541
	MDD-W score $< 5$	37.5%	100	36.5%	50	39.7%	
<b>Food Group 11 (fried and salty foods) intake</b>	Yes	50.5%	143	52.2%	59	46.8%	.319
	No	49.5%	131	47.8%	67	53.2%	
<b>Food Group 12 (sweet foods) intake</b>	Yes	57.3%	167	60.9%	62	49.2%	<b>.027*</b>
	No	42.8%	107	39.1%	64	50.8%	
<b>Food Group 13 (sweet beverage) intake</b>	Yes	70.0%	190	69.3%	90	71.4%	.672
	No	30.0%	84	30.7%	36	28.6%	

### 5.3.6 Association between anemia at 24 weeks and lifestyle variables (at 24 weeks of pregnancy)

The occurrence of anemia at 24 weeks was significantly associated with meal frequency /day, history of a healthy diet, history of changes in eating habits, tea /coffee consumption during/after meals, iron intake compliance, minimum dietary diversity for women (MDD-W), grains, white

root, nut, milk, yogurt, meat, and fish intake ( $p < 0.10$ ). Other women's nutrition and lifestyle variables did not show any significant association with the incidence of anemia at the 24 weeks of pregnancy (Tables 5.3.6 a-f)

- Physical activity and smoking

We followed the Pregnancy physical activity questionnaire (PPAQ) calculation guidelines described by Chasan-Taber et al (Chasan-Taber et al., 2004), and following those calculations, women were classified as having a sedentary, light, moderate, or vigorous PA level. An independent samples T-test was conducted to compare the intensity of physical activity levels between nonanemic and anemic women at 24 weeks of pregnancy. As shown in Table 5.3.6a, there were no significant differences between nonanemic and anemic pregnant women regarding the intensity of physical activity levels.

However, 99.5% of anemic women demonstrated that their physical activity had changed and 72.2% of them had a worse sleep pattern after pregnancy. Pregnant women who had smoked before pregnancy have stopped smoking after they got pregnant. (Table 5.3.6b)

**Table 5.3.6a: The intensity of physical activity levels between nonanemic and anemic women**

Group Statistics						
	anemia at 24 weeks of pregnancy	N	Mean	Std. Deviation	Std. Error Mean	P value
<b>Total activity</b>	No Anemia	274	25.43	9.29	.56	.686
	Anemia	126	25.02	10.00	.89	
<b>sedentary. activity</b>	No Anemia	274	2.78	2.00	.12	.590
	Anemia	126	2.9	2.27	.20	
<b>light. activity</b>	No Anemia	274	16.28	5.59	.33	.497
	Anemia	126	15.87	5.66	.50	
<b>moderate. activity</b>	No Anemia	274	6.37	5.03	.30	.814
	Anemia	126	6.24	5.37	.40	

**Table 5.3.6b: Association between anemia at 24 weeks and physical activity and smoking (at 24 weeks of pregnancy)**

	Total N%	Anemia 24 weeks (cat)		P value
		No Anemia	Anemia	

			Count	N %	Count	N %	
<b>Stop smoking during pregnancy</b>	Yes	23.3%	61	22.3%	32	25.4%	.491
	doesn't smoke	76.8%	213	77.7%	94	74.6%	
<b>Change in physical activity during pregnancy</b>	Yes	89.0%	242	88.3%	114	90.5%	.522
	No	11.0%	32	11.7%	12	9.5%	
<b>Change in sleep pattern during pregnancy</b>	Yes	29.3%	82	29.9%	35	27.8%	.661
	No	70.8%	192	70.1%	91	72.2%	

- Nutrition and Eating habits

As shown in Table 5.3.6c. There was a significant difference between anemic and nonanemic women concerning the number of meals per day ( $p < 0.1$ ). 37.8% of participating women had a meal frequency of less than three meals per day with an incidence of IDA 50.8%. Among anemic women, 19.8% had a history of loss of appetite, and 14.3% had a history of vomiting. Moreover, there were significant differences between anemic and nonanemic women regarding changing eating habits and eating healthy, varied food ( $p < 0.1$ ). 53.2% of anemic women had mentioned that they had no change in eating habits while 57.1% didn't take a healthy and varied diet. There was a significant difference between anemic and nonanemic women concerning had a history of tea or coffee consumption after meals ( $p < 0.1$ ). 51.8% of participating women had a history of tea or coffee consumption after meals with an incidence of IDA 45.2%. However, 91.8% had no outside snack intake with an incidence of IDA 90.5%.

**Table 5.3.6c: Association between anemia at 24 weeks and Women's nutrition (at 24 weeks of pregnancy)**

		Total N%	Anemia 24 weeks (cat)				P value
			No Anemia		Anemia		
			Count	N %	Count	N %	
<b>meal frequency /day</b>	< 3 meals/day	37.8%	87	31.8%	64	50.8%	<b>.000*</b>
	>= 3 meals/day	62.3%	187	68.2%	62	49.2%	
	Yes	17.8%	46	16.8%	25	19.8%	.458

<b>History of loss of appetite</b>	No	82.3%	228	83.2%	101	80.2%	
<b>History of vomiting</b>	Yes	16.8%	49	17.9%	18	14.3%	.371
	No	83.3%	225	82.1%	108	85.7%	
<b>tea /coffee consumption during/after meal</b>	Yes	51.8%	150	54.7%	57	45.2%	<b>.077*</b>
	No	48.3%	124	45.3%	69	54.8%	
<b>History of a healthy diet</b>	Yes	64.3%	203	74.1%	54	42.9%	<b>.000*</b>
	No	35.8%	71	25.9%	72	57.1%	
<b>History of changes in eating habits outside snack</b>	Yes	64.0%	197	71.9%	59	46.8%	<b>.000*</b>
	No	36.0%	77	28.1%	67	53.2%	
<b>outside snack</b>	Yes	8.3%	21	7.7%	12	9.5%	.530
	No	91.8%	253	92.3%	114	90.5%	

- Folic acid, multivitamin, and calcium supplement intake

Regarding vitamin and mineral supplement intake. As shown in Table 5.3.6d, among anemic women, 84.1% had taken folic acid supplementations, 19% before pregnancy, 27.8% in the 2<sup>nd</sup> month, and 15.9% in the 3<sup>rd</sup> month. 49.2% of women had high compliance by taking folic acid daily, and 81.7% of them stopped taking it after the first trimester. Concerning the Calcium supplementation. Among the anemic women, only 24.6% had taken calcium, 15.1% in the 4<sup>th</sup> month. 15.1% of women had high compliance by taking calcium daily. Regarding multivitamin intake. Among anemic women, 50.8% had taken multivitamins, 27.8% in the 4<sup>th</sup> month. 33.3% of women had high compliance by taking multivitamins daily with 47.6% of women taking one tablet per day.

**Table 5.3.6d: Association between anemia at 24 weeks and Women’s Folic acid, multivitamin, and calcium supplement intake (at 24 weeks of pregnancy)**

		Total N%	Anemia 24 weeks (cat)				P value
			No Anemia		Anemia		
			Count	N %	Count	N %	
<b>Folic acid intake</b>	Yes	86.3%	239	87.2%	106	84.1%	.403
	No	13.8%	35	12.8%	20	15.9%	
	before pregnancy	22.0%	64	23.4%	24	19.0%	.289

<b>Folic acid intake /month</b>	1st month	16.8%	40	14.6%	27	21.4%	
	2nd month	28.0%	77	28.1%	35	27.8%	
	3rd month	19.5%	58	21.2%	20	15.9%	
	No folic acid intake	13.8%	35	12.8%	20	15.9%	
<b>Folic acid compliance</b>	Yes	55.3%	159	58.0%	62	49.2%	.255
	No	31.0%	80	29.2%	44	34.9%	
	No folic acid intake	13.8%	36	13.1%	20	15.9%	
<b>Stop folic acid intake</b>	Yes	81.8%	224	81.8%	103	81.7%	.295
	No	4.5%	15	5.5%	3	2.4%	
	No folic acid intake	13.8%	35	12.8%	20	15.9%	
<b>Calcium supplement intake</b>	Yes	28.8%	84	30.7%	31	24.6%	.214
	No	71.3%	190	69.3%	95	75.4%	
<b>Calcium supplement intake// month</b>	4th month	14.0%	37	13.5%	19	15.1%	.224
	5th month	11.0%	36	13.1%	8	6.3%	
	6th month	3.8%	11	4.0%	4	3.2%	
	No calcium intake	71.3%	190	69.3%	95	75.4%	
<b>Calcium supplement compliance</b>	Yes	18.3%	54	19.7%	19	15.1%	.444
	No	10.5%	30	10.9%	12	9.5%	
	No calcium intake	71.3%	190	69.3%	95	75.4%	
<b>Vitamin intake</b>	Yes	55.0%	156	56.9%	64	50.8%	.251
	No	45.0%	118	43.1%	62	49.2%	
<b>Vitamin intake /month</b>	3rd month	2.3%	5	1.8%	4	3.2%	.439
	4th month	28.0%	77	28.1%	35	27.8%	
	5th month	20.5%	60	21.9%	22	17.5%	
	6th month	4.3%	14	5.1%	3	2.4%	
	No vitamin intake	45.0%	118	43.1%	62	49.2%	
<b>Vitamin intake compliance</b>	Yes	37.3%	107	39.1%	42	33.3%	.475
	No	17.8%	49	17.9%	22	17.5%	
	No vitamin intake	45.0%	118	43.1%	62	49.2%	
<b>Vitamin intake quantity</b>	One tablet	50.5%	142	51.8%	60	47.6%	.418
	Two tablets	4.5%	14	5.1%	4	3.2%	

	No vitamin intake	45.0%	118	43.1%	62	49.2%	
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- Iron supplement intake

Concerning iron supplement intake. Among anemic women, 63.5% of women had taken iron supplements, 26.2% in the 4th month and 19.0% in the 5th month, with 52.4% of them taking one tablet per day. 57.9% of women didn't take iron with any citrus juice, 63.5% didn't take it with milk or any dairy products, and of those who took calcium supplements, 23% of women didn't take it with calcium.

There were significant differences between anemic and nonanemic women regarding iron supplement compliance ( $p < 0.1$ ). 44.5% of women take iron with low compliance with an incidence of IDA 51.6%. and 35.5% of women didn't take iron supplements with an incidence of IDA 36.5%. Also, there were significant differences between anemic and nonanemic women concerning low iron supplement compliance reasons either due to forgetfulness or its side effects ( $p < 0.1$ ). 45.5% of women forgot to take iron with an incidence of IDA 54.8%, and 18.3% of women had low compliance due to constipation with an incidence of IDA 19.8%. However, only 14.3% of women had high compliance to iron because they believe it is important for both maternal and fetus health with an incidence of IDA of 9.5%.

**Table 5.3.6e: Association between anemia at 24 weeks and Women's iron intake (at 24 weeks of pregnancy)**

		Total N%	Anemia 24 weeks (cat)				P value
			No Anemia		Anemia		
			Count	N %	Count	N %	
<b>Iron intake</b>	Yes	64.5%	178	65.0%	80	63.5%	.775
	No	35.5%	96	35.0%	46	36.5%	
<b>Iron intake /month</b>	2nd month	6.0%	16	5.8%	8	6.3%	.885
	3rd month	11.5%	34	12.4%	12	9.5%	
	4th month	23.8%	62	22.6%	33	26.2%	
	5th month	21.3%	61	22.3%	24	19.0%	
	6th month	2.0%	5	1.8%	3	2.4%	
	No iron intake	35.5%	96	35.0%	46	36.5%	
	Yes	19.8%	64	23.4%	15	11.9%	<b>.012*</b>

<b>Iron intake compliance</b>	No	44.5%	114	41.6%	65	51.6%	
	No iron intake	35.5%	96	35.0%	46	36.5%	
<b>Iron intake quantity</b>	One tablet	52.8%	145	52.9%	66	52.4%	.941
	Two tablets	11.8%	33	12.0%	14	11.1%	
	No iron intake	35.5%	96	35.0%	46	36.5%	
<b>Iron intake with juice</b>	Yes	6.3%	18	6.6%	7	5.6%	.906
	No	58.3%	160	58.4%	73	57.9%	
	No iron intake	35.5%	96	35.0%	46	36.5%	
<b>Iron intake with milk/milk product</b>	No	64.5%	178	65.0%	80	63.5%	.775
	No iron intake	35.5%	96	35.0%	46	36.5%	
<b>Iron intake with calcium</b>	No	107	78	28.5%	29	23.0%	.503
	I don't take calcium	37.8%	100	36.5%	51	40.5%	
	No iron intake	35.5%	96	35.0%	46	36.5%	
<b>Iron high compliance reasons</b>	important to both maternal and fetus health	14.3%	45	16.4%	12	9.5%	.023*
	due to anemia	5.5%	19	6.9%	3	2.4%	
	No iron intake low compliance	80.3%	210	76.6%	111	88.1%	
<b>Iron low compliance reasons</b>	forget taking iron	45.5%	113	41.2%	69	54.8%	.031*
	constipation	18.3%	48	17.5%	25	19.8%	
	nausea	6.0%	17	6.2%	7	5.6%	
	stomach pain/heartburn	10.5%	32	11.7%	10	7.9%	
	No iron intake+ high compliance	19.8%	64	23.4%	15	11.9%	

- Women's dietary diversity

Regarding women's dietary diversity, as shown in Table 5.3.6f, there were significant differences between anemic and nonanemic women regarding meat, poultry, and fish intake ( $p < 0.01$ ). 38.3% of women had no meat, poultry, or fish intake with an incidence of IDA 55.6%. Also, there were significant differences between anemic and nonanemic women regarding grains, white root, nuts, milk, and milk product intake ( $p < 0.01$ ). 86.5% of women had grains and white roots food intake with an incidence of IDA 81.7%, 64.5% had no nuts and seeds intake with an incidence of IDA 70.6%, 63.5% had a milk and milk products intake with an incidence of IDA 57.1%. Moreover,

there were significant differences between anemic and nonanemic women concerning Minimum Dietary Diversity for Women ( $p < 0.1$ ). 46.3% of women had an MDD-W score  $< 5$  with an incidence of IDA 57.1%.

As shown in Table 5.3.6f, 79.8% had no pulse intake with an incidence of IDA 84.1%. 75.8% had no eggs intake with an incidence of IDA 77.0%, 78.5% had no dark green leafy vegetables intake with an incidence of IDA 82.5%, 75.8% had no intake of vitamin A rich fruits and vegetables with an incidence of IDA 77.8%, 71.5% had an intake of another vegetable intake with an incidence of IDA 73.0%, 51.3% had no intake of other fruits with an incidence of IDA 54.0%. 54.8% had fried and salty food intake with an incidence of IDA 58.7%, 52.0% had sweets food intake with an incidence of IDA 52.4% and 65.8% had sweet beverages intake with an incidence of IDA 62.7%.

