جـــامـعـــة الـــشـرق الأوسـط
MIDDLE EAST UNIVERSITY
Amman - Jordan

Effects of Herbal Medicine and Nutraceuticals among Pregnant Women: A Cross-Sectional Study in Iraq

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A Thesis Submitted In Partial Fulfillment Of The Requirements For The Master's Degree In Pharmaceutical Sciences

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جـــامـعـــة الـــشـرق الأوسـط
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الآثار المحتملة للأدوية العشبية والمكملات الغذائية بين النساء الحوامل: دراسة مقطعية في العراق

إعداد

مبين عبد الخالق عبد الله اللهبي

إشراف

الأستاذ الدكتورة ريم عدنان عيسى

قُدمت هذه الرسالة استكمالاً لمتطلبات الحصول على درجة الماجستير في العلوم الصيدلانية

قسم العلوم الصيدلانية

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Thesis Committee Decision

This thesis, titled "**Effects of Herbal Medicine and Nutraceuticals among Pregnant Women: A Cross-Sectional Study in Iraq**" By Researcher **Mubeen Abdulkhaliq Abdullah Al-Lahbi** was defended and approved on:24-12-2025

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Dedication

To the source of love and tenderness, to the heart that overflows with giving, the one who taught me since childhood that *"knowledge is light and ignorance is darkness,"* and who set the greatest examples of patience… my beloved mother.

To my support and strength, who planted ambition and passion within me, and sacrificed everything precious for our sake… my dear father.

To those who surrounded me with love and support throughout my years of study, my beloved brothers.

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May Allah protect you all and grant you happiness. I ask Him, the Almighty, to grant me success in repaying at least a part of your kindness and generosity toward me.

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Praise be to Allah, who granted me help and success in completing this thesis—abundant praise until praise reaches its utmost limit.

Mubeen Al-Lahbi

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List of Abbreviations

Abbreviation	Meaning
OR	Odds Ratio
CI	Confidence Interval
RBC	Red Blood Cells
WBC	White Blood Cells
DNA	Deoxyribonucleic Acid
DHA	Docosahexaenoic Acid
EPA	Eicosapentaenoic Acid
UTI	Urinary Tract Infection
CAM	Complementary Alternative Medicine

Effect of Herbal Medicine and Phytopharmaceuticals among Pregnant Women: A cross-sectional Study in Iraq

Prepared by

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Abstract

Background: The practice of consumption of herbal medicine and nutraceutical supplements during pregnancy periods has increased over the years due to various reasons.

Aim and scope of the study: This study aimed to estimate the prevalence of the use of herbal medicine and nutraceuticals during pregnancy among Iraqi women and to determine the demographic and socioeconomic variables that relate to this practice. **Methods:** A cross-sectional study was conducted among 411 pregnant women attending the Al-Batool Teaching Hospital in Diyala, Iraq. Data were collected through a questionnaire that focused on the consumption of herbal and nutraceutical products and the sources of information about these products. Descriptive statistics and inferential analyses were used to examine potential associations between consumption and other demographic and socioeconomic variables, with the significance level for the alternative hypothesis set at $p = 0.05$.

Results: The prevalence of nutraceutical consumption (96.1%) was higher than that of herbal medicine (26.52%) among pregnant women. Folic acid (65.9%) and calcium (17.9%) were the most commonly consumed products, while cinnamon was the consumed herb. Most patients reported starting to consume these products and herbs during the first trimester of their pregnancy. Young adults (20-30 years), primigravidas, women with moderate education, urban residents, and housewives showed a higher prevalence of consumption. Physicians and relatives were the primary source of information regarding the consumption of these products and herbs. The type of ingestion did not significantly affect WBC or platelet count. All groups had low abnormal findings (e.g., platelet count remained nearly 100% normal), with p-values above the acceptance

level (e.g., $p = 0.121$ for WBC and $p = 0.41$ for platelet count). During pregnancy, folic acid consumption is high but varies between the first and third trimesters ($\chi^2 = 60.9$; $p < 0.001$). Calcium levels increase across the trimester ($p < 0.001$), whereas magnesium levels are significantly related ($p = 0.03$). 15 women used a few herbs in the first trimester, but they increased in the second and third trimesters, with statistically significant differences for some types. Cardamom, cloves, castor oil, ginger, and cumin consumption significantly differed (high chi-square values and p-values close to 0.001).

Conclusions: This study emphasizes the importance of early education on proper intake of herbal products during pregnancy. Health educational programs should be conducted on specific groups of the community.

Keywords: Pregnancy; herbal medicine; nutraceutical supplements; Iraq; maternal health.

الآثار المحتملة للأدوية العشبية والمكملات الغذائية بين النساء الحوامل: دراسة مقطعية في العراق

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الملخّص

خلفية الدراسة: شهد استخدام الأدوية العشبية والمكملات الغذائية خلال فترة الحمل ازديادًا ملحوظًا في السنوات الأخيرة، نتيجةً لتعدد العوامل الصحية والاجتماعية والثقافية التي تسهم في تبنّي هذه الممارسات.