**Table 5.3.6f: Association between anemia at 24 weeks and Women’s dietary diversity (at 24 weeks)**

		Total N%	Anemia 24 weeks (cat)				P value
			No Anemia		Anemia		
			Count	N %	Count	N %	
<b>Food Group1 (grains, white roots) intake</b>	Yes	86.5%	243	88.7%	103	81.7%	<b>.059</b>
	No	13.5%	31	11.3%	23	18.3%	
<b>Food Group2 (Bean peas) intake</b>	Yes	20.3%	61	22.3%	20	15.9%	.140
	No	79.8%	213	77.7%	106	84.1%	
<b>Food Group3 (nuts) intake</b>	Yes	35.5%	105	38.3%	37	29.4%	<b>.082</b>
	No	64.5%	169	61.7%	89	70.6%	
<b>Food Group 4 (milk, yogurt) intake</b>	Yes	63.5%	182	66.4%	72	57.1%	<b>.073</b>
	No	36.5%	92	33.6%	54	42.9%	
<b>Food Group 5 (meat, fish) intake</b>	Yes	61.8%	191	69.7%	56	44.4%	<b>.000*</b>
	No	38.3%	83	30.3%	70	55.6%	
<b>Food Group 6 (egg) intake</b>	Yes	24.3%	68	24.8%	29	23.0%	.696
	No	75.8%	206	75.2%	97	77.0%	
<b>Food Group 7 (dark green leafy vegetables) intake</b>	Yes	21.5%	64	23.4%	22	17.5%	.182
	No	78.5%	210	76.6%	104	82.5%	
<b>Food Group 8 (vitamin A-rich fruits and veg) intake</b>	Yes	24.3%	69	25.2%	28	22.2%	.521
	No	75.8%	205	74.8%	98	77.8%	

<b>Food Group 9 (other vegetables) intake</b>	Yes	71.5%	194	70.8%	92	73.0%	.649
	No	28.5%	80	29.2%	34	27.0%	
<b>Food Group 10 (fruits) intake</b>	Yes	48.8%	137	50.0%	58	46.0%	.461
	No	51.3%	137	50.0%	68	54.0%	
<b>Minimum dietary diversity for women (MDD-W)</b>	MDD-W score $\geq 5$	53.8%	161	58.8%	54	42.9%	<b>.003*</b>
	MDD-W score $< 5$	46.3%	113	41.2%	722	57.1%	
<b>Food Group 11 (fried and salty foods) intake</b>	Yes	54.8%	145	52.9%	74	58.7%	.278
	No	45.3%	129	47.1%	52	41.3%	
<b>Food Group 12 (sweet foods) intake</b>	Yes	52.0%	142	51.8%	66	52.4%	.918
	No	48.0%	132	48.2%	60	47.6%	
<b>Food Group 13 (sweet beverage) intake</b>	Yes	65.8%	184	67.2%	79	62.7%	.383
	No	34.3%	90	32.8%	47	37.3%	

### 5.3.7 Association between anemia at 24 weeks and health education variables

According to Table 5.3.7a-f, Receiving information about iron and multivitamin supplements, doctor's confirmation of daily iron and multivitamin intake, health staff counseling about iron side effects, encouragement of iron-rich foods such as red meat and green leafy vegetables, taking iron with juice, taking iron supplements at bedtime, avoidance of taking iron supplements with antacid tablets or with milk, dairy products or calcium supplements, and avoidance of the drinks that affects iron absorption such as tea and coffee, and women perceive that iron intake for a long time is boring were determined the incidence of anemia at 24 weeks of pregnancy (p-value  $< 0.10$ ).

The health education and counseling variables are shown in Table 5.3.7a. Among anemic women, only 27.0% and 23.0% were informed that they were anemic either by the doctor or the nurse respectively, with 19.0% informed in their 1<sup>st</sup> trimester. However, 87.3 % of them got a medical prescription for folic acid intake, while 71.4% of them obtained folic acid supplementation from UNRWA health centers. 78.6 % of them got a prescription for iron intake, with 69.8% of them

obtaining it from UNRWA health centers. 50% of them got a prescription medical prescription for multivitamin intake from outside.

**Table 5.3.7a: Association between anemia at 24 weeks and health education variables**

		Total N%	Anemia 24 weeks (cat)				P value
			No Anemia		Anemia		
			Count	N %	Count	N %	
<b>Informed had an anemia by doctor</b>	Yes	27.0%	74	27.0%	34	27.0%	.996
	No	73.0%	200	73.0%	92	73.0%	
<b>Informed had anemia by nurse</b>	Yes	22.5%	61	22.3%	29	23.0%	.867
	No	77.5%	213	77.7%	97	77.0%	
<b>Anemia time</b>	not known to have anemia	72.8%	200	73.0%	91	72.2%	.630
	anemia in 1 <sup>st</sup> trimester	20.3%	57	20.8%	24	19.0%	
	anemia in 2 <sup>nd</sup> trimester	7.0%	17	6.2%	11	8.7%	
<b>Got a medical prescription for folic acid</b>	Yes	87.5%	240	87.6%	110	87.3%	.935
	No	12.5%	34	12.4%	16	12.7%	
<b>Got a medical prescription for iron</b>	Yes	79.8%	220	80.3%	99	78.6%	.691
	No	20.3%	54	19.7%	27	21.4%	
<b>Got a medical prescription for vitamin</b>	Yes	54.5%	155	56.6%	63	50.0%	.220
	No	45.5%	119	43.4%	63	50.0%	
<b>Iron place</b>	from the clinic	72.0%	200	73.0%	88	69.8%	.789
	outside the clinic	7.8%	20	7.3%	11	8.7%	
	I don't take it	20.3%	54	19.7%	27	21.4%	
<b>Folic acid place</b>	from the clinic	73.0%	202	73.7%	90	71.4%	.817
	outside the clinic	15.0%	39	14.2%	21	16.7%	
	I don't take it	12.0%	33	12.0%	15	11.9%	
<b>Vitamin place</b>	outside the clinic	54.8%	156	56.9%	63	50.0%	.196
	I don't take it	45.3%	118	43.1%	63	50.0%	

- Iron and multivitamin supplements counseling

As shown in Table 5.3.7b, there was a significant difference between anemic and nonanemic women concerning iron supplement information ( $p < 0.1$ ). 31.3% of women didn't receive information regarding the consumption of iron supplements with an incidence of IDA 57.9%, and only 20.6% of anemic women obtained this counseling from the nurses (midwives). Also, there was a significant difference between anemic and nonanemic women regarding the doctor's confirmation of daily iron supplement intake at every antenatal visit ( $p < 0.1$ ). The study showed that 48.8% of women didn't receive this confirmation every visit with an incidence of IDA 57.1%. While 61.1% of anemic women obtained a nurse's confirmation of daily iron supplement intake at every antenatal visit.

Furthermore, concerning multivitamins supplements counseling. There was a significant difference between anemic and nonanemic women regarding multivitamin supplement information. Among anemic women, 46.0% of women didn't receive information regarding the consumption of multivitamin supplements with an incidence of IDA 54.8%, and only 22.2% of anemic women obtained this counseling from the OBS/GYNE specialists. However, there was a significant difference between anemic and nonanemic women regarding the doctor's confirmation of daily multivitamin supplement intake at every antenatal visit ( $p < 0.1$ ). The study showed that 57.8% of women didn't receive this confirmation every visit with an incidence of IDA 66.7%. While 58.7% of anemic women didn't obtain a nurse's confirmation of daily multivitamin supplement intake at every antenatal visit. (Table 5.3.7b)

**Table 5.3.7b: Association between anemia at 24 weeks and iron and vitamin information variables**

		Total N%	Anemia 24 weeks (cat)				P value
			No Anemia		Anemia		
			Count	N %	Count	N %	
<b>Receive information about iron supplement</b>	Yes	68.8%	222	81.0%	53	42.1%	<b>.000*</b>
	No	31.3%	52	19.0%	73	57.9%	
<b>From whom? information about an iron supplement</b>	Doctor	35.3%	118	43.1%	23	18.3%	<b>.000*</b>
	Nurse/midwife	29.8%	93	33.9%	26	20.6%	
	Pharmacist	3.8%	11	4.0%	4	3.2%	
	Didn't receive the information	31.3%	52	19.0%	73	57.9%	

<b>Receive information about vitamin supplement</b>	Yes	54.0%	159	58.0%	57	45.2%	<b>.017*</b>
	No	46.0%	115	42.0%	69	54.8%	
<b>From whom? Information about vitamin supplement</b>	Doctor	22.0%	65	23.7%	23	18.3%	.125
	Nurse/midwife	5.3%	15	5.5%	6	4.8%	
	OBS/GYNE specialist	26.8%	79	28.8%	28	22.2%	
	Didn't receive the information	46.0%	115	42.0%	69	54.8%	
<b>Doctor's confirmation of daily iron intake</b>	Yes	51.3%	151	55.1%	54	42.9%	<b>.023*</b>
	No	48.8%	123	44.9%	72	57.1%	
<b>Doctor's confirmation of daily multivitamin intake</b>	Yes	42.3%	127	46.4%	42	33.3%	<b>.014*</b>
	No	57.8%	147	53.6%	84	66.7%	
<b>nurse's confirmation of daily iron intake</b>	Yes	64.0%	179	65.3%	77	61.1%	.414
	No	36.0%	95	34.7%	49	38.9%	
<b>nurse's confirmation of daily multivitamin intake</b>	Yes	41.0%	112	40.9%	52	41.3%	.941
	No	59.0%	162	59.1%	74	58.7%	

- Doctor's health education and counseling about iron supplements

Regarding health education and counseling about iron supplements intake and side effects provided by the doctors. As demonstrated in Table 5.3.7c, there was a significant difference between anemic and nonanemic women concerning possible iron supplement side effects counseling provided by doctors like nausea, vomiting, or constipation( $p<0.1$ ). 65.5% of women didn't receive any counseling about its side effects with an incidence of IDA 73.0%. Also, there was a significant difference between anemic and nonanemic women regarding doctor's encouragement of iron-rich foods such as red meat and green leafy vegetables( $p<0.1$ ). 65.5% of women didn't receive any counseling about iron-rich food diets with an incidence of IDA 73.0%.

Moreover, there was a significant difference between anemic and nonanemic women regarding doctor’s counseling about the avoidance of taking iron supplements with antiacids or with milk, dairy products, or calcium supplements, and the avoidance of drinks that affect iron absorption such as tea and coffee during/ after meals. Among anemic women, 91.3% didn’t receive counseling about the avoidance of taking iron supplements with antacid tablets and 73.8% didn’t receive counseling concerning the avoidance of drinking tea or coffee during /after meals. 61.1% didn’t receive counseling about the avoidance of taking iron supplements with milk, dairy products, or calcium supplements.

Nevertheless, there were no differences between anemic and nonanemic women concerning the other variables of iron supplement counseling provided by doctors. Among anemic women, 73.0% didn’t receive counseling concerning taking iron at bedtime, and 73.8% didn’t receive counseling about taking iron supplements with any citrus juice. (Tabel 5.3.7c)

**Table 5.3.7c: Association between anemia at 24 weeks and doctor’s iron supplement counseling variables**

		Total N%	Anemia 24 weeks (cat)				P value
			No Anemia		Anemia		
			Count	N %	Count	N %	
<b>Doctor’s information about iron side effect</b>	Yes	34.5%	104	38.0%	34	27.0%	<b>.032*</b>
	No	65.5%	170	62.0%	92	73.0%	
<b>Doctor’s information to take iron at bedtime</b>	Yes	31.0%	90	32.8%	34	27.0%	.239
	No	69.0%	184	67.2%	92	73.0%	
<b>Doctor’s information to take iron with juice</b>	Yes	30.5%	89	32.5%	33	26.2%	.204
	No	69.5%	185	67.5%	93	73.8%	
	Yes	45.8%	134	48.9%	49	38.9%	<b>.062</b>

<b>Doctor's information to avoid taking iron with milk/calcium</b>	No	54.3%	140	51.1%	77	61.1%	
	Yes	13.5%	43	15.7%	11	8.7%	<b>.058</b>
<b>Doctor's information to avoid taking iron with antiacid</b>	No	86.5%	231	84.3%	115	91.3%	
	Yes	32.8%	98	35.8%	33	26.2%	<b>.058</b>
<b>Doctor's information to avoid drinking coffee/tea with meals</b>	No	67.3%	176	64.2%	93	73.8%	
	Yes	35.0%	106	38.7%	34	27.0%	<b>.023*</b>
<b>Doctor's information about iron-rich foods such as red meat and green leafy vegetables</b>	No	65.0%	168	61.3%	92	73.0%	
	Yes	35.0%	106	38.7%	34	27.0%	<b>.023*</b>

- Nurse's health education and counseling about iron supplements

As shown in Table 5.3.7d, health education and counseling about iron supplement intake and side effects are provided by the midwives. There was a significant difference between anemic and nonanemic women concerning taking iron supplements at bedtime, encouragement of iron-rich food, and taking iron tablets with any citrus juice, ( $p < 0.1$ ). 64.3% of women didn't receive counseling about taking iron at bedtime with an incidence of IDA 74.6%. Also, 64.0% of women didn't receive counseling about taking iron with citrus juice with an incidence of IDA 70.6%. 57.0% of women didn't receive any counseling about iron-rich food diets with an incidence of IDA 68.3%.

However, there were no differences between anemic and nonanemic women concerning the other variables of iron supplement counseling provided by midwives. Among anemic women, 73.8% of women didn't receive any counseling about iron supplements' side effects. 60.3% didn't receive

counseling about the avoidance of taking iron supplements with milk, dairy products, or calcium supplements, 87.3% didn't receive counseling about the avoidance of taking iron supplements with antacid tablets and 55.6% didn't receive counseling concerning the avoidance of the drinks that affects iron absorption such as tea and coffee. (Table 5.3.7d)

**Table 5.3.7d: Association between anemia at 24 weeks and nurse's iron supplement counseling variables**

		Total N%	Anemia 24 weeks (cat)				P value
			No Anemia		Anemia		
			Count	N %	Count	N %	
<b>Nurse's information about iron side effect</b>	Yes	30.3%	88	32.1%	33	26.2%	.231
	No	69.8%	186	67.9%	93	73.8%	
<b>Nurse's information to take iron at bedtime</b>	Yes	35.8%	111	40.5%	32	25.4%	<b>.003*</b>
	No	64.3%	163	59.5%	94	74.6%	
<b>Nurse's information to take iron with juice</b>	Yes	36.0%	107	39.1%	37	29.4%	<b>.061</b>
	No	64.0%	167	60.9%	89	70.6%	
<b>Nurse's information to avoid taking iron with milk/calcium</b>	Yes	42.8%	121	44.2%	50	39.7%	.400
	No	57.3%	153	55.8%	76	60.3%	
<b>Nurse's information to avoid taking iron with antacid</b>	Yes	15.8%	47	17.2%	16	12.7%	.256
	No	84.3%	227	82.8%	110	87.3%	
<b>Nurse's information to avoid drinking coffee/tea with meals</b>	Yes	43.0%	116	42.3%	56	44.4%	.692
	No	57.0%	158	57.7%	70	55.6%	
<b>Nurse's information about iron-rich foods such as red meat and green leafy vegetables</b>	Yes	43.0%	132	48.2%	40	31.7%	<b>.002*</b>
	No	57.0%	142	51.8%	86	68.3%	

- Iron supplement’s side effects

As shown in Table 5.3.7e, among anemic women who take iron supplements, 11.9% suffered from stomach pain, 12.7% had nausea, and 27.0% suffered from constipation. 15.9% of them have stopped iron supplements intake, 7.1% due to pain, 5.6% due to nausea, and 10.3% due to constipation.