الهدف من الدراسة: هدفت هذه الدراسة إلى تقدير معدل انتشار استخدام الأدوية العشبية والمكملات الغذائية بين النساء الحوامل في العراق، إضافة إلى تحليل المتغيرات الديموغرافية والاجتماعية والاقتصادية المرتبطة بهذه الظاهرة.

المنهجية: استُخدم المنهج الوصفي التحليلي من خلال دراسة مقطعية شملت 411 امرأة حامل يراجعن مستشفى البتول التعليمي في محافظة ديالى، العراق. جُمعت البيانات باستخدام استبيان مُنظّم تناول أنماط استهلاك الأدوية العشبية والمكملات الغذائية ومصادر المعلومات المتعلقة بها. كما تم توظيف الإحصاءات الوصفية والتحليلات الاستدلالية للكشف عن العلاقات المحتملة بين الاستهلاك والمتغيرات الديموغرافية والاجتماعية والاقتصادية، مع اعتماد مستوى دلالة إحصائية قدره.($p = 0.05$)

النتائج: أظهرت النتائج أن معدل انتشار استخدام المكملات الغذائية بين النساء الحوامل بلغ (96.1%)، متجاوزًا معدل استخدام الأدوية العشبية الذي بلغ (26.52%). وجاء حمض الفوليك في مقدمة المكملات الأكثر استخدامًا بنسبة (65.9%)، يليه الكالسيوم بنسبة (17.9%)، في حين كانت القرفة العشبة الأكثر شيوعًا. وأفادت غالبية المشاركات ببدء استخدام هذه المنتجات خلال الثلث الأول من الحمل. كما سُجّل معدل استخدام أعلى بين النساء في الفئة العمرية (20–30 عامًا)، والحوامل لأول مرة، والنساء ذوات المستوى التعليمي المتوسط، وسكان المناطق الحضرية، وربات البيوت. وكان الأطباء والأقارب المصدرين

الرئيسيين للمعلومات المتعلقة باستخدام الأدوية العشبية والمكملات الغذائية أثناء الحمل. لم تُظهر النتائج وجود تأثير معنوي لطريقة الاستهلاك على عدد خلايا الدم البيضاء أو الصفائح الدموية، حيث جاءت القيم المخبرية ضمن الحدود الطبيعية في معظم الحالات، مع تسجيل قيم احتمالية أعلى من مستوى الدلالة الإحصائية المعتمد ($p = 0.121$) لخلايا الدم البيضاء و $p = 0.41$للصفائح الدموية .(كما بيّنت النتائج وجود فروق ذات دلالة إحصائية في استهلاك حمض الفوليك بين مراحل الحمل، ولا سيما بين الثلثين الأول والثالث($\chi^2 = 60.9$) ؛ .($p < 0.001$ وسُجِّل ارتفاع معنوي في مستويات الكالسيوم خلال الثلث الأول من الحمل($p < 0.001$) ، إضافةً إلى وجود ارتباط معنوي بمستويات المغنيسيوم .($p = 0.03$) وفيما يتعلق باستخدام الأعشاب، أفادت خمس عشرة مشاركة باستخدام بعض الأعشاب خلال الثلث الأول من الحمل، مع ازدياد الاستهلاك خلال الثلثين الثاني والثالث، وظهور فروق ذات دلالة إحصائية لبعض الأنواع. كما اختلف استهلاك الهيل والقرنفل وزيت الخروع والزنجبيل والكمون اختلافًا ذا دلالة إحصائية، حيث سُجّلت قيم مرتفعة لاختبار مربع كاي، وقيم احتمالية منخفضة قريبة من.($p = 0.001$)

الاستنتاجات: تؤكد نتائج هذه الدراسة على ضرورة تعزيز التثقيف الصحي المبكر والمستند إلى أسس علمية حول الاستخدام الآمن للأدوية العشبية والمكملات الغذائية أثناء الحمل، مع أهمية تصميم وتنفيذ برامج توعوية موجّهة تسهم في تحسين صحة الأم والجنين والحد من الممارسات غير الآمنة.

الكلمات المفتاحية: الحمل؛ الأدوية العشبية؛ المكملات الغذائية؛ العراق؛ صحة الأم.

Chapter One
Background and Problem Statement

1.1 Introduction

The World Health Organization (WHO) defines traditional medicine (TM) as health methods, techniques, knowledge, and values that include medicinal products, animals, minerals, religious therapies, manual activities, and exercises used for disease management, prevention, and well-being (WHO, 2001).

The WHO estimates that the traditional and complementary form of medicine makes up 80% of the world's healthcare (WHO, 2023), and 40% among Asian countries such as China (Adane et al., 2020). On the other hand, the continent of Africa records the practice of traditional medicine at a rate of 80%, which caters to the health requirements of the populace (WHO, 2022).

As one of the traditional forms of medicines, herbal medicines and phytotherapy have experienced a revival within modern medicine with the revival of the passion toward herbal medicine and alternative forms of medicine (Beicovrtch, 1987; Moreira et al., 2014; Paupério et al., 2014). The low cost, natural origin, low toxicity, and proven efficiency of herbal drugs in the treatment of certain diseases may explain their widespread acceptance (Kadhim et al., 2023).

Herbal medicine consumption behavior is a significant concern for health authorities worldwide (Noor et al., 2021), as the majority of herbal medicines on the market have not undergone approval procedures to prove their safety and efficacy.

1.2 The global perspective of use of herbal medicine and nutraceuticals during pregnancy

The rate of herbal medicine consumption during pregnancies differs greatly according to geographic location, ethnic and cultural characteristics, and socio-economic status (Illamola et al., 2020). The available systematic review data revealed that 32.4% of women use herbal medicines during pregnancy worldwide (Heydarpour et al., 2022). Kadhim et al. (2023) study indicated that 64.8% of Iraqi women, and Adane et al. (2020) indicating that 47.77% in Ethiopian women accessing prenatal care reported using herbal medicines.

Pregnant women use herbal medicines because of their wide availability, possibly better effectiveness relative to modern medicine, and traditional and cultural beliefs in herbal medicines to cure diseases (Fakeye et al., 2009; Gardiner et al., 2007). Among these treatments are Ginger (Zingiber officinale), garlic (Allium sativum), green tea (Camellia sinensis), peppermint (Mentha piperita), and fenugreek (Trigonella foenum graecum) are among the most widely consumed herbal products worldwide by pregnant mothers (Ernst, 2002).

Nordeng and Havnen (2004) reported that 39% of pregnant women use herbal medicines that may be harmful to them or have insufficient information about their safety. (Kennedy et al., 2016) classified the safety of the most used herbal medicines during pregnancy in American, Australian, and European populations. Herbal medicines used in Asia differ from those used in Western countries due to cultural and traditional differences (Al-Ramahi et al., 2013). Although several studies conducted in Asian countries have reported the use of herbal medicines during pregnancy (Amasha & Jarrah, 2012; Rahman et al., 2009), no attempt has been made to classify the safety of herbal medicines used during pregnancy.

Despite the increasing use of herbal medicines by pregnant mothers, most of them are still unaware of the potential side effects of these treatments (Dugoua, 2010; Mothupi, 2014). The use of Herbal products may cause serious congenital disabilities, react with prescribed drugs, and create unforeseen side effects during the time of conception or delivery (Jahan et al., 2022).

The risk factors associated with the use of herbal medicines may vary among pregnant women and the type of herbal medicines they use, depending on the region (Adane et al., 2020). Therefore, rigorous scientific and clinical validation of a therapeutic product's safety and efficacy is essential for it to be accepted as a reliable alternative to modern medicine.

1.3 Study Problem

The wide consumption of herbal medications and nutraceuticals during pregnancy period, despite the insufficient knowledge about their benefits and safety, is considered as a critical health issue. These products could potentially cause an undesired and harmful effects on pregnant women health and may possibly be the cause of various adverse reactions and side effects during the period of pregnancy.

Therefore, to our knowledge, the current study is the first to identify the pattern and prevalence of commonly used herbal medicines and nutraceuticals during pregnancy period among the Iraqi women.

1.4 Study Questions

1. What is the prevalence and pattern of use of herbal medicine and nutraceuticals during pregnancy period among Iraqi women?
1. Is the use of herbal medicine and nutraceuticals by Iraqi women rational and based on scientific evidence?
2. Does the use of herbal medicine and nutraceuticals have an impact on the health status of the pregnant woman during pregnancy period?
3. Is there any statistically significant association between the use of herbal medicines and nutraceuticals during pregnancy period with the study variables (demographic, socioeconomic, and blood tests results)?

1.5 Study Objectives

1. Determination of the prevalence, types and frequency of use of medications, herbal medicines and nutraceutical during pregnancy period by Iraqi pregnant women.
2. Determination of the reasons for using herbal medicine during pregnancy period.
3. Identification of the source of recommendations and information on the use of nutraceuticals and herbal medicine during pregnancy period.
4. Understanding the perceptions of participants on the benefits of using nutraceuticals and herbal medicine during pregnancy period.
5. Association of the side effects as reported by participants to the use of herbal medicines during pregnancy period.
6. Association between demographic, residential area, and occupational variables and the type of nutraceutical, or herbal medicines used during pregnancy period.
7. Investigating the impact of using herbal medicines and nutraceuticals on the blood laboratory tests results among the participants.
8. Investigating the pattern of use of herbal medicines and nutraceuticals during each pregnancy trimester.