**Table 5.3.7e: Association between anemia at 24 weeks and iron supplement’s side effects**

		Total N%	Anemia 24 weeks (cat)				P value
			No Anemia		Anemia		
			Count	N %	Count	N %	
<b>Iron causes stomach pain</b>	Yes	16.5%	51	18.6%	15	11.9%	.239
	No	63.8%	171	62.4%	84	66.7%	
	I don’t take it	19.8%	52	19.0%	27	21.4%	
<b>Iron causes nausea</b>	Yes	10.8%	27	9.9%	16	12.7%	.533
	No	69.5%	195	71.2%	83	65.9%	
	I don’t take it	19.8%	52	19.0%	27	21.4%	
<b>Iron causes constipation</b>	Yes	24.5%	64	23.4%	34	27.0%	.523
	No	55.8%	158	57.7%	65	51.6%	
	I don’t take it	19.8%	52	19.0%	27	21.4%	
<b>Stop iron intake</b>	Yes	16.5%	46	16.8%	20	15.9%	.844
	No	63.8%	176	64.2%	79	62.7%	
	I don’t take it	19.8%	52	19.0%	27	21.4%	
<b>Stop iron intake due to pain</b>	Yes	8.0%	23	8.4%	9	7.1%	.910
	No	8.5%	23	8.4%	11	8.7%	
	Don’t take iron and don’t stop iron	83.5%	228	83.2%	106	84.1%	
<b>Stop iron intake due to nausea</b>	Yes	4.8%	12	4.4%	7	5.6%	.748
	No	11.8%	34	12.4%	13	10.3%	
	Don’t take iron and don’t stop iron	83.5%	228	83.2%	106	84.1%	
<b>Stop iron intake due to constipation</b>	Yes	9.8%	26	9.5%	13	10.3%	.795
	No	6.8%	20	7.3%	7	5.6%	
	Don’t take iron and don’t stop iron	83.5%	228	83.2%	106	84.1%	

- Women’s perceptions of multivitamins and iron supplements

Lastly, as shown in Table 5.3.7f, in regards to women’s perceptions of multivitamins and iron supplements, 96.8% of women didn’t attend any health education lectures about iron supplements in UNRWA health centers 79.8% of women believe that iron supplements are important for their health with the incidence of IDA81.0%. 85.0% of women believe that multivitamin supplements are important for their health with an incidence of IDA 84.9%.80.8% of women believe that taking iron supplements regularly improves their hemoglobin level with an incidence of IDA81.0%. 81.8% of women believe that taking iron supplements regularly is important for both maternal and infant health with an incidence of IDA82.5%. 86.3% of women believe that taking multivitamin supplements regularly is important for both maternal and infant health with an incidence of IDA85.7%. Moreover, the study showed that women had a significantly negative perception of iron supplementation since 66.3% of women described their iron intake for long periods as boring with an incidence of IDA 83.3% (p<0.1). ( Table 5.3.7f)

**Table 5.3.7f: Association between anemia at 24 weeks and women’s perceptions of multivitamins and iron supplements**

		Total N%	Anemia 24 weeks (cat)				P value
			No Anemia		Anemia		
			Count	N %	Count	N %	
<b>Attend a lecture about iron in the clinic</b>	Yes	3.3%	8	2.9%	5	4.0%	.583 <sup>b</sup>
	No	96.8%	266	97.1%	121	96.0%	
<b>Iron supplements are important</b>	Yes	79.8%	217	79.2%	102	81.0%	.685
	No	20.3%	57	20.8%	24	19.0%	
<b>Multivitamin supplements are important</b>	Yes	85.0%	233	85.0%	107	84.9%	.976
	No	15.0%	41	15.0%	19	15.1%	
<b>Taking iron supplements regularly improves hemoglobin level</b>	Yes	80.8%	221	80.7%	102	81.0%	.944
	No	19.3%	53	19.3%	24	19.0%	

<b>Taking iron supplements regularly is important for both maternal and infant health</b>	Yes	81.8%	223	81.4%	104	82.5%	.782
	No	18.3%	51	18.6%	22	17.5%	
<b>Taking multivitamin supplements regularly is important for both maternal and infant health</b>	Yes	86.3%	237	86.5%	108	85.7%	.833
	No	13.8%	37	13.5%	18	14.3%	
<b>Iron intake for long periods is boring</b>	Yes	66.3%	160	58.4%	105	83.3%	
	No	33.8%	114	41.6%	21	16.7%	<b>.000*</b>

#### 5.4 Multivariate analysis

In this section of the analysis, one model was developed, in which all risk factors revealed in Chi-Square and T-Test results and had ( $p < 0.1$ ) were included. Logistic regression model results are shown in Table 5.4.1. The table illustrates that women's age increased the risk of anemia at 24 weeks of pregnancy. Women between the ages of 25-34 had a significant double risk of anemia compared to pregnancies at younger ages, and women who become pregnant later in life had a nine times higher risk of anemia at 24 weeks of pregnancy.

Concerning having a history of anemia in past pregnancies. According to the table, women who had previously had anemia during pregnancy were significantly six times at higher risk of anemia at 24 weeks of pregnancy compared to women who had never experienced anemia before. While primigravida women had a four times higher risk of anemia at 24 weeks of pregnancy. Moreover, having anemia at registration increased the risk of anemia at 24 weeks of pregnancy. At the time of registration, women who were anemic were fifteen times at higher risk of anemia than women who were not. Additionally, women who perceive that iron intake for a long time is boring were significantly four times higher risk of anemia at 24 weeks than women who didn't.

As demonstrated in Table 5.4.1, obtaining iron information counseling, eating a healthy diet, and increasing meat and fish intake were significantly associated with a lower risk of anemia at 24 weeks of pregnancy.

**Table 5.4.1: Multivariate model for anemia at 24 weeks of pregnancy**

Variable	Category	Sig.	Exp(B)	95% C.I.for EXP(B)	
				Lower	Upper
<b>Age</b>	15-24 years	.002	Ref.	--	--
	25-34 years	.070	1.989	.946	4.181
	35-49 years	.000	7.107	2.439	20.713
<b>History of past pregnancies anemia</b>	No	.000	Ref.	--	--
	Yes	.000	6.681	2.922	15.279
	Never been pregnant	.002	4.490	1.699	11.865
<b>Anemia at registration</b>	No Anemia		Ref.	--	--
	Anemia	.000	14.900	6.700	33.132
<b>Receive information about iron supplement</b>	No		Ref.	--	--
	Yes	.000	.084	.040	.175
<b>Iron intake for long periods is boring</b>	No		Ref.	--	--
	Yes	.000	4.072	1.924	8.618
<b>History of a healthy diet at 24 weeks of pregnancy</b>	No		Ref.	--	--
	Yes	.000	.229	.120	.439
<b>Group 5 (meat, fish) intake at 24 weeks of pregnancy</b>	No		Ref.	--	--
	Yes	.000	.194	.097	.389

The conditional forward logistic regression model includes Clinic Region, Age, Women's education level, Residency, House type, Family size (members), Husband's education level, Income, Past work, Current work, Parental consanguinity, History of past pregnancy anemia, History of anemia in the last pregnancy, anemia at registration, History of iron intake for (six months), intake of vitamin A-rich fruit and vegetables at registration, sweet food intake at registration, meal frequency /day at 24 weeks, history of a healthy diet at 24 weeks, history of changes in eating habits at 24 weeks, tea /coffee consumption during/after meals at 24 weeks, iron intake compliance at 24 weeks, minimum dietary diversity for women (MDD-W) at 24 weeks, grains and white root intake at 24 weeks, nut intake at 24 weeks, milk and yogurt intake at 24 weeks, meat and fish intake at 24 weeks, Receive information about iron supplement, From whom? information about an iron supplement, Receive information about vitamin supplements, From whom? Information about vitamin supplements, Doctor's confirmation of daily iron intake, Doctor's confirmation of daily multivitamin intake, Doctor's information about iron side effects, Doctor's information to avoid taking iron with milk/calcium, Doctor's information to avoid taking iron with antiacid, Doctor's information to avoid drinking coffee/tea with meals, Doctor's information about iron-rich foods such as red meat and green leafy vegetables, Nurse's information to take iron at bedtime, Nurse's information to take iron with juice, Nurse's information about iron-rich foods such as red meat and green leafy vegetables, Iron intake for long periods is boring.

## **Chapter Six: Discussion, Limitations, Conclusion, and Recommendations**

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### **6.1 Introduction**

Our study was a follow-up study conducted at UNRWA's health care centers in the Jerusalem area out of the separation wall. 400 pregnant women who registered for antenatal care clinics from May to July year 2022 participated in this study. This study aims to identify the determinants of maternal anemia and to determine the compliance and effectiveness of the micronutrient intervention program implemented at the UNRWA among pregnant women.

In the coming sections, the study results will be discussed and compared to the present literature and study conceptual model in detail. Part I will be the discussion and in Part II we will present the conclusions and recommendations

### **Part I: Results discussion**

### **6.2 Anemia prevalence among pregnant women**

As reported by the Ministry of Health, the prevalence of anemia (hemoglobin < 11g/dl) among normal and high-risk pregnant women in the West Bank was 27.6 % and 30.3 % respectively (Ministry of Health, 2023). Also, the prevalence of anemia among pregnant women in the 1<sup>st</sup> trimester was 20%, while in the 2<sup>nd</sup> trimester of pregnancy, this percentage increased to 32% (Hb < 10.5 g/dl). These results are similar to other studies done previously in Palestine (Srour et al., 2018).(Damiri et al., 2024) and studies in Arab countries like Saudi Arabia (Alreshidi & Haridi, 2021) Jordan (Al-Mehaisen et al., 2011), and Yemen (Alflah et al., 2017). A previous study was conducted among pregnant women attending the UNRWA clinics in Palestine. The overall prevalence of anemia was 38.6%. There was a threefold risk of developing anemia in the 2<sup>nd</sup> and 3<sup>rd</sup> trimesters of gestation as opposed to the first (2<sup>nd</sup> versus 1<sup>st</sup> : OR = 3·2, 95 % CI 2·2, 4·6; 3<sup>rd</sup> v.1<sup>st</sup>): OR = 3·3, 95 % CI 2·2, 4·8)(Khader et al., 2009) . However, the physiological needs for iron rise significantly during pregnancy to support fetoplacental development and maternal adaptation to pregnancy, which puts pregnant women at higher risk of developing iron deficiency and IDA.

### **6.3 Mother's Socioeconomic Status and Anemia during Pregnancy**

Our study results indicate that there is no significant association between anemia during pregnancy and the following socioeconomic factors: health clinic regions, place of residency, house type, women's educational level, husband's educational level, family size, family income, past and current work status, and paternal consanguinity. This result is in concordance with other studies in Palestine (Abu-Hasira, 2007) (AL-TELL et al., 2010) (Samha, 2012a). (Srouf et al., 2018). The only factor that showed a significant difference between anemic and non-anemic was women's age ( $p < 0.05$ ). Women between the ages of 25-34 had a significantly 2-fold increased risk of anemia than pregnancies at younger ages, and women who become pregnant later in life had an increased risk by 9-fold. Similar to a previous study in Palestine which showed that anemia prevalence was found to increase with women's age (Khader et al., 2009a). This can be justified as women age, the number of pregnancies, delivery, and subsequent lactation increases, all of which increase the demand for iron. This increased demand for iron is covered mostly by maternal iron stores, which puts pregnant women at higher risk of anemia.

Several studies showed that lower socioeconomic status, low educational level of the mother, and large family size were the determinants factors of anemia during pregnancy. A study in Yemen showed that low socioeconomic status was a determinant factor of anemia (Al-Aini et al., 2020). Another study in Yemen showed that increased maternal age, low income, low educational level, and inadequate nutrition intake were significantly related to anemia in pregnancy (Alflah et al., 2017). Also, a study in Saudi Arabia showed that having a larger family size with low income was a determinant of anemia. (Alreshidi & Haridi, 2021). In Egypt, it has been shown that the prevalence of anemia increases with women's age. (Rezk et al., 2015).

Additionally, a study in Tanzania showed that the place of residence and low educational level were the main risk factors for anemia during pregnancy (Stephen et al., 2018). An Ethiopian study showed that low family income and large family size were associated with anemia during pregnancy (Melku et al., 2014). Also, an Indian study showed that poor literacy levels, rural background, and lower socioeconomic status affect the degree of anemia during pregnancy (Hooja et al., 2020). In addition, in Bengal, the low socioeconomic status was significantly related to anemia during pregnancy (Sinha et al., 2021). Moreover, a study in Ethiopia showed the determinant factors that were associated with increased risk of anemia during pregnancy which

include: maternal age, belonging to the poorest wealth index, number of household members being four to six, number of under-five children being two (Woldegebriel et al., 2020). However, this association between anemia in pregnancy and low family income and large family size may be related to a lack of food security and dietary variety. Also, the association between anemia in pregnancy and the level of women's education can be justified as educated pregnant women have healthier eating habits and eat nutritious food, hence do not develop nutritional anemia.

#### **6.4 Mother's reproductive health and anemia during pregnancy**

The majority of the reproductive health characteristics in our research aligned with the general reproductive characteristics of Palestinian society, such as young marital age, multiparity, and high breastfeeding practice. In the West Bank, the median age of a first marriage was 21.0 years, according to PSBC 2022, consequently, they were young at 1st pregnancy, 1st delivery and breastfeeding. Our study results show no significant association between anemia during pregnancy and the woman's reproductive factors. Which is similar to another study in Palestine (Abu-Hasira, 2007). According to (Khader et al., 2009), the prevalence of anemia in pregnancy increases with women's parity. Unfortunately, there haven't been any published studies in Palestine that investigated the association between anemia in pregnancy and women's reproductive health characteristics. So, further researches need to be conducted to study women's reproductive factors as determinants of anemia in pregnancy in Palestine.

Several reproductive health factors affect anemia in pregnancy, Multiparity, short pregnancy intervals, frequency of antenatal care visits and others were shown to be risk factors for anemia in pregnancy. In Yemen, it has been found that gestational age, gravidity, and short pregnancy intervals raised the risk of anemia (Alflah et al., 2017)(Al-Aini et al., 2020). Additionally, in Egypt, it has been revealed that multiparity, shorter pregnancy intervals, and lack of antenatal care visits are the main causes of anemia in pregnancy. (Rezk et al., 2015). Another study in Saudi Arabia revealed that multiparity, longer menstrual periods, and bleeding during pregnancy were significantly associated with anemia in pregnancy (Alreshidi & Haridi, 2021). In Ethiopia, it has been shown that short birth intervals and a history of blood loss during pregnancy were significantly related to anemia during pregnancy (Abdu et al., 2021). Another Ethiopian study showed that pregnancy trimester, the number of under-five children, previous history of abortion, breastfeeding

practices, and the frequency of antenatal care visits were independent determinants of anemia during pregnancy (Alemu & Umeta, 2015) (Kejela et al., 2020). A study in Ethiopia showed that the absence of the history of abortion was identified as a protective variable of anemia during pregnancy (Gari et al., 2020). Also study in Bengal showed that multigravida and delayed time of 1<sup>st</sup> antenatal visit were significantly related to anemia during pregnancy (Sinha et al., 2021). However, this can be justified as multiparous women with short pregnancy intervals have experienced the stress of pregnancy, delivery, and subsequent lactation many times, all of which increase the demand for iron and other micronutrients. This increased demand is covered mostly by maternal micronutrient stores, which puts multiparous pregnant women at higher risk of anemia because there is insufficient time to restore that storage. Concerning longer menstrual bleeding or bleeding during pregnancy, they both can lead to decreased iron storage levels which increase the risk of anemia. Moreover, ANC visits frequency can be related to anemia in pregnancy as ANC visits offer health education as well as access to health care services like iron-folic acid supplements for pregnant women.

### **6.5 Mother's anemia before pregnancy and the risk for anemia during pregnancy**

In this group of factors, a history of anemia, history of anemia in previous pregnancies, history of anemia in the last pregnancy, and anemia at registration of current pregnancy were included in our study.

Our study results indicate that there is no significant association between anemia during pregnancy and having a history of anemia. There is a significant association between anemia during the current pregnancy with having a history of anemia in previous pregnancies, a history of anemia in the last pregnancy, and anemia at registration of the current pregnancy ( $p < 0.05$ ). It has been shown that women who had previously had anemia during pregnancy had a significantly 6-fold increased risk of anemia at 24 weeks of pregnancy compared to women who had never experienced anemia before. While primigravida women had an increased risk of anemia by 4-fold. Moreover, having anemia at registration increased the risk of anemia at 24 weeks of pregnancy. At the time of registration, women who were anemic had a significantly 15-fold increased risk of anemia than women who were not. Unfortunately, there haven't been any published studies in Palestine that investigated the association between a mother's anemia before pregnancy and the occurrence of

anemia during pregnancy. So, further studies need to be conducted to determine this association among pregnant women at the community level.

Several studies have shown that having a history of anemia before pregnancy is associated with anemia in pregnancy. In Saudi Arabia, it has been shown that a prior history of anemia significantly raised the risk of anemia during pregnancy (Alreshidi & Haridi, 2021). In Ethiopia, a study showed that having a history of anemia was identified as a predisposing factor for anemia during pregnancy (Gari et al., 2020). A study in Mexico showed that women started gestation with insufficient iron storage trends to present anemia at significantly earlier gestational ages. (Casanueva et al., 2003).

Although in UNRWA there is a postnatal care, family planning, and preconception care policies. After the delivery of a pregnant woman who was receiving antenatal care at all UNRWA clinics, all mothers need at least one postnatal care visit and checkups in the first 6 weeks after delivery. Where hemoglobin level needs to be done to assess anemia status for women who have had any of the following risk factors: including anemia during pregnancy, antepartum or postpartum hemorrhage, multiple births, and women who delivered by CS. Health information and counseling about nutrition and dietary intake should be obtained from the family health team. Iron and folic acid supplementation should be continued until at least three months after delivery to prevent anemia. After that, they are enrolled in either the family planning services or the preconception care program and follow up with them till their anemia status improves. (UNRWA, 2020b). This can be justified as there is a gap in the implementation of these policies. So, more efforts are needed to implement these policies in a very effective manner to reduce the risk of anemia in pregnancy.

#### **6.6 Mother's chronic medical condition and anemia during pregnancy:**

In this group of factors, BMI, History of chronic diseases, history of past pregnancies diseases (complications), and history of surgeries were included in our study. Our study showed that there is no significant association between a mother's past medical history and the occurrence of anemia during pregnancy. Which is similar to another study in Palestine. (Abu-Hasira, 2007).

Several studies showed that maternal chronic medical diseases were associated with anemia in pregnancy. A study in Jordan showed that underweight women (BMI) and a history of prior surgery were significantly associated with anemia. (Al-Mehaisen et al., 2011). In Egypt, it has been shown that women with a body mass index of less than 20, and having intestinal parasites were positively

associated with anemia (Rezk et al., 2015). In Saudi Arabia, it has been shown that increased BMI was negatively associated with anemia among pregnant women (Alreshidi & Haridi, 2021). In Iraq, it has been shown that there is a high risk of anemia during pregnancy that is complicated by UTI (Jabbar et al., 2006) which is similar to another study in Yemen. (Al-Aini et al., 2020). Another study in Nigeria showed that malaria and bacteriuria were associated with anemia in pregnancy. (Dattijo et al., 2016).

A study carried out by Gangopadhyay et al (2011) showed that anemia is often worsened by the presence of other maternal chronic communicable and non-communicable diseases such as malaria, HIV, tuberculosis, and diabetes (Gangopadhyay et al., 2011). However, this can be justified as women with low BMI are more likely to be malnourished and to have micronutrient deficiencies, which raise the risk of anemia. Similarly, women with chronic illnesses are more likely to experience anemia because of their medical conditions which may cause bleeding or interfere with their ability to absorb iron.

## **6.7 Mother's nutrition and lifestyle and anemia during pregnancy**

This group of factors, the mother's physical activity, smoking status, sleeping pattern, mother's nutrition and eating habits, and iron and multivitamin intake at the time of registration and after 24 weeks of current pregnancy were all included in our study.

Our study showed that there is no significant difference between anemic and non-anemic women regarding the mother's physical activity, smoking status, and sleeping pattern at registration and after 24 weeks of pregnancy. It has been shown that the vast majority of women had low physical activity levels. Concerning smoking status, we suspected under-reporting, due to the fear of stigma reasons. However, 89% of women demonstrated that their physical activity had changed and 70.8% of them had a worse sleep pattern after pregnancy. While the majority of pregnant women have stopped smoking after they got pregnant, Regrettably, there haven't been any published studies in Palestine or Arab countries that investigated the association between anemia in pregnancy and the previous lifestyle factors. An Indian study showed that tobacco use contributes to IDA (Mistry et al., 2018). A study in China indicated moderate physical activity was an important factor in the prevention of anemia during pregnancy (Zhang et al., 2021).

Regarding mother's nutrition and eating habits, our study showed that there was no significant difference between anemic and non-anemic women at the time of registration. It has been shown that a majority of women had a meal frequency of less than three meals per day. While a high percentage of women have experienced a history of loss of appetite and vomiting due to pregnancy. It is worth mentioning that the majority of women have demonstrated that there is no change in their eating habits and have not eaten a healthy diet. Regarding women's dietary diversity, according to Minimum Dietary Diversity for Women, 62.5% of women had an MDD-W score  $\geq 5$  with an incidence of IDA 60.3%. Finally, the only factors that showed a significant difference between anemic and non-anemic were lower intake of vitamin A-rich fruit and vegetables and sweet food.

At 24 weeks of current pregnancy, our study showed that there was a significant difference between anemic and non-anemic women regarding the mother's nutrition and eating habits. It has been shown that there is a significant difference between anemic and nonanemic women concerning the number of meals per day ( $p < 0.05$ ). 37.8% of participating women had a meal frequency of less than three meals per day with an incidence of IDA 50.8%. Moreover, there were significant differences between anemic and nonanemic women regarding changing eating habits and eating healthy, varied food ( $p < 0.05$ ). 53.2% of anemic women had mentioned that they had no change in eating habits while 57.1% didn't take a healthy and varied diet. Regarding women's dietary diversity at 24 weeks, there were significant differences between anemic and nonanemic women concerning Minimum Dietary Diversity for Women ( $p < 0.05$ ). 46.3% of women had an MDD-W score  $< 5$  with an incidence of IDA 57.1%. Moreover, it has been shown that eating a healthy diet and increasing meat and fish intake was significantly associated with a lower risk of anemia at 24 weeks of pregnancy. Also, our study showed that there is no significant association between anemia during pregnancy and eating green leafy vegetables or consumption of tea or coffee during meal times.

Regrettably, there haven't been any published studies in Palestine that investigated the association between anemia in pregnancy and mothers' nutrition and eating habits. So, further studies need to be conducted to determine this association among pregnant women at the community level. A single study showed a significant association between the perceived risk of anemia and eating practices. (AL-TELL et al., 2010)

Several nutritional and lifestyle factors such as inadequate intake, low dietary diversity, frequent daily tea consumption, and irregular intake of iron supplements were contributing factors to anemia during pregnancy. In Egypt, it has been shown that low weekly intake of meat, vegetables, and fruits, and frequent daily tea consumption were independent risk factors for anemia (Eweis et al., 2021). (Rezk et al., 2015). In Yemen, having tea and coffee after meals and consuming fewer proteins is associated with anemia.(Alflah et al., 2017).while in Saudi Arabia, infrequent intake of meat and the habit of drinking tea just after meals were found to be significantly associated with anemia (Alreshidi & Haridi, 2021) In Ethiopia, meal frequency of less than three times per day during pregnancy was significantly related to anemia during pregnancy (Abdu et al., 2021)(Gebre & Mulugeta, 2015). While in Abidjan, inadequate intake, low dietary diversity, and skipping meals were independent determinants factors of anemia during pregnancy (Vanié et al., 2021). A similar study in Tanzania showed dietary habits such as consumption of tea or coffee during meal times, eating <3 meals/d and inadequate dietary diversity were determinant factors of anemia in pregnant women(Gibore et al., 2021).In India, the consumption of green leafy vegetables contributed to IDA (Mistry et al., 2018). However, this can be justified as a woman's need for nutrients is particularly great throughout her pregnancy. Inadequate meal intake and lack of diversity in a pregnant woman's diet increase the risk of deficiencies in important nutrients which can result in anemia. Also, tea /coffee consumption during meals had an inhibition role in iron absorption

Concerning vitamin and mineral supplement intake, our study showed that there was no significant difference between anemic and non-anemic women regarding folic acid, iron, and multivitamin intake( $p < 0.05$ ). There were significant differences between anemic and nonanemic women regarding iron supplement compliance ( $p < 0.05$ ). 44.5 % of women take iron with low compliance with an incidence of IDA 51.6%. and 35.5% of women didn't take iron supplements with an incidence of IDA 36.5%. Also, there were significant differences between anemic and nonanemic women concerning low iron supplement compliance reasons either due to forgetness or its side effects( $p < 0.05$ ). Similar to another study conducted among pregnant women at UNRWA clinics in the West Bank which showed that the compliance rate with iron supplementation was low. (Samha, 2012a). Another study in Palestine showed that previous and current use of iron supplements seems to have limited effect in lowering the prevalence rate of IDA. (Abu-Hasira, 2007)

In Egypt, irregular intake of iron supplements was an independent risk factor for anemia. (Eweis et al., 2021). In Jordan, multivitamin intake during pregnancy was significantly associated with anemia (Al-Mehaisen et al., 2011). In Turkey, the use of a folic acid supplement, dietary folate equivalent, and total iron intake were contributing factors for anemia. (Kangalgil et al., 2021) Iran showed that the most common reasons for low compliance with iron /folate supplements were their side effects and forgetfulness. (Siabani et al., 2018). In Nigeria, the main obstacles to iron supplementation compliance were gastrointestinal adverse effects of iron supplements, non-affordability of iron supplements, and forgetfulness. (Ugwu et al., 2014). However, this can be justified as a woman's need for nutrients is particularly great throughout pregnancy. Inadequate iron and vitamin intake increases the risk of deficiencies in important nutrients which can result in anemia.

#### **6.8 Health Education and UNRWA's interventional program and anemia in pregnancy:**

Our study showed that among anemic women, only 27.0% and 23.0% were informed that they were anemic either by the doctor or the nurse respectively. However, the majority of women got a medical prescription for folic acid and iron intake, and they obtained folic acid and iron supplementation mainly from UNRWA health centers.

Regarding iron and multivitamin supplements counseling. Our study showed that obtaining iron information counseling was significantly associated with a lower risk of anemia at 24 weeks of pregnancy. There was a significant difference between anemic and nonanemic women concerning iron, and multivitamin supplement information ( $p < 0.05$ ) Also, there was a significant difference between anemic and nonanemic women regarding the doctor's confirmation of daily iron and multivitamin supplement intake at every antenatal visit ( $p < 0.05$ ). However, the medical officer was found to be the most preferable person that women believed could give proper counseling about supplements.

Concerning health education and counseling about iron supplement intake and side effects provided by the family health team. Our study showed that there was a significant difference between anemic and nonanemic women concerning counseling about iron side effects, encouragement of iron-rich foods such as red meat and green leafy vegetables, and taking iron

supplements at bedtime. Additionally, women who perceive that iron intake for a long time is boring were significantly four times higher risk of anemia at 24 weeks than women who didn't.

This is similar to another study of pregnant women at UNRWA facilities in the West Bank. The study found that health education and counseling for proper use of iron supplements, advantages, information about probable side effects, and clear instruction offered by health workers were major variables for compliance (Samha, 2012a)

There is an antenatal care guideline and prevention and treatment guidelines in the UNRWA for micronutrient deficiencies, and family health team members are requested to counsel and advise pregnant women to maintain a balanced and varied diet to increase iron intake. In the guidelines iron supplementation should be given to pregnant women throughout pregnancy and for three months after delivery to provide sufficient iron to meet the requirements of pregnancy, and lactation, and to protect pre-existing iron stores to prevent maternal anemia. Our study results may suggest that there might be a gap in the implementation of these policies and guidelines. As a result, we propose conducting an assessment of how those guidelines are implemented. This could help with adjusting the implementation plan which might ultimately help in reducing the risk of anemia during pregnancy. The health professionals can participate in modifying the health education and counseling program based on the mother's diet, iron and multivitamin intake, iron compliance, and potential adverse effects of iron.

A randomized controlled trial in Jordan, showed the effectiveness of a planned health education program on the knowledge and compliance of pregnant anemic women, as women in the intervention group scored higher on the compliance checklist, knowledge, capacity to choose foods, and hemoglobin level. (Abujilban et al., 2019). A similar study in Ethiopia demonstrated that pregnant women's consumption of an iron-rich diet and hemoglobin levels were both improved by intensive nutrition education and counseling. (Wakwoya et al., 2023). Another study showed that improved hemoglobin levels, better dietary intake, and enhanced nutritional knowledge of anemia and iron-rich foods were all significantly correlated with the provision of nutrition education and an iron-rich food-based diet plan. (Sunuwar et al., 2019). In Ethiopia, revealed that good knowledge about anemia and iron /folate supplementation, and obtaining health education regarding the benefits of iron/folate supplementations were associated factors for supplementation compliance (Sendeku et al., 2020).

## **Part II: Study limitations, conclusion, and recommendations**

### **6.9 Study limitations:**

There may be a social desirability bias for dietary information and monthly income. This may under/overestimate the association between the variables and anemia among pregnant women. For example, anemic women with low compliance with the diet and supplement recommendations due to their cost or the availability of food might underestimate the affectivity of the intervention program which will lead to information bias. Also, recall bias as participants were requested to information about past medical history and prior pregnancy events. Another limitation was the UNRWA strike in 2023, which negatively affected the follow-up of the pregnant women who participated in the study.

### **6.10 Conclusion**

This is the first study of its type in UNRWA health care clinics in Jerusalem Area. The study presented the role of healthcare factors such as health education and counseling on the incidence of anemia in pregnancy before and during pregnancy. The study results were consistent with the published research that investigated the determinants of anemia during pregnancy. The results showed that women's age, history of anemia in past pregnancies, being anemic in the first trimester, and low iron compliance were significant determinants of anemia in pregnancy. While, obtaining iron information counseling, eating a healthy diet, and increasing meat and fish intake were significantly associated with a lower risk of anemia at 24 weeks of pregnancy.

### **6.11 Recommendations**

- **For pregnant women and the general population:**

1. Anemia in pregnancy, to an extent, is a modifiable disease. It can be controlled by having a healthy diet taking iron and multivitamin supplements and having healthier eating habits. So, it is recommended for all women to pay more attention to their nutrition and eating habits.