1.6 Study Importance

To the best of the researchers' knowledge, this study stands the first of its kind that endeavors to identify the determinants of the use of herbal medications and nutraceuticals products by pregnant Iraqi women.

The current study was designed to get insights into the demographic and socioeconomic variables, and the pattern of use of herbal medications and nutraceuticals during each pregnancy trimester, as well as the blood laboratory tests results of the participants. These variables were assessed in relation to the consumption pattern of herbal medicine and nutraceuticals in relation to the available literature.

These findings can enhance our understanding of the status of the study population and spots the light on critical misuses of these products during pregnancy trimesters. Additionally, investigations of the causes and reasons behind the incorrect consumptions of these products, will pave the way for decision makers to improve the health care services provided to pregnant women, based on cultural and behaviors background of the Iraqi women society and family perceptions.

Therefore, the presented findings are valuable if attempted were made to implement new health care guidelines, enhance awareness, and improve the pattern of use of herbal medications and nutraceuticals products by health care providers.

1.7 Study Scope

Geographical Scope

This research was performed in Iraqi hospitals and specifically at Al-Batoul Hospital Teaching Hospital based in Baquba, Diyala Province, Iraq, which works under the Iraqi Ministry of Health. The hospital comprises an obstetrics and gynecological department that deals with a considerable number of pregnancies and births.

Time Scope

The first half of 2025 was used for data collection and reporting.

Subject Scope

The study included pregnant women in Iraq during the period of January- July 2025.

Topical Scope

The prevalence of pregnant women's use of herbal and nutraceutical products during pregnancy, their sources of information about the benefits of use of herbal and nutraceutical products, reasons for use, in association with demographic data and biochemical blood test results were studied.

1.8 Theoretical and Practical Definitions for Study Variables

1. **Nutraceuticals**

- **Theoretical Definition:** These are foods, or portions of foods, that help prevent and treat various ailments, in addition to a supplemented diet. Dr. Stephen De Felice developed the word “nutraceutical,” combining the concepts “nutrition” and “pharmaceutical” in 1989 (Rama Rao & Anand, 2024).

- **Practical Definition:** The supplements that pregnant women consumed during pregnancy trimesters: the first, second, and third trimesters.

2. **Herbal Medicine:**

- **Theoretical Definition:** Herbs, herbal components, herbal supplements, and final herbal goods that comprise plant materials as active substances (WHO, 2000)).

- **Practical Definition:** Herbal medicines that pregnant women have used frequently during their pregnancies to maintain their health or to manage non-life-threatening health problems.

Chapter Two
Theoretical Framework and Previous Studies

2.1 Introduction

Pharmaceutical supplementations, known as dietary or nutritional supplements, are products intended to supplement the diet by providing a concentrated source of nutrients or other beneficial compounds. They come in forms like tablets, capsules, powders, or liquids and are used to address nutrient deficiencies or enhance health. Examples include vitamins, minerals, herbs, amino acids, and botanicals (Hutt, 2005).

In many countries, these products are classified as foods, not drugs. This means they do not have to undergo the same rigorous testing for efficacy and safety as pharmaceuticals and cannot make claims to treat, diagnose, cure, or prevent disease. They are often sold over the counter in pharmacies, grocery stores, and health food stores (Brody, 2016).

2.2 Types of pharmaceuticals supplementations

Different types of pharmaceutical supplementations have been explained based on different conditions as follows:

1. **Nutrients:** Natural plant-based compounds can be used to treat several conditions, including low haemoglobin levels and osteoporosis (Eisenreich & Schafer, 2023). It includes a range of vitamins, fatty acids, and amino acids represent key metabolites having specific roles in diverse metabolic pathways. Plant and animal products, along with vitamins, offer several health benefits and support the treatment of disorders affecting the heart, kidneys, lungs, and other organs (Rama Rao & Anand, 2024).

The most popular nutrient is Salmon oil is rich in omega-3 polyunsaturated fatty acids, which are advantageous for cognitive function, the inflammatory response, and arterial cholesterol levels (Utri-Khodadady & Glabska, 2024).

2. **Herbals:** Nutrients and medicinal herbs are efficiently included to reduce the risk of numerous chronic diseases and enhance individuals' quality of life (Rama Rao & Anand, 2024). Clinical investigations indicate that salicin, present in the bark of the black willow (Salix nigra), possesses anti-inflammatory, analgesic,

antipyretic, astringent, and anti-arthritis activities (Khokale & B Borse, 2024). Parsley (*Petroselinum crispum*) possesses a flavonoid known as psoralen, which exhibits antipyretic, diuretic, and carminative characteristics (Ahmed et al., 2025).

3. **Phytochemicals:** Their classification is predominantly based on phytochemicals. Carotenoids, also known as isoprenoids, are found in vegetables and are known to boost the immune system, especially the activity of killer cells that help protect against cancer (El-Nakhel et al., 2021).