2. For women who had a history of anemia or had anemia in their last pregnancy, it is recommended to follow up on their anemia status postnatally, take iron supplements regularly, use proper family planning methods, and receive preconception care to improve their hemoglobin level as they consider a high susceptible group for anemia in the coming pregnancies.

▪ **For UNRWA health staff and policymakers:**

1. Planned training program for medical officers and midwives on anemia in pregnancy, its symptoms, complications, prophylactic and treatment measures, the importance of obtaining health counseling and education about women's diet, iron-rich food, and food that enhances iron absorption, iron supplement, and its possible side effects and how to minimize these effects

2. Awareness campaign about anemia in pregnancy, and healthy lifestyle.

3. Proper implementation of preconception care, antenatal care, postnatal care, and family planning UNRWA's policies and guidelines. especially among those who were highly susceptible to anemia: including anemia during pregnancy, antepartum or postpartum hemorrhage, multiple births, and women who delivered by CS

4. enhance women to read the health advice about pregnancy that they found in their maternal booklet or the MCH phone application.

▪ **For the research field**

1. Further research to study the determinants of anemia in pregnancy at the community level including maternal reproductive health factors, maternal past medical history, maternal nutrition, and lifestyle.

2. An intervention study to investigate the type of health promotion educational program that would help to improve mother's nutrition and iron compliance. It would also introduce knowledge about anemia and its consequences, the benefits of regular iron supplement intake, and the role that medical staff advice plays in the education process.

3. In general, anemia research in Palestine is still poor and any new hypothesis must be encouraged to be investigated.

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## Appendices

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- Appendix 1
- Appendix 2
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- Appendix 5
- Appendix 6

## Appendices 1:

### Baseline Questionnaire



كلية الصحة العامة

اسم المركز الصحي : \_\_\_\_\_

#### الجزء الاول :البيانات الشخصية

	العمر (بالسنوات)	1. SD
	ما هو أعلى مستوى علمي حصلت عليه ؟ 1-المرحلة اساسي (0-6) 2-المرحلة الاعدادية (7-10) 3-المرحلة الثانوية(11-12) 4- كلية 5- جامعة	2. SD
	أين تقيمين حالياً؟ 1-مدينة 2-قرية 3-مخيم	3. SD
	ما نوع السكن؟ 1-بيت مستقل 2-شقة في عمارة 3-بيت شعر (خيمة) 4-بيت صفيح	4. SD
	ما عدد أفراد الأسرة المقيمة في منزلك الحالي؟ (بما فيهم انت)	5. SD
	ما هو أعلى مستوى علمي حصل عليه الزوج؟ 1-المرحلة اساسي (0-6) 2-المرحلة الاعدادية (7-10) 3-المرحلة الثانوية(11-12) 4- كلية 5- جامعة	6. SD
	ما هو معدل دخل الأسرة الشهري ؟ (بالشيكل) 1-أقل من 1000	7. SD

		2- (1000 – 2000) 3- (2001 – 3000) 4- (3001 – 5000) 5- أكثر من 5000	
	<input type="checkbox"/> نعم <input type="checkbox"/> لا	هل سبق لك العمل خارج البيت؟	8. SD
	<input type="checkbox"/> نعم <input type="checkbox"/> لا	هل تعملين حالياً خارج البيت؟	9. SD
		ما هي صلة القرابة بين والدك ووالدتك؟ 1- لا قرابة 2- أقرباء درجة أولى (ابناء عم، ابناء عمه، أبناء خالة) 3- من نفس العائلة	10. SD

### الجزء الثاني : الصحة الانجابية

		كم كان عمرك عندما تزوجت أول مرة؟	11. RH																				
		طبيعة دورتك الشهرية : 1- منتظمة 2- ليست منتظمة	12. RH																				
		كم تبلغ مدة دورتك الشهرية؟ (بالايام)	13. RH																				
	<input type="checkbox"/> نعم <input type="checkbox"/> لا	هل تعتبر دورتك الشهرية غزيرة؟	14. RH																				
		هل سبق وان عانيت من (بامكانك اختيار اكثر من اجابة)	15. RH																				
		<table border="1"> <tr> <td>لا</td> <td>نعم</td> <td></td> </tr> <tr> <td></td> <td></td> <td>1. وجود اكياس على المبايض</td> </tr> <tr> <td></td> <td></td> <td>2. الياف بالرحم</td> </tr> <tr> <td></td> <td></td> <td>3. تشوهات في الرحم او عنق الرحم</td> </tr> <tr> <td></td> <td></td> <td>4. حمل خارج الرحم</td> </tr> </table>	لا	نعم				1. وجود اكياس على المبايض			2. الياف بالرحم			3. تشوهات في الرحم او عنق الرحم			4. حمل خارج الرحم						
لا	نعم																						
		1. وجود اكياس على المبايض																					
		2. الياف بالرحم																					
		3. تشوهات في الرحم او عنق الرحم																					
		4. حمل خارج الرحم																					
		كم كان عمرك عندما حملت لأول مرة؟ (مهما كانت نتيجة الحمل سواء حمل كامل، إجهاض أو خداج)	16. RH																				
		كم عدد المرات التي حملت بها؟ (شامل الحمل العادي والخداج الإجهاض وفقدان الجنين و الحمل في القنوت و الحمل الحالي)	17. RH																				
		كم عدد الأحمال التي أدت إلى إنجاب أطفال أحياء؟	18. RH																				
		ما هو عدد مرات الإجهاض؟	19. RH																				
	<input type="checkbox"/> نعم <input type="checkbox"/> لا <input type="checkbox"/> لا ينطبق	هل سبق ان تعرضت لحدوث نزيف خلال الحمل؟	20. RH																				
	<input type="checkbox"/> نعم <input type="checkbox"/> لا <input type="checkbox"/> لا ينطبق	هل سبق ان تعرضت لحدوث نزيف بعد الحمل؟	21. RH																				
		هل سبق وان (بامكانك اختيار اكثر من اجابة)	22. RH																				
		<table border="1"> <tr> <td>لا ينطبق</td> <td>لا</td> <td>نعم</td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td>1- تعرضت لحدوث ولادة مبكرة</td> </tr> <tr> <td></td> <td></td> <td></td> <td>2- انجبت جنين ميت بعد الأسبوع 24 من الحمل</td> </tr> <tr> <td></td> <td></td> <td></td> <td>3- انجبت طفل في الأسبوع 37 من الحمل او بعده، ووزنه (أقل من 2500 غرام)</td> </tr> <tr> <td></td> <td></td> <td></td> <td>4- انجبت طفل بتشوهات خلقية</td> </tr> </table>	لا ينطبق	لا	نعم					1- تعرضت لحدوث ولادة مبكرة				2- انجبت جنين ميت بعد الأسبوع 24 من الحمل				3- انجبت طفل في الأسبوع 37 من الحمل او بعده، ووزنه (أقل من 2500 غرام)				4- انجبت طفل بتشوهات خلقية	
لا ينطبق	لا	نعم																					
			1- تعرضت لحدوث ولادة مبكرة																				
			2- انجبت جنين ميت بعد الأسبوع 24 من الحمل																				
			3- انجبت طفل في الأسبوع 37 من الحمل او بعده، ووزنه (أقل من 2500 غرام)																				
			4- انجبت طفل بتشوهات خلقية																				
	<input type="checkbox"/> نعم <input type="checkbox"/> لا <input type="checkbox"/> لا ينطبق	هل سبق وان تناولت اقراص الحديد في الاحمال السابقة؟	23. RH																				

24. RH	هل تناولت حمض الفوليك في الاحمال السابقة ؟	<input type="checkbox"/> نعم <input type="checkbox"/> لا <input type="checkbox"/> لا ينطبق																												
25. RH	هل أرضعت اطفالك رضاعة طبيعية؟	<input type="checkbox"/> نعم <input type="checkbox"/> لا <input type="checkbox"/> لا ينطبق																												
26. RH	مدة الرضاعة الطبيعية للطفل السابق 1. ثلاثة اشهر او اقل 2. ستة اشهر او اقل 3. سبعة اشهر - سنة 4. من سنة الى سنتين 5. لا ينطبق	لا																												
27. RH	ما هو عدد اطفالك الاحياء الذين تقل اعمارهم عن 5 سنوات																													
28. RH	ما هي فترة التباعد بين هذا الحمل والحمل الذي سبقه؟(بالسنوات)																													
29. RH	هل استخدمت وسيلة تنظيم أسرة بين هذا الحمل والحمل الذي سبقه ؟	<input type="checkbox"/> نعم <input type="checkbox"/> لا <input type="checkbox"/> لا ينطبق																												
30. RH	ما هي وسيلة تنظيم الاسرة التي استخدمتها ؟	<table border="1"> <tr> <td><input type="checkbox"/> لا ينطبق</td> <td><input type="checkbox"/> لا</td> <td><input type="checkbox"/> نعم</td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td>1- حبوب منع الحمل</td> </tr> <tr> <td></td> <td></td> <td></td> <td>2- الواقي</td> </tr> <tr> <td></td> <td></td> <td></td> <td>3- اللولب</td> </tr> <tr> <td></td> <td></td> <td></td> <td>4- ابر منع الحمل</td> </tr> <tr> <td></td> <td></td> <td></td> <td>5- وسائل طبيعية</td> </tr> <tr> <td></td> <td></td> <td></td> <td>6- غير ذلك ، اذكرها</td> </tr> </table>	<input type="checkbox"/> لا ينطبق	<input type="checkbox"/> لا	<input type="checkbox"/> نعم					1- حبوب منع الحمل				2- الواقي				3- اللولب				4- ابر منع الحمل				5- وسائل طبيعية				6- غير ذلك ، اذكرها
<input type="checkbox"/> لا ينطبق	<input type="checkbox"/> لا	<input type="checkbox"/> نعم																												
			1- حبوب منع الحمل																											
			2- الواقي																											
			3- اللولب																											
			4- ابر منع الحمل																											
			5- وسائل طبيعية																											
			6- غير ذلك ، اذكرها																											
31. RH	ما هي طريقة الولادة في الحمل السابق ؟ 1. طبيعية 2. عملية قيصرية 3. لا ينطبق																													
32. RH	هل كان حملك الحالي مخطا له ؟	<input type="checkbox"/> نعم <input type="checkbox"/> لا																												
33. RH	هل تلقيت خدمة رعاية ما قبل الحمل من اي مركز صحي او متابعة دورية عند طبيب اختصاصي للتخطيط لهذا الحمل ؟	<input type="checkbox"/> نعم <input type="checkbox"/> لا																												
34. RH	مدة الحمل اثناء زيارتك الحالية للمركز الصحي ؟ 1- الشهر الاول 2- الشهر الثاني 3- الشهر الثالث																													
35. RH	هل عانيت من وجود نزيف مهبلي(سواء كان بسيط او شديد ) في الفترة الاولى من هذا الحمل ؟	<input type="checkbox"/> نعم <input type="checkbox"/> لا																												
36. RH	هل تناولت حبوب الاسبرين في هذا الحمل ؟	<input type="checkbox"/> نعم <input type="checkbox"/> لا																												
37. RH	هل تستخدمين ابر تجلط الدم (كليكسان ) في هذا الحمل ؟	<input type="checkbox"/> نعم <input type="checkbox"/> لا																												

### الجزء الثالث : التاريخ الطبي

38. MH	ما هو طولك (ال متر ) ؟	
39. MH	كم وزنك قبل الحمل (كغم ) ؟	

40. MH

هل تعانين او سيق وان عانيت من الامراض التالية؟( بإمكانك اختيار أكثر من اجابة )

(لا)	(نعم)	
		0 - لا أعاني
		1. ارتفاع ضغط الدم
		2. امراض القلب و الاوعية
		3. امراض بالكلية
		4. امراض الجهاز الهضمي
		5. امراض بالكبد
		6. امراض الحساسية
		7. امراض الغدد
		8. هشاشة العظام
		9. أمراض مفاصل
		10. دهنيات الدم
		11. أمراض مناعية
		12. السكري المزمن
		13. فقر الدم (الانيميا) (نسبة هيموغلوبين الدم اقل من 12 غم/ديسليتر)
		14. ثلاسيميا، فقر الدم المنجلي او غيرها امراض دم
		15. امراض نزف الدم (الهيموفيليا)
		16. قرحة في المعدة
		17. البواسير
		18. التهابات
		19. الاصابة بالطفيليات(كالمالريا وغيرها )
		20. السرطان ، علاج كيميائي او اشعاعي
		21. غير ذلك ، اذكرها ؟

41. MH

هل عانيت من الامراض التالية خلال الاحمال السابقة

لا ينطبق	لا	نعم	
			0.لم اعاني
			1. ارتفاع ضغط الدم
			2.سكري الحمل
			3.تكون الأجسام المضادة لفصيلة الدم (مرض عامل ريسس)
			4.تشنج الحمل أو اي نوع من انواع تسمم الحمل
			5. فقر الدم (الانيميا) (نسبة هيموغلوبين الدم اقل من 11 غم/ديسليتر)
			6. نزيف خلال الحمل او بعده

				7. نقص في الصفائح الدموية
				8. قرحة المعدة
				9. البواسير
				10. اضطرابات الكبد والمرارة
				11. غير ذلك من مضاعفات الحمل الخطرة ، اذكريها ؟
	<input type="checkbox"/> نعم <input type="checkbox"/> لا <input type="checkbox"/> لم يسبق لي الحمل		هل عانيت من فقر الدم في الحمل الذي يسبق هذا الحمل ؟ (نسبة هيموغلوبين الدم اقل من 11 غم/ديسليتر)	42. MH
	<input type="checkbox"/> نعم <input type="checkbox"/> لا		هل سبق وان تناولت حبوب الحديد لمدة 6 أشهر فاكتر ؟ متى بالسنوات او بالاشهر ؟	43. MH
	<input type="checkbox"/> نعم <input type="checkbox"/> لا		هل سبق وان احتجت الى نقل وحدات من الدم بسبب فقر الدم ؟	44. MH
	<input type="checkbox"/> نعم <input type="checkbox"/> لا		هل سبق وان اجريت اي عملية جراحية ؟	45. MH

#### الجزء الرابع : نمط الحياة والتغذية

##### ❖ النشاط الرياضي : قبل الحمل

<input type="checkbox"/> نعم <input type="checkbox"/> لا	هل طبيعة عملك تتطلب منك القيام بنشاط بدني شاق مثل : ( الحمل الثقيل والحفر ورشة بناء - التي تسبب تعرق شديد وزيادة في ضربات القلب والتنفس لمدة لا تقل عن 10 دقائق في اليوم؟ <b>الإجابة (لا) ، انتقل للسؤال 50</b>	46. LS
_____ يوم	كم يوما من أيام الأسبوع العادي تقومين بمثل هذا النشاط ( البدني الشاق) كجزء من عملك؟	47. LS
_____ ساعة	كم من الوقت (ساعة) تقضينه في القيام بهذا النشاط البدني الشاق في اليوم الواحد كجزء من عملك	48. LS
<input type="checkbox"/> نعم <input type="checkbox"/> لا	هل طبيعة عملك يتطلب منك القيام بنشاط بدني متوسط مثل (المشي السريع أو حمل أشياء خفيفة - التي تسبب تعرق بسيط وزيادة قليلة في ضربات القلب والتنفس) لمدة 10 دقائق على الأقل في اليوم ؟ <b>الإجابة (لا) انتقل للسؤال 53</b>	49. LS
_____ يوم	كم يوما من أيام الأسبوع العادي تقومين بمثل هذا النشاط ( البدني المتوسط) كجزء من عملك؟	50. LS
_____ ساعة	كم من الوقت (ساعة) تقضينه في القيام بهذا النشاط البدني المتوسط في اليوم الواحد كجزء من عملك	51. LS
<input type="checkbox"/> نعم <input type="checkbox"/> لا	هل تذهبين مشيا على الأقدام للتنقل من وإلى الأماكن (الزيارات ، التسوق ، العمل ) . لمدة لا تقل عن 10 دقائق متواصلة على الأقل في كل مرة؟ <b>الإجابة (لا) انتقل للسؤال 55</b>	52. LS
_____ يوم	في الأسبوع العادي كم يوما تمشين لمدة لا تقل عن 10 دقائق في كل مرة للتنقل من وإلى هذه الأماكن ؟	53. LS
_____ دقيقة	بالمتوسط كم من الوقت (دقيقة) تمشين في كل مرة للتنقل من وإلى هذه الأماكن	54. LS
<input type="checkbox"/> نعم <input type="checkbox"/> لا	هل تقوم في وقت فراغك بنشاط بدني شديد شاق كالرياضة مثل: الجري بسرعة أو حمل أشياء ثقيلة ، الحفر ، العمل في المزرعة أو ورشة بناء ) لمدة 10 دقائق مستمرة على الأقل؟ <b>الإجابة (لا) انتقل للسؤال 59</b>	55. LS
_____ يوم	في الأسبوع العادي كم يوما تقومين بممارسة هذه الأنشطة البدنية الشديدة ؟	56. LS

ساعة _____	في اليوم العادي: كم من الوقت (ساعة) تقومين بممارسة الأنشطة البدنية الشديدة؟	57. LS
لا <input type="checkbox"/> نعم <input type="checkbox"/>	هل تقومين في وقت فراغك بنشاط بدني متوسط الشدة بسيط للمحافظة علي اللياقة لمدة لا تقل عن 10 دقائق مستمرة في اليوم؟ (المشي السريع او السباحة او ركوب دراجة او لعب الكرة الطائرة) <b>الإجابة (لا) انتقل للسؤال 62</b>	58. LS
يوم _____	كم يوما في الأسبوع العادي تقومين بممارسة هذه الأنشطة البدنية المتوسطة؟	59. LS
ساعة _____	في اليوم العادي: كم من الوقت (ساعة) تقومين بممارسة الأنشطة البدنية المتوسطة؟	60. LS
ساعة _____	في اليوم العادي كم من الوقت (ساعة) تمضين جالسة أو مستلقية ( ما عدا وقت النوم). تشمل الجلوس في العمل , او القراءة , او مشاهدة التلفزيون أو التطريز أو اعمال يدوية , أو الكمبيوتر ..الخ	61. LS

❖ التدخين وشرب الكحول : قيل الحمل؟

لا <input type="checkbox"/> نعم <input type="checkbox"/>	هل سبق وان تناولت مشروباً كحولياً؟ ( مثل البيرة ، النبيذ ، الويسكي) خلال الاثنى عشر شهراً الماضية؟ <b>الإجابة (لا) ، انتقل للسؤال 67</b>	62. LS																		
يوم _____	في المتوسط: كم يوما تشربين المشروبات الكحولية في الأسبوع؟	63. LS																		
كأس _____	عندما تشربين الكحول: في المتوسط كم كأسا تشربين في المرة الواحدة؟	64. LS																		
	كم كان عمرك عندما تناولت الكحول للمرة الأولى؟	65. LS																		
لا <input type="checkbox"/> نعم <input type="checkbox"/>	هل تدخين حاليا أي نوع من أنواع التبغ التالية مثل السجائر أو السيجار أو الغليون.....الخ ما عدا الأرجيلة سأسألك لاحقا عليها <b>الإجابة لا ، انتقل للسؤال 72</b>	66. LS																		
لا <input type="checkbox"/> نعم <input type="checkbox"/>	هل تدخينين أيا من هذه الأنواع السابقة (السجائر أو السيجار أو الغليون...) يومياً؟	67. LS																		
_____	كم كان عمرك عندما بدأت التدخين؟	68. LS																		
سنة _____	كم من الوقت مضى عليك وأنت تدخينين؟	69. LS																		
	خلال الثلاثين يوما الماضية، كم كان معدل استهلاكك للتبغ؟ إذا كانت الاجابة لا يدخن نوع معين من التالي اکتبي كلمة (لا شيء) او صفر كتابة وليس ارقاما	70. LS																		
	<table border="1" style="width: 100%;"> <tr> <td>العدد يوميا</td> <td></td> </tr> <tr> <td>أ- السجائر</td> <td></td> </tr> <tr> <td>ب- السجائر اللف المصنعة يدويا</td> <td></td> </tr> </table> <table border="1" style="width: 100%;"> <tr> <td colspan="3">عدد المرات</td> </tr> <tr> <td>في اليوم</td> <td>في الاسبوع</td> <td>في الشهر</td> </tr> <tr> <td></td> <td></td> <td>ج- غليون</td> </tr> <tr> <td></td> <td></td> <td>د- سيجار</td> </tr> </table>	العدد يوميا		أ- السجائر		ب- السجائر اللف المصنعة يدويا		عدد المرات			في اليوم	في الاسبوع	في الشهر			ج- غليون			د- سيجار	
العدد يوميا																				
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في اليوم	في الاسبوع	في الشهر																		
		ج- غليون																		
		د- سيجار																		
لا <input type="checkbox"/> نعم <input type="checkbox"/>	هل يدخن أحد والديك (حاليا أو في السابق)	71. LS																		
لا <input type="checkbox"/> نعم <input type="checkbox"/>	في الماضي هل سبق لك التدخين يوميا؟ <b>الإجابة لا انتقلي للسؤال 75</b>	72. LS																		
	إذا كنت قد توقفت عن التدخين، كم كان عمرك عندما توقفت عن التدخين؟	73. LS																		

74. LS	هل تدخين الأرجيلة حاليا ؟ <b>الإجابة لا ، انتقل للسؤال 79</b>	<input type="checkbox"/> نعم <input type="checkbox"/> لا								
75. LS	كم مرة تدخين الأرجيلة ؟ <b>إجابة واحدة فقط</b>	<table border="1"> <tr> <td>عدد المرات</td> <td>اليوم</td> <td>الاسبوع</td> <td>الشهر</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> </tr> </table>	عدد المرات	اليوم	الاسبوع	الشهر				
عدد المرات	اليوم	الاسبوع	الشهر							
76. LS	كم كان عمرك عندما بدأت تدخين الأرجيلة ؟									
77. LS	كم سنة دخنت الأرجيلة؟									

❖ التغذية الحالية

78. LS	ما هو عدد الوجبات المتناولة عادة بشكل يومي خلال الحمل؟																						
79. LS	هل تعانيين من فقدان للشهية او تجنب للطعام بسبب الحمل ؟	<input type="checkbox"/> نعم <input type="checkbox"/> لا																					
80. LS	هل تعانيين من القيء والاستفراغ بسبب الحمل ؟	<input type="checkbox"/> نعم <input type="checkbox"/> لا																					
81. LS	هل تقومين بشرب الشاي /القهوة مع او مباشرة بعد تناول الوجبة ؟	<input type="checkbox"/> نعم <input type="checkbox"/> لا																					
82. LS	هل تناولت حبوب الفوليك اسيد في هذا الحمل ؟ <b>اذا كانت الإجابة لا ، انتقلي للسؤال 85</b>	<input type="checkbox"/> نعم <input type="checkbox"/> لا																					
83. LS	في اي فترة من الحمل بدأت باخذ حمض الفوليك ؟																						
84. LS	هل تناولت حبوب الحديد في هذا الحمل ؟ <b>اذا كانت الإجابة لا ، انتقلي للسؤال 88</b>	<input type="checkbox"/> نعم <input type="checkbox"/> لا																					
85. LS	هل تتناولين قرص الحديد مع عصير البرتقال أو مع أي نوع من الحمضيات؟	<input type="checkbox"/> نعم <input type="checkbox"/> لا																					
86. LS	هل تتناولين قرص الحديد مع الحليب أو مع أي نوع من مشتقات الحليب الغنية بالكالسيوم؟	<input type="checkbox"/> نعم <input type="checkbox"/> لا																					
87. LS	هل تعانيين من اشتها مواد غير غذائية خلال الحمل ( تراب ، الطين ، طلاء الاظافر ، الطباشير )	<input type="checkbox"/> نعم <input type="checkbox"/> لا																					
88. LS	هل توقفتي عن شرب ( مثل البيرة ، النبيذ ، الويسكي ) بسبب الحمل؟	<input type="checkbox"/> نعم <input type="checkbox"/> لا <input type="checkbox"/> لا اشرب																					
89. LS	هل بدأت بتناول طعام صحي ومتنوع (يحتوي على العناصر الغذائية ) بسبب الحمل؟	<input type="checkbox"/> نعم <input type="checkbox"/> لا																					
90. LS	هل قمت بتغيير عاداتك الغذائية بسبب الحمل؟	<input type="checkbox"/> نعم <input type="checkbox"/> لا																					
91. LS	هل توقفتي عن التدخين بسبب الحمل؟	<input type="checkbox"/> نعم <input type="checkbox"/> لا ادخن																					
92. LS	هل نشاطك البدني تغير بعد الحمل؟	<input type="checkbox"/> نعم <input type="checkbox"/> لا																					
93. LS	هل نومك افضل من قبل الحمل؟	<input type="checkbox"/> نعم <input type="checkbox"/> لا																					
94. LS	<b>الاطعمة المتناولة حاليا</b> الآن أود أن أسألك عن الأطعمة والمشروبات التي تناولتها بالأمس خلال النهار أو في الليل ، سواء أكلت أو شربت في المنزل أو في مكان آخر. يرجى التفكير في الوجبات الخفيفة و وجبات صغيرة وكذلك وجبات رئيسية.																						
	<table border="1"> <thead> <tr> <th>لا</th> <th>نعم</th> <th>الاطعمة</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td>1. أرز ،خبز ،عصيدة ،معكرونة</td> </tr> <tr> <td></td> <td></td> <td>2. البقطين ،القرع ،الجزر او البطاطا الحلوة</td> </tr> <tr> <td></td> <td></td> <td>3. البطاطا البيضاء</td> </tr> <tr> <td></td> <td></td> <td>4. الفاصوليا ، البازلاء ، العدس ، الحمص</td> </tr> <tr> <td></td> <td></td> <td>5. المكسرات ، الفول السوداني ، الكاجو ، بذور الشيا أو بذور الكتان؟</td> </tr> <tr> <td></td> <td></td> <td>6. حليب</td> </tr> </tbody> </table>	لا	نعم	الاطعمة			1. أرز ،خبز ،عصيدة ،معكرونة			2. البقطين ،القرع ،الجزر او البطاطا الحلوة			3. البطاطا البيضاء			4. الفاصوليا ، البازلاء ، العدس ، الحمص			5. المكسرات ، الفول السوداني ، الكاجو ، بذور الشيا أو بذور الكتان؟			6. حليب	
لا	نعم	الاطعمة																					
		1. أرز ،خبز ،عصيدة ،معكرونة																					
		2. البقطين ،القرع ،الجزر او البطاطا الحلوة																					
		3. البطاطا البيضاء																					
		4. الفاصوليا ، البازلاء ، العدس ، الحمص																					
		5. المكسرات ، الفول السوداني ، الكاجو ، بذور الشيا أو بذور الكتان؟																					
		6. حليب																					

		7. لبننة، زبادي، جبنة	
		8. لحم الكبد، لحم كلاوي، قلوب	
		9. اللحوم الحمراء (لحم البقر أو لحم الضأن أو لحم الماعز)	
		10. اللحوم البيضاء (دجاج، بط، حبش)	
		11. اللحوم المصنعة (سجق، سلامي، أو بسطرمة)	
		12. الأسماك، الأطعمة البحرية (التونا المعلب والسردين)	
		13. البيض	
		14. السبانخ، البروكلي، الخردل الأخضر، الهندباء، الجرجير	
		15. بادنجان، خيار، شندر، ملفوف، كوسا، بندورة، فطر	
		16. المانجا، اليابايا	
		17. تفاح، أفوكادو، موز، توت، أناناس أو برتقال	
		18. رقائق البطاطا، الشيبس	
		19. دونات، خبز مقلي، سمبوسك	
		20. معكرونة سريعة التحضير، اندومي	
		21. اغذية من مطاعم الوجبات السريعة	
		22. الشوكولاتة، الحلوى، المعجنات، الكعك، البسكويت، الأيس كريم أو المصاصات؟	
		23. المشروبات الغازية، عصائر الفاكهة، مشروبات الشوكولاتة، مشروبات الطاقة؟	
		24. الشاي المحلى أم القهوة المحلاة أم المشروبات العشبية المحلاة؟	
		هل تناولت وجبة خفيفة (عصرونة) خارج البيت بالامس؟ <input type="checkbox"/> نعم <input type="checkbox"/> لا	95. LS

في حالة موافقتك للاستمرار بالمتابعة ارجو تعبئة التالي

	رقم الهوية	96. SD
	رقم كرت المؤمن	97. SD
	رقم الهاتف	98. SD

انتهت الاستمارة...شكرا لحسن تعاونك

## Appendix 2

### Follow-up Questionnaire



كلية الصحة العامة

اسم المركز الصحي : \_\_\_\_\_

❖ الجزء الاول: التثقيف الصحي للنساء الحوامل من مقدمي الرعاية الصحية في عيادات وكالة الغوث

1. HE	هل اخبرك الطبيب بان لديك فقر او ضعف دم خلال حملك هذا ؟	<input type="checkbox"/> نعم <input type="checkbox"/> لا <input type="checkbox"/> غير متأكدة												
2. HE	هل اخبرتك القابلة(الممرضة) بان لديك فقر او ضعف دم خلال حملك هذا ؟	<input type="checkbox"/> نعم <input type="checkbox"/> لا <input type="checkbox"/> غير متأكدة												
3. HE	متى تم اعلامك بذلك: (شهر الحمل)؟													
4. HE	هل تم وصف التالي لك؟	<table border="1"> <tr> <td>لا</td> <td>نعم</td> <td></td> </tr> <tr> <td></td> <td></td> <td>حمض الفوليك</td> </tr> <tr> <td></td> <td></td> <td>حبوب الحديد</td> </tr> <tr> <td></td> <td></td> <td>حبوب الفيتامينات</td> </tr> </table>	لا	نعم				حمض الفوليك			حبوب الحديد			حبوب الفيتامينات
لا	نعم													
		حمض الفوليك												
		حبوب الحديد												
		حبوب الفيتامينات												
5. HE	من اين تحصلين على حبوب الحديد ؟													
6. HE	من اين تحصلين على حبوب حمض الفوليك ؟													
7. HE	من اين تحصلين على حبوب الفيتامينات ؟													
8. HE	هل تلقيت اي معلومات عن استعمال حبوب الحديد خلال فترة حملك ؟ اذا كانت الاجابة لا انتقلي للسؤال 10	<input type="checkbox"/> نعم <input type="checkbox"/> لا												
9. HE	ممن تلقيت هذه المعلومات ؟ 1-طبيب العيادة 2-ممرضة/قابلة 3-الصيدلي 4- غيره ، من اين؟													
10. HE	هل تلقيت اي معلومات عن استعمال حبوب الفيتامينات خلال فترة حملك ؟ اذا كانت الاجابة لا انتقلي للسؤال 12	<input type="checkbox"/> نعم <input type="checkbox"/> لا												
11. HE	ممن تلقيت هذه المعلومات ؟ 1-طبيب العيادة 2-ممرضة/قابلة 3-الصيدلي 4- غيره من اين؟													