Flavonoids are a type of secondary metabolite found in most plants, with more than 4,000 different types identified, and these compounds have been shown to help prevent various diseases, including diabetes, kidney disease, cancer, and heart disease, due to their bioactive properties and antioxidant effects(Ahmed et al., 2025). Phenolic acids, the predominant category of secondary metabolites, are primarily located in citrus fruits and have antioxidant properties that counteract free radicals produced by many metabolic processes, including protein, carbohydrate, and lipid metabolism (Ebrahimi et al., 2024).

4. **Probiotic microorganisms:** Metchnikoff was the first person to administer probiotics. Owing to their property that makes the intestines favorable for functions like absorption and metabolism, their application has increased immensely in modern medicine (Maftei et al., 2024).

Probiotics like *Bacillus bulgaricus* are a remarkable example and have the capacity to remove the harmful bacteria present in the intestines as well as preserve the favorable conditions (Rama Rao & Anand, 2024). Probiotics are highly helpful in the treatment of lactose intolerance because they contain enzymes like beta-galactosidase that split lactose into its component sugars (Oak & Jha, 2019).

2.3 Review on case reports of complications among pregnant women associated with their use of pharmaceutical supplementations during pregnancy trimesters (2020–2024)

The purpose of this narrative review is to synthesize case reports between 2020 and 2024 and present complications associated with the misuse of pharmaceutical supplement products during the prenatal period. These case reports focus on vitamins, minerals, and herbal dietary supplements consumed at pharmacologic or supratherapeutic doses. Several case reports have described complications associated with supplement use during pregnancy.

1. High-dose vitamin D in late pregnancy and severe neonatal hypercalcemia

(Karacan Küçükali et al., 2021) reported a female patient who had been given extremely high doses of vitamin D during the third trimester on a presumptive diagnosis of vitamin D deficiency. Her neonate developed severe manifestations of hypercalcemia, hypoxic-ischemic encephalopathy, thrombocytosis, and increased troponin I levels, which required critical care. This case highlights the importance of avoiding overt changes in vitamin D levels during late gestation, administering vitamin D supplementation at evidence-based doses, and maintaining close biochemical surveillance.

2. Vitamin D macro-dosing and hypervitaminosis D with perinatal toxicity

(Lanzi et al., 2023) discussed the case of a pregnant woman following a nonconventional Coimbra protocol, self-administering very high doses of vitamin D during the entire gestation. The patient suffered from hypervitaminosis D and toxicity due to vitamin D, and the newborn also developed problems due to high vitamin D and high blood calcium levels. The case further shows that the so-called therapeutic protocols of megadose vitamin D administration could potentially act adversely during a pregnancy.

3. Calcium-alkali syndrome from calcium carbonate antacids in early twin gestation

In a case reported by (Beamish et al., 2024), a 28-year-old patient, at 13-14 weeks' gestation and with a dichorionic-diamniotic twin pregnancy, took massive doses of over-the-counter calcium carbonate antacid medications. Consequently, the patient suffered severe bouts of hypercalcemia, metabolic alkalosis, and acute tubular necrosis, due to calcium-alkali syndrome, and required dialysis. After the patient stopped the antacid, the blood calcium levels and the renal failure reversed, and the patient went on to have a successful pregnancy. This case brings into focus how common antacid medications and/or vitamin D supplementation can sometimes induce catastrophic diseases such as calcium-alkali syndrome during pregnancy.

4. Calcium-alkali syndrome following calcium-carbonate overdose during pregnancy

A case report published by ("Calcium-carbonate," 2023) involved a pregnant woman who overdosed on calcium carbonate, used to treat gastroesophageal reflux and vomiting.

The patient developed calcium-alkali syndrome, which is associated with hypercalcemia, and responded to withholding the supplement. This pharmacovigilance case highlights the importance of distinguishing between safe and excessive antacid use, which can occur when patients are not provided with instructions on maximum dosing.

5. Iron overdose and secondary hemochromatosis during pregnancy and postpartum

In a case presentation by (Shishii et al., 2024), it is evident that a woman took high doses of iron tablets over a long time, leading to high levels of ferritin and deposits in the liver associated with secondary hemochromatosis during late gestation and post-delivery. The use of high-dose iron, generally prescribed to prevent anemia, clearly highlights, through the above case, the importance of individualized iron supplementation based on blood indices.

6. Fatal herbal preparation use in pregnancy for abortive purposes

According to (Ossei et al., 2020), a case study involving a pregnant teenager who took a considerable amount of crude herbal medicine to trigger an abortion is on record. Autopsy findings indicated an excessive amount of herbal medicine present in the stomach and trachea, besides gastric erosion, intravascular coagulation, and hemorrhage in various organs. The case suggests unregulated herbal medicine, which is often considered safe and natural, leading to catastrophic complications when used during pregnancy alongside conventional drugs.