	<p>هل يؤكد الطبيب عليك</p> <table border="1"> <tr> <td>لا</td> <td>نعم</td> <td></td> </tr> <tr> <td></td> <td></td> <td>تناول حبوب الحديد بانتظام في كل زيارة</td> </tr> <tr> <td></td> <td></td> <td>تناول حبوب الفيتامينات بانتظام في كل زيارة</td> </tr> </table>	لا	نعم				تناول حبوب الحديد بانتظام في كل زيارة			تناول حبوب الفيتامينات بانتظام في كل زيارة	12. HE															
لا	نعم																									
		تناول حبوب الحديد بانتظام في كل زيارة																								
		تناول حبوب الفيتامينات بانتظام في كل زيارة																								
	<p>هل تؤكد القابلة (الممرضة) عليك</p> <table border="1"> <tr> <td>لا</td> <td>نعم</td> <td></td> </tr> <tr> <td></td> <td></td> <td>تناول حبوب الحديد بانتظام في كل زيارة</td> </tr> <tr> <td></td> <td></td> <td>تناول حبوب الفيتامينات بانتظام في كل زيارة</td> </tr> </table>	لا	نعم				تناول حبوب الحديد بانتظام في كل زيارة			تناول حبوب الفيتامينات بانتظام في كل زيارة	13. HE															
لا	نعم																									
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		تناول حبوب الفيتامينات بانتظام في كل زيارة																								
	<p>هل اخبرك الطبيب عن</p> <table border="1"> <tr> <td>لا</td> <td>نعم</td> <td></td> </tr> <tr> <td></td> <td></td> <td>اي اثار جانبية محتملة لحبوب الحديد (الغثيان او الامساك،الم في المعدة )</td> </tr> <tr> <td></td> <td></td> <td>تناول حبوب الحديد عند وقت النوم</td> </tr> <tr> <td></td> <td></td> <td>تناول حبوب الحديد مع عصير البرتقال او الحمضيات ؟</td> </tr> <tr> <td></td> <td></td> <td>عدم تناول حبوب الحديد مع الحليب او مشتقاته او مع مضادات الحموضة</td> </tr> <tr> <td></td> <td></td> <td>عدم تناول حبوب الحديد مع مضادات الحموضة</td> </tr> <tr> <td></td> <td></td> <td>عدم تناول الاطعمة او المشروبات التي تمنع امتصاص حبوب الحديد مثل الشاي او القهوة ؟</td> </tr> <tr> <td></td> <td></td> <td>تناول الاطعمة الغنية بالحديد كاللحوم الحمراء والخضار الورقية</td> </tr> </table>	لا	نعم				اي اثار جانبية محتملة لحبوب الحديد (الغثيان او الامساك،الم في المعدة )			تناول حبوب الحديد عند وقت النوم			تناول حبوب الحديد مع عصير البرتقال او الحمضيات ؟			عدم تناول حبوب الحديد مع الحليب او مشتقاته او مع مضادات الحموضة			عدم تناول حبوب الحديد مع مضادات الحموضة			عدم تناول الاطعمة او المشروبات التي تمنع امتصاص حبوب الحديد مثل الشاي او القهوة ؟			تناول الاطعمة الغنية بالحديد كاللحوم الحمراء والخضار الورقية	14. HE
لا	نعم																									
		اي اثار جانبية محتملة لحبوب الحديد (الغثيان او الامساك،الم في المعدة )																								
		تناول حبوب الحديد عند وقت النوم																								
		تناول حبوب الحديد مع عصير البرتقال او الحمضيات ؟																								
		عدم تناول حبوب الحديد مع الحليب او مشتقاته او مع مضادات الحموضة																								
		عدم تناول حبوب الحديد مع مضادات الحموضة																								
		عدم تناول الاطعمة او المشروبات التي تمنع امتصاص حبوب الحديد مثل الشاي او القهوة ؟																								
		تناول الاطعمة الغنية بالحديد كاللحوم الحمراء والخضار الورقية																								
	<p>هل اخبرتك القابلة (الممرضة) عن</p> <table border="1"> <tr> <td>لا</td> <td>نعم</td> <td></td> </tr> <tr> <td></td> <td></td> <td>اي اثار جانبية محتملة لحبوب الحديد (الغثيان او الامساك،الم في المعدة )</td> </tr> <tr> <td></td> <td></td> <td>تناول حبوب الحديد عند وقت النوم</td> </tr> <tr> <td></td> <td></td> <td>تناول حبوب الحديد مع عصير البرتقال او الحمضيات ؟</td> </tr> <tr> <td></td> <td></td> <td>عدم تناول حبوب الحديد مع الحليب او مشتقاته او مع مضادات الحموضة</td> </tr> <tr> <td></td> <td></td> <td>عدم تناول حبوب الحديد مع مضادات الحموضة</td> </tr> <tr> <td></td> <td></td> <td>عدم تناول الاطعمة او المشروبات التي تمنع امتصاص حبوب الحديد مثل الشاي او القهوة ؟</td> </tr> <tr> <td></td> <td></td> <td>تناول الاطعمة الغنية بالحديد كاللحوم الحمراء والخضار الورقية</td> </tr> </table>	لا	نعم				اي اثار جانبية محتملة لحبوب الحديد (الغثيان او الامساك،الم في المعدة )			تناول حبوب الحديد عند وقت النوم			تناول حبوب الحديد مع عصير البرتقال او الحمضيات ؟			عدم تناول حبوب الحديد مع الحليب او مشتقاته او مع مضادات الحموضة			عدم تناول حبوب الحديد مع مضادات الحموضة			عدم تناول الاطعمة او المشروبات التي تمنع امتصاص حبوب الحديد مثل الشاي او القهوة ؟			تناول الاطعمة الغنية بالحديد كاللحوم الحمراء والخضار الورقية	15. HE
لا	نعم																									
		اي اثار جانبية محتملة لحبوب الحديد (الغثيان او الامساك،الم في المعدة )																								
		تناول حبوب الحديد عند وقت النوم																								
		تناول حبوب الحديد مع عصير البرتقال او الحمضيات ؟																								
		عدم تناول حبوب الحديد مع الحليب او مشتقاته او مع مضادات الحموضة																								
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		عدم تناول الاطعمة او المشروبات التي تمنع امتصاص حبوب الحديد مثل الشاي او القهوة ؟																								
		تناول الاطعمة الغنية بالحديد كاللحوم الحمراء والخضار الورقية																								
	<p>هل سببت حبوب الحديد لك</p> <table border="1"> <tr> <td>لم اتناولها</td> <td>لا</td> <td>نعم</td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td>الم في المعدة</td> </tr> <tr> <td></td> <td></td> <td></td> <td>غثيان</td> </tr> <tr> <td></td> <td></td> <td></td> <td>امساك</td> </tr> </table>	لم اتناولها	لا	نعم					الم في المعدة				غثيان				امساك	16. HE								
لم اتناولها	لا	نعم																								
			الم في المعدة																							
			غثيان																							
			امساك																							
<p>لم <input type="checkbox"/> لا <input type="checkbox"/> نعم <input type="checkbox"/> اتناولها</p>	<p>هل توقفت عن تناول حبوب الحديد</p>	17. HE																								

هل توقفت عن تناول حبوب الحديد بسبب		لا		نعم		18. HE
الم في المعدة						
غثيان						
امسك						
هل حضرت محاضرة تثقيف صحي عن حبوب الحديد في العيادة		لا <input type="checkbox"/>		نعم <input type="checkbox"/>		19. HE
هل تعتقد ان		لا		نعم		20. HE
تناول حبوب الحديد يوميا هو ضروري لك						
تناول حبوب الفيتامينات يوميا هو ضروري لك						
تناول حبوب الحديد بشكل منتظم يعدل نسبة الدم لديك						
تناولك حبوب الحديد بشكل منتظم هو جيد لصحة المراه						
الحامل وصحة الجنين						
تناولك حبوب الفيتامينات بشكل منتظم هو جيد لصحة						
المراه الحامل وصحة الجنين						
هل تشعرين بالملل من تناول حبوب الحديد لمدة طويلة		لا <input type="checkbox"/>		نعم <input type="checkbox"/>		21. HE

❖ الجزء الثاني : النشاط الجسدي خلال فترة الحمل

خلال الأشهر الثلاثة (3) الماضية وخارج نطاق العمل، كم من الوقت كنت تمضين بشكلٍ عام في						22. LS
3	من 2-	من 1-2	من 0.5	أقل من 0.5	مطلقاً	
ساعات	3	ساعات	1 -	ساعة /		
أو أكثر	ساعات	/ اليوم	ساعة /	اليوم		
/ اليوم	/ اليوم		/ اليوم			
						1. تحضير وجبات الطعام (الطبخ، إعداد المائدة، غسل الأنية)
						2. لباس أطفالك وغسلهم وإطعامهم وأنت جالسة
						3. لباس أطفالك وغسلهم وإطعامهم وأنت واقفة
						4. اللعب مع الأطفال وأنت جالسة أو واقفة
						5. اللعب مع الأطفال وأنت تمشين أو تركضين
						6. حمل أولادك (بين ذراعيك، بواسطة حمالة الأطفال، على ظهرك، إلخ)
						7. الإهتمام بشخص مسن
						8. الجلوس لاستخدام الحاسوب أو للكتابة خارج دوام العمل
						9. مشاهدة التلفاز، شريط فيديو أو دف.د. (أسطوانة رقمية)
						10. الجلوس للقراءة، للتحدث إلى أحدهم أو للإتصال بأحدهم خارج دوام العمل
						11. اللعب مع الحيوانات الأليفة
						12. القيام بالأعمال المنزلية اليومية (ترتيب السرير، الغسيل، الكي، ترتيب الأغراض)
						13. التبتّع (شراء الطعام، الملابس وحاجيات أخرى)

						14.تنظيف المنزل (إستخدام المكنسة، غسل التوافذ)	
<p>التنقل من مكان لآخر...  خلال الأشهر الثلاثة (٣) الماضية، كم من الوقت كنت تمضين بشكلٍ عام في :</p>							23. LS
3 ساعات أو أكثر / اليوم	من 2-3 ساعات / اليوم	من 1-2 ساعات / اليوم	من 0.5 - 1 ساعة / اليوم	أقل من 0.5 ساعة / اليوم	مطلقًا		
						1.المشي البطيء للوصول إلى مكانٍ معيّن (مثال: ركوب الباص/السيارة، الذهاب إلى العمل، القيام بزيارة) وليس بداعي المتعة أو لممارسة الرياضة	
						2.المشي السريع للوصول إلى مكانٍ معيّن (مثال: ركوب الباص/السيارة، الذهاب إلى العمل أو إلى المدرسة) وليس بداعي المتعة أو لممارسة الرياضة	
						3.قيادة السيارة أو ركوبها أو ركوب الباص	
<p>في سبيل المتعة أو ممارسة الرياضة...  خلال الأشهر الثلاثة (٣) الماضية، كم من الوقت كنت تمضين بشكلٍ عام في :</p>							24. LS
3 ساعات أو أكثر / اليوم	من 2-3 ساعات / اليوم	من 1-2 ساعات / اليوم	من 0.5 - 1 ساعة / اليوم	أقل من 0.5 ساعة / اليوم	مطلقًا		
						1.المشي البطيء في سبيل المتعة أو لممارسة الرياضة	
						2.المشي السريع في سبيل المتعة أو لممارسة الرياضة	
						3.المشي السريع صعودًا في سبيل المتعة أو لممارسة الرياضة	
						4.الركض	
						5.متابعة صفوف تربيّنة للحوامل	
						6.السباحة	
						7.الرقص	

أثناء العمل ...							25. LS
رجاءً إملئي القسم الآتي إذا كنت تعملين لقاء أجرٍ أو تقومين بعملٍ تطوّعيٍّ أو لا تزالين طالبة. أما إذا كنت ربة منزل، في إجازة الأمومة في المنزل، عاطلة عن العمل أو غير مؤهلة للعمل الرجاء الاجابة ب (لا ينطبق) خلال الأشهر الثلاثة (٣) الماضية، كم من الوقت كنت تمضين بشكلٍ عام في :							
مطلقاً	أقل من 0.5 ساعة / اليوم	من 0.5 - 1 ساعة / اليوم	من 1-2 ساعات / اليوم	من 2-3 ساعات / اليوم	3 ساعات أو أكثر / اليوم	لا ينطبق (لا تعمل/لست طالبة)	
							1. الجلوس أثناء العمل أو في الصّف
							2. الوقوف أو المشي البطيء أثناء العمل وأنت تحملين أغراضًا أثقل من غالون حليب (سعة ٤ ليتر)
							3. الوقوف أو المشي البطيء أثناء العمل من دون أن تحملي أيّ شيء
							4. المشي السريع أثناء العمل وأنت تحملين أغراضًا أثقل من غالون حليب (سعة ٤ ليتر)
							5. المشي السريع أثناء العمل من دون أن تحملي أيّ شيء

❖ الجزء الثالث : التغذية الحالية

26. LS	ما هو عدد الوجبات المتناولة عادة بشكل يومي خلال الحمل؟	
27. LS	هل تعانين من فقدان للشهية أو تجنب للطعام بسبب الحمل ؟	لا <input type="checkbox"/> نعم <input type="checkbox"/>
28. LS	هل تعانين من القيء والاستفراغ بسبب الحمل ؟	لا <input type="checkbox"/> نعم <input type="checkbox"/>
29. LS	هل تقومين بشرب الشاي /القهوة مع او مباشرة بعد تناول الوجبة ؟	لا <input type="checkbox"/> نعم <input type="checkbox"/>
30. LS	هل تناولين حبوب الفوليك اسيد ؟ اذا كانت الاجابة لا ،انتقلي للسؤال 29	لا <input type="checkbox"/> نعم <input type="checkbox"/>
31. LS	في اي شهر من الحمل بدأت باخذ حمض الفوليك ؟	
32. LS	هل تناولين حبوب الفوليك اسيد يوميا ؟	لا <input type="checkbox"/> نعم <input type="checkbox"/>
33. LS	هل توقفت عن تناول حمض الفوليك	لا <input type="checkbox"/> نعم <input type="checkbox"/>
34. LS	هل تناولين حبوب الكالسيوم ؟ اذا كانت الاجابة لا ،انتقلي للسؤال 31	لا <input type="checkbox"/> نعم <input type="checkbox"/>
35. LS	في اي شهر من الحمل بدأت باخذ حبوب الكالسيوم ؟	
36. LS	هل تناولين حبوب الكالسيوم يوميا ؟	لا <input type="checkbox"/> نعم <input type="checkbox"/>

37. LS	هل تتاولين حبوب الفيتامينات ؟ اذا كانت الاجابة لا ،انتقلي للسؤال 36	<input type="checkbox"/> نعم <input type="checkbox"/> لا
38. LS	في اي شهر من الحمل بدأت باخذ حبوب الفيتامينات ؟	
39. LS	هل تتاولين حبوب الفيتامينات يوميا بانتظام ؟	<input type="checkbox"/> نعم <input type="checkbox"/> لا
40. LS	كم حبة فيتامينات تأخذين في اليوم ؟ 1-حبة واحدة 2-حيتين 3- 3 حبات	
41. LS	هل تتناولين حبوب الحديد ؟ اذا كانت الاجابة لا ، انتقلي للسؤال 43	<input type="checkbox"/> نعم <input type="checkbox"/> لا
42. LS	في اي شهر من الحمل بدأت باخذ حبوب الحديد؟	
43. LS	هل تتاولين حبوب الحديد يوميا بانتظام ؟	<input type="checkbox"/> نعم <input type="checkbox"/> لا
44. LS	كم حبة حديد تأخذين في اليوم ؟ 1-حبة واحدة 2-حيتين 3- 3 حبات	
45. LS	هل تتناولين قرص الحديد مع عصير البرتقال أو مع أي نوع من الحمضيات؟	<input type="checkbox"/> نعم <input type="checkbox"/> لا
46. LS	هل تتناولين قرص الحديد مع الحليب أو مع أي نوع من مشتقات الحليب الغنية بالكالسيوم او مع ؟	<input type="checkbox"/> نعم <input type="checkbox"/> لا
47. LS	هل تتناولين قرص الحديد مع حبوب الكالسيوم	<input type="checkbox"/> نعم <input type="checkbox"/> لا <input type="checkbox"/> لا اتناول الكالسيوم
48. LS	هل تعانيين من اشتها مواد غير غذائية خلال الحمل ( تراب ، الطين ، طلاء الاظافر ، الطباشير)	<input type="checkbox"/> نعم <input type="checkbox"/> لا
49. LS	هل توقفتي عن شرب ( مثل البيرة ، النبيذ ، الويسكي) بسبب الحمل؟	<input type="checkbox"/> نعم <input type="checkbox"/> لا <input type="checkbox"/> لا اشرب
50. LS	هل بدأت بتناول طعام صحي ومتنوع (يحتوي على العناصر الغذائية) بسبب الحمل؟	<input type="checkbox"/> نعم <input type="checkbox"/> لا
51. LS	هل قمت بتغير عاداتك الغذائية بسبب الحمل؟	<input type="checkbox"/> نعم <input type="checkbox"/> لا
52. LS	هل توقفتي عن التدخين بسبب الحمل؟	<input type="checkbox"/> نعم <input type="checkbox"/> لا ادخن
53. LS	هل نشاطك البدني تغير بعد الحمل؟	<input type="checkbox"/> نعم <input type="checkbox"/> لا
54. LS	هل نومك افضل من قبل الحمل؟	<input type="checkbox"/> نعم <input type="checkbox"/> لا
55. LS	<b>الاطعمة المتناولة حاليا</b> الآن أود أن أسألك عن الأطعمة والمشروبات التي تناولتها بالأمس خلال النهار أو في الليل ، سواء أكلت أو شربت في المنزل أو في مكان آخر. يرجى التفكير في الوجبات الخفيفة و وجبات صغيرة وكذلك وجبات رئيسية.	
	<b>الاطعمة</b>	<input type="checkbox"/> نعم <input type="checkbox"/> لا
	25. أرز ،خبز ،عصيدة ،معكرونة	
	26. اليقطين ،القرع ،الجزر او البطاطا الحلوة	
	27. البطاطا البيضاء	
	28. الفاصوليا ، البازلاء ، العدس ، الحمص	
	29. المكسرات ، الفول السوداني ، الكاجو ، بذور الشيا أو بذور الكتان؟	
	30. حليب	
	31. لبنه ،زيادي ،جبنه	
	32. لحم الكبد ،لحم كلاوي ،قلوب	

		33. اللحوم الحمراء (لحم البقر او لحم الضأن أو لحم الماعز)	
		34. اللحوم البيضاء (دجاج ،بط ،حبش)	
		35. اللحوم المصنعة (سجق ، سلامي ، أو بسطرمة)	
		36. الاسماك ، الاطعمة البحرية (التونا المعلب والسردين)	
		37. البيض	
		38. السبانخ ، البروكلي ، الخردل الاخضر ، الهندباء ، الجرجير	
		39. بادنجان ، خيار ، شمندر ، ملفوف ، كوسا ، بندورة ، فطر	
		40. المانجا ، البابايا	
		41. تفاح ، أفوكادو ، موز ، توت ، أناناس او برتقال	
		42. رقائق البطاطا ، الشيبس	
		43. دونات ، خبز مقلّي ، سمبوسك	
		44. معكرونة سريعة التحضير ، اندومي	
		45. اغذية من مطاعم الوجبات السريعة	
		46. الشوكولاتة ، الحلوى ، المعجنات ، الكعك ، البسكويت ، الأيس كريم أو المصاصات؟	
		47. المشروبات الغازية ، عصائر الفاكهة ، مشروبات الشوكولاتة ، مشروبات الطاقة؟	
		48. الشاي المحلى أم القهوة المحلاة أم المشروبات العشبية المحلاة؟	
	56. LS	هل تناولت وجبة خفيفة (عصرونة) خارج البيت بالامس ؟ <input type="checkbox"/> نعم <input type="checkbox"/> لا	

❖ الامتثال لاقراص مكملات الحديد بين النساء الحوامل يقسم الى مجموعتين :

- 1- عالية الامتثال : المرأة الحامل تأخذ اقرص مكملات الحديد يوميا بانتظام
- 2- قليلة الامتثال : المراه الحامل تأخذ اقرص الحديد اقل من ثلاثة ايام في الاسبوع

57. اذا كنت من المجموعة عالية الامتثال : ما الاسباب التي تجعلك تتناولين حبوب الحديد بانتظام يوميا ؟

.....

.....

58. اذا كنت من المجموعة قليلة الامتثال : لماذا لم تأخذي حبوب الحديد بانتظام يوميا ؟

.....

.....

في حالة موافقتك للاستمرار بالمتابعة ارجو تعبئة التالي

	رقم الهوية	59. SD
	رقم كرت المؤمن	60. SD
	رقم الهاتف	61. SD

انتهت الاستمارة...شكرا لحسن تعاونك

## Appendix 3:

### Consent Form for Pregnant Women

#### نموذج الموافقة للنساء الحوامل

#### العوامل المؤثرة في حدوث فقر الدم لدى النساء الحوامل في عيادات وكالة الغوث الصحية /الاونروا

عزيزتي المشاركة:

من ضمن متطلبات رسالة الماجستير في الصحة العامة -جامعة القدس للطالبة د. منيرة العبد، نود دعوتك للمشاركة في هذا البحث والذي يهدف إلى تحديد العوامل التي قد تؤثر في حدوث فقر الدم لدى النساء الحوامل في عيادات وكالة الغوث خلال العام 2022م. يتطلب البحث متابعة وضعك الصحي خلال فترة الحمل حتى الولادة، كما سيتم الحصول على معلومات من ملفك الشخصي لدى مراجعتك العيادة في فترة الحمل.

ستستخدم نتائج هذا البحث في تخطيط وتحسين نوعية الخدمات الصحية المقدمة للأم الحامل في عيادات الاونروا والتي ستساعد في تحسين الوضع الصحي للمرأة الحامل بشكل عام. نرجو من حضرتك الموافقة على فتح ملفك الشخصي واستخدام البيانات المسجلة بداخله. وايضا الموافقة على المشاركة وذلك بإتمام المقابلة والتي تتضمن إجابتك الدقيقة على الاسئلة المطروحة من قبل الباحثة أو احد مساعداتها.

نضمن لحضرتك السرية التامة في المعلومات التي ستقدمينها للبحث ولك الحرية التامة في عدم ذكر اسمك أو عدم الإجابة عن أي سؤال يطرح عليك ولك كامل الحرية في الانسحاب متى شئت من الدراسة وإنهاء المقابلة والمغادرة في أي وقت، دون أي التزام.

وبناء عليه أوافق على المشاركة في هذه الدراسة.

الاسم الرباعي: \_\_\_\_\_

توقيع المشاركة: \_\_\_\_\_

تاريخ الموافقة: \_\_\_\_\_

شكرا جزيلاً للمشاركة الكريمة

الباحثة: منيرة العبد

## Appendix 4

### Approval from Al Quds University Research Ethical Committee

**Al-Quds University**  
Jerusalem  
School of Public Health



**جامعة القدس**  
القدس  
كلية الصحة العامة

التاريخ: 2022/1/24

عزيزتي الطالبة منيرة العبد المحترمة  
برنامج: الصحة العامة/مستاد علم الأوبئة

الموضوع: موافقة لجنة أخلاقيات البحث العلمي

قامت اللجنة الفرعية لأخلاقيات البحث التابعة لكلية الصحة العامة بمراجعة مشروع الرسالة

بعنوان:

**\* Determinants of anemia among pregnant women attending the UNRWA Health care clinics in Jerusalem: a follow-up study"**

المقدم من (مشرف الرسالة/ د. نهى الشريف)،  
يعتبر مشروعك مستوفياً لمتطلبات أخلاقيات البحث في جامعة القدس.  
للمنى لكم كل التوفيق في تسيير المشروع.

رئيسة لجنة الأخلاقيات البحث



د. أسماء الإمام  
نسخة/ أعضاء لجنة البحث  
نسخة/ الملف

Jerusalem Branch/Telephone 09, 9988777

## Appendix 5

### Approval from the UNRWA

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ



جامعة القدس  
القدس  
كلية الصحة العامة

التاريخ: 2022/3/6

حضرة الدكتورة اشراق أبو فارة المحترمة  
مديرة اهلءاء منطفة القدس في وكالة العوث الدولية

الموضوع: تسهول مهمة الطالبة منيرة العبد

تحية طيبة وبعد..

تقوم الطالبة منيرة العبد ، برناج الصحة العامة / كلية الصحة العامة/ جامعة القدس بإعداد بعث رسالة ماجستير في عيادات منطفة القدس التابعة لوكالة العوث الدولية. بالتراف الدكورة نهى الشريف وللاستفسار على الإيميل [nsharif@staff.alquds.edu](mailto:nsharif@staff.alquds.edu)

بعنوان:

**Determinants of anemia among pregnant women attending the UNRWA healthcare clinics in Jerusalem: a follow-up study**

حيث يهنا بعث إلى تحديد العوامل التي قد تؤثر في حدوث فقر الدم لدى النساء الحوامل في عيادات وكالة العوث خلال العام 2022م. يتطلب البعث توزيع استبيان على النساء الحوامل و متابعة وضعهن الصحي خلال فترة الحمل حتى الولادة، كما سيتم الحصول على المعلومات اللازمة من الملف الشخصي للسيدة الحامل . نرجو من حضرتكم الموافقة وتسهول مهمة الطالبة للحصول على المعلومات لإتجاز هذه المرحلة من البعث ، علما بأن المعلومات ستكون سرية وإغراض البعث العلمي فقط.

شكرين لكم حسن تعاونكم ..

  
د. حازم العا  
عميد كلية الصحة العامة

لمسحة: الملف

Jerusalem  
P.O.Box 51000  
Telephone +970 9 7700000

رقم القدس / القدس 02-2199234

## Appendix 6

### Previous Pregnancies Analysis

		anemia at 24 weeks of pregnancy				P- value
		No Anemia		Anemia		
		Count	N %	Count	N %	
<b>Numbers of pregnancies of live babies</b>	No live babies	12	5.4%	3	3.0%	.561
	1-2 live babies	140	63.1%	61	61.6%	
	>=3 live babies	70	31.5%	35	35.4%	
<b>Numbers of abortions</b>	No Abortion	132	59.5%	61	61.6%	.825
	1-2 Abortions	83	37.4%	34	34.3%	
	>=3 Abortions	7	3.2%	4	4.0%	
<b>History of antenatal bleeding</b>	Yes	19	8.6%	8	8.1%	.635
	No	191	86.0%	88	88.9%	
	Never been pregnant	12	5.4%	3	3.0%	
<b>History of PPH</b>	Yes	14	6.3%	4	4.0%	.445
	No	196	88.3%	92	92.9%	
	Never been pregnant	12	5.4%	3	3.0%	
<b>History of preterm labour</b>	Yes	12	5.4%	7	7.1%	.562
	No	198	89.2%	89	89.9%	
	Never been pregnant	12	5.4%	3	3.0%	
<b>History of Stillbirth</b>	Yes	8	3.6%	6	6.1%	.412 <sup>a</sup>
	No	202	91.0%	90	90.9%	
	Never been pregnant	12	5.4%	3	3.0%	
<b>History of LBW baby</b>	Yes	19	8.6%	10	10.1%	.603
	No	191	86.0%	86	86.9%	
	Never been pregnant	12	5.4%	3	3.0%	
<b>History of baby abnormality</b>	Yes	5	2.3%	6	6.1%	.154 <sup>a</sup>
	No	205	92.3%	90	90.9%	
	Never been pregnant	12	5.4%	3	3.0%	

<b>History of iron intake in past pregnancies</b>	Yes	205	92.3%	95	96.0%	.226 <sup>a</sup>
	No	17	7.7%	4	4.0%	
	Never been pregnant	0	0.0%	0	0.0%	
<b>History of folic acid intake in past pregnancies</b>	Yes	215	96.8%	95	96.0%	.687 <sup>a</sup>
	No	7	3.2%	4	4.0%	
	Never been pregnant	0	0.0%	0	0.0%	
<b>Breastfeeding</b>	Yes	201	90.5%	90	90.9%	.492 <sup>a</sup>
	No	9	4.1%	6	6.1%	
	No breastfeeding history	12	5.4%	3	3.0%	
<b>Breastfeeding duration in the last pregnancy</b>	Three months or less	30	13.5%	15	15.2%	.952
	Six months or less	43	19.4%	16	16.2%	
	Seven months - one year	55	24.8%	27	27.3%	
	one to two years	73	32.9%	32	32.3%	
	No breastfeeding history	21	9.5%	9	9.1%	
<b>Number of children under five</b>	No children <5year	50	22.5%	25	25.3%	.736
	one child <5year	127	57.2%	52	52.5%	
	>=2 children <5year	45	20.3%	22	22.2%	
<b>Pregnancy interval between current and last pregnancy</b>	1st pregnancy	0	0.0%	0	0.0%	.773 <sup>a</sup>
	<=2 years	133	59.9%	61	61.6%	
	>2 years	89	40.1%	38	38.4%	
<b>using family planning methods between the current and last pregnancy</b>	Yes	127	57.2%	63	63.6%	.279
	No	95	42.8%	36	36.4%	
<b>Family planning methods (pills, injection, IUD)</b>	Yes	53	23.9%	25	25.3%	.790 <sup>a</sup>
	No	169	76.1%	74	74.7%	
	Yes	77	34.7%	40	40.4%	.325 <sup>a</sup>

<b>Family planning methods (condom, natural methods)</b>	No	145	65.3%	59	59.6%	
<b>Type of delivery</b>	NVD	164	73.9%	72	72.7%	.541
	C.S	46	20.7%	24	24.2%	
	Never been pregnant	12	5.4%	3	3.0%	