2.4 Herbal Medicine Use during Pregnancy: Benefits, and Side Effects

Indigenous herbal medicine (IHM), a subset of traditional medicine (TM), is the practice of using locally available herbs to treat ailments and maintain general well-being (WHO, 2019). These herbal medicines include herbs, herbal materials, herbal preparations, and herbal products that contain plant parts like seeds, leaves, stems, flowers, and roots (Ahmad Khan & Ahmad, 2019).

The use of herbal medicine products has reached levels of up to 60% prevalence within the developed nations (Hwang et al., 2016) It was found that the rate of use of herbal medicine during pregnancies varies regionally according to geographical location, ethnic group identity, levels of education, and socioeconomic conditions (El Hajj & Holst,

2020). It was found that the use of herbal medicines is extensively used during pregnancies, because they are natural medicines, assumed that it contains lesser dangers than the traditional medicines prescribed by the physicians (Illamola et al., 2020).

Of the mostly widely reported herbal medicines being used during pregnancy are ginger, cranberry, raspberry leaves, chamomile, peppermint, thyme, green tea, sage, anise, garlic, fenugreek and aloe vera products (Ernst, 2002; Laelago, 2019). The following is a review of these herbs, their benefits, and side effects.

2.4.1 Ginger (Zingiber officinale)

Ginger is commonly used as an anti-nauseant and anti-emetic to alleviate nausea, including in cases of hyperemesis gravidarum, and it is an effective herbal remedy for vomiting during pregnancy (Tiani et al., 2024). The recommended daily dose of ginger is up to 1-3 grams of dried powder.

2.4.1.1 Side Effects of Ginger supplements

High doses, specifically those exceeding 1000 mg per day, could act as a potential abortifacient (Shawahna & Taha, 2017). Additionally, consuming high amounts of ginger may lead to blood thinning, stomach discomfort, and heartburn (Martins et al., 2025).

2.4.2 Chamomile (Matricaria recutita)

The word “chamomile” comes from two Greek words, Chemos and Melos, meaning “ground apple” for its apple-like smell (Bansal et al., 2010). There are many varieties of Chamomile, and an array of names, such as Babuna camomile, German chamomile, Roman chamomile, English chamomile, Hungarian chamomile, Single chamomile, Camomilla, Flos chamomile, pinheads, sweet false chamomile, and scented mayweed.

Chamomile is found worldwide and is a well-documented plant (National Library of Medicine, 2021). Cha momile (Matricaria chamomilla L.), a member of the family Asteraceae (formerly Compositae), is an essential medicinal herb native to Europe and Asia (Šalamon, 2004).

2.4.2.1 Benefits of chamomile use

There are two main types of chamomile widely used in treating health conditions: German chamomile (M. chamomilla L.) and Roman or English chamomile

(Chamaemelum nobile syn. Anthemis nobilis L.) (Singh et al., 2011). M. chamomilla L. has more biological effects than the other two types (Mohammad, 2011). In Europe, it is considered a "whole-food remedy," and in Germany, it is referred to as "alleszutraut," meaning it can do anything. Chamomile is generally safe for consumption and is used as a tea or tonic. It is an ingredient in many traditional, Greek, and homeopathic medicinal preparations (Shareef et al., 2016).

As a medicine, chamomile is beneficial for flatulence, colic, hysteria, intermittent fever, depression, ulcers, wound healing, and other ailments. In 2000, the U.S. Food and Drug Administration (FDA) approved chamomile as an active ingredient in over-the-counter dietary supplements, and German chamomile is classified as Generally Recognized As Safe (GRAS) for use in food products (Sah et al., 2022). Chamomile has a role in pregnancy nausea and vomiting, pain and anxiety during childbirth, quality of sleep for pregnant women, labor contractions, and postpartum bleeding (Abedian & Ameri, 2024).

2.4.2.2 Side effects of chamomile use

Chamomile may cause increased blood flow, contractions, miscarriage or premature labor. It can also cause allergic reactions (Ferguson & Gordon, 2025).

2.4.3 Cranberry (Vaccinium macrocarpon)

Cranberry (Vaccinium macrocarpon A.), also known as American Cranberry, is a fruit native to North America, and has been used traditionally against urinary tract infections (UTIs) (Blumenthal, 2003). It is included in the United States Pharmacopeia as Cranberry Liquid Preparation (United States Pharmacopeial Convention, 2013) and is usually administered as cranberry juice cocktail or as capsules.

Cranberry is one of the most commonly used herbs during pregnancy, several studies reported high prevalence rates (over 5%) for its use (Holst et al., 2009; Nordeng et al., 2011).

2.4.3.1 Benefits of cranberry supplements

Cranberries are well-known for their role in preventing UTIs during pregnancy, whose preventive mechanism involves inhibiting the adhesion of uropathogenic bacteria to the urinary tract epithelium, facilitated by phenolic compounds and A-type proanthocyanidins (PACs) (Hakim et al., 2025).

It is believed that cranberry to cause the inhibition of type 1 and type P fimbriae of Escherichia coli bacteria, which are responsible for the pathogenesis of cystitis and pyelonephritis, respectively (Liu et al., 2019). This mechanism of action assumes particular importance since E. coli is responsible for 82.5% of pyelonephritis cases in pregnant women (Wing et al., 2014). Besides inhibiting adhesion, cranberry components significantly reduced beta-lactamase and other virulence gene expression in vitro, which is interesting as high levels of extended-spectrum beta-lactamases are the primary reason for E. coli resistance (Cai et al., 2014; Samarasinghe et al., 2019).

The use of cranberry was observed to decrease the associated risk for stillbirth/neonatal death, low birth weight, small for gestational age, preterm birth, low Apgar score (<7), neonatal infections or maternal vaginal bleeding in early pregnancy (Heitmann et al., 2013).

2.4.3.2 Side effects of cranberry supplements

An association was found between use of cranberry in late pregnancy and vaginal bleeding after week 17 (Heitmann et al., 2013).

The following table summarizes some herbs taken during pregnancy, along with their benefits and drawbacks for pregnant women.

Table No (2.1): Herbal Supplements in Pregnancy: Scientific Names, Benefits, Risks

Common Name	Scientific Name (Full Taxonomy)	Benefits	Risks	References
Cardamom	Elettaria cardamomum (L.) Maton – Family: Zingiberaceae	May aid digestion and reduce nausea due to antioxidant and gastroprotective properties.	High intake may stimulate the uterus; limited pregnancy safety data.	(Ashokkumar et al., 2020)
Dates	Phoenix dactylifera L. – Family: Arecaceae	May promote cervical ripening and shorten labor duration.	May elevate blood glucose in women with gestational diabetes.	(Al-Kuran et al., 2011)
Castor Oil	Ricinus communnis L. –	Used traditionally to stimulate bowel	May cause dehydration, uterine hyperstimulation	(Boel et al., 2009)

Common Name	Scientific Name (Full Taxonomy)	Benefits	Risks	References
	Family: Euphorbiaceae	motility and induce labor.	and fetal distress; not recommended.	
Mint	Mentha × piperita L. / Mentha spicata L. – Family: Lamiaceae	May relieve nausea and digestive discomfort when used moderately.	Concentrated oils may cause uterine effects; high doses may worsen reflux.	(Tiran, 2003)
Cumin	Cuminum cyminum L. – Family: Apiaceae	Antioxidant and digestive benefits; may reduce bloating.	High doses may lower blood sugar or stimulate the uterus.	(Singh et al., 2021)
Fenugreek	Trigonella foenum-graecum L. – Family: Fabaceae	Supports lactation postpartum due to phytoestrogens.	Unsafe in pregnancy due to uterine contractions and possible anomalies.	(Ulbricht et al., 2008)
Spirulina	Arthrospira platensis (Gomont) – Family: Microcoleaceae	Nutrient-rich algae providing iron, protein, and B vitamins.	Risk of contamination with heavy metals; insufficient pregnancy safety data.	(Gu et al., 2021)
Saffron	Crocus sativus L. – Family: Iridaceae	Low culinary doses may improve mood and reduce anxiety.	High doses may cause uterine contractions and miscarriage.	(Tiran, 2003)
Cinnamon	Cinnamomum verum J. Presl / C. cassia (L.) J. Presl – Family: Lauraceae	May support glucose metabolism and provide antioxidant benefits.	Cassia contains coumarin which may cause hepatotoxicity; excessive intake unsafe.	(Sinha et al., 2020)

2.5 Preview on the use of herbal medicine during Pregnancy period

Eid and Jaradat (2020) aimed to investigate the extent of herbal product use and the reasons for using these products. In addition, they also aimed to verify the validity of the rationale of these uses. An ethnopharmacological survey (a cross-sectional design study) was conducted using a previously piloted questionnaire on herbal products used by pregnant and lactating women in the West Bank region of Palestine. The questionnaire was distributed to 350 pregnant and lactating women.

The data collected revealed the use of 13 medicinal plants during pregnancy. The most used plants during pregnancy were sage (Salvia fruticosa), anise (Pimpinella anisum), and mint (Mentha × piperita). Castor oil (Ricinus communis), ginger (Zingiber officinale), saffron (Crocus sativus), and senna (Senna alexandrine). The study also showed that cinnamon (Cinnamomum verum), anise (Pimpinella anisum), peppermint (Mentha piperita), and sage (S. fruticosa) were most commonly used during lactation.

In a similar study by (Illamola et al., 2020) revealed that many herbal medicines utilized during pregnancy were used to enhance mother and/or child health, or to aid in lowering nausea and vomiting, curing infections, preparing for delivery, inducing labor, or easing labor pain. Findings also revealed that pregnant women's usage of herbal medicines stemmed from their belief that they were safer than alternative treatments. Supplementing traditional therapy with herbal medicines may complicate the care of pregnant women with pre-existing medical disorders, including asthma and epilepsy.

The study by Ouoba et al. (2023) aimed to describe the phytopharmacological practices of traditional medicine practitioners in Burkina Faso. This study was a cross-sectional ethnopharmacological descriptive study, conducted from October 1 to November 30, 2020, among traditional practitioners in four randomly selected health zones: Nongr-Massom (Central Zone), Tenkodogo (Central-East Zone), Diapaga (East Zone), and Dafra (Hauts-Bassins Zone). This study revealed that traditional medicine practitioners possess significant knowledge in the use of medicinal plants. However, several limitations were observed in their practices in the fields of phytopharmaceuticals and plant protection.

Mohammed et al. (2024) aimed to investigate the prevalence of indigenous herbal medicine use and its associated factors among pregnant women attending antenatal care

(ANC) at public health facilities in Dire Dawa, Ethiopia. The study revealed that 47.8% of pregnant women used herbal medicines. In addition, the results revealed that a lack of formal education at the primary level, being a housewife, the number of ANC visits, insufficient knowledge, and a favorable perception were factors significantly associated with the use of herbal medicine. The results showed that the most commonly used herbs were garden cress (Lepidium sativum), bitter leaf (Vernonia amygdalina), and moringa (Moringa oleifera). The most indications for their use were to treat conditions related to gastrointestinal problems, blood pressure, and high blood levels.

2.6 Nutraceuticals: Definition, Types, and uses during Pregnancy

The term “nutraceutical” was coined by Dr. Stephen De Felice in 1989, derived from the combination of the words “nutrition” and “pharmaceutical” (Altalhi & Cruz, 2023). Nutraceuticals are foods or parts of foods that contain bioactive elements with physiological and medicinal effects, which provide health benefits and prevent disease, including prebiotics, probiotics, fibers, fatty acids, antioxidants, spices, herbs, nutrients, and supplements (Perna et al., 2024). They contain bioactive elements such as polyphenolic compounds, isoprenoids, minerals, amino acid derivatives and fatty acids that have numerous beneficial and healing effects without side effects (Bansal & Dhiman, 2020).

However, dietary supplements are not limited to vitamins and minerals (Perna et al., 2024). In Canada, for example, vitamin and mineral supplements are classified and regulated as natural health products (NHPs), a classification that also includes herbal remedies, homeopathic medicines, traditional medicines, probiotics, essential fatty acids, and amino acids (Mine & Young, 2009).

Table (2.1) summarizes several previous work that established a detailed definition, benefits of use, and types of commonly used nutraceuticals (Bansal & Dhiman, 2020; Mishra et al., 2022; Rama Rao & Anand, 2024).

Table No (2.2): Definition, benefits of use, and types of commonly used nutraceuticals

Feature	Details
Definition	Polyphenolic compounds, isoprenoids, minerals, amino acid derivatives and fatty acids.
Health Benefits	Positive effects on cardiovascular, immune and nervous systems; role in infections, cancer, and obesity; useful in preventing acute and chronic diseases.
Types of common Nutraceuticals	Fish oil, prebiotics, probiotics, cranberry, garcinia, ginkgo biloba, ginseng, green tea, omega-3 fatty acids, red yeast rice and turmeric.

(Bansal & Dhiman, 2020; Mishra et al., 2022; Rama Rao & Anand, 2024).

2.7 Nutraceuticals products use during Pregnancy period

Several studies have investigated the use of supplements and micronutrients such as omega-3 polyunsaturated fatty acids, minerals and vitamins, including folic acid and vitamin D, during pregnancy to study the risk of conditions associated with its use, such as pre-eclampsia and impaired fetal development (Al-Dughaishi et al., 2016; Omotayo et al., 2016). Table (2.2) presents the findings of epidemiological studies conducted by various research groups on the utilization of nutraceuticals during pregnancy in recent years.

Table No (2.3): List of commonly used nutraceuticals during pregnancy in relation to previous epidemiological studies.

Nutraceuticals	Maternal Benefits	Adverse Effects	References
Folic Acid	The timely initiation of folic acid (FA) supplementation during gestation was associated with a decreased risk of congenital malformations, with the protective effect mainly attributed to its reduction in heart defects.	It is recommended that FA supplementation be initiated 1.5 months prior to conception and continued for 4 months to optimize prevention of congenital malformations.	(Dong et al., 2023)
Omega-3 Fatty Acids	It is recommended that pregnant women consume an additional intake of at least 100-200 mg/d of docosahexaenoic acid (DHA), as advised by the European Food Safety Authority (EFSA). Observational studies have demonstrated that a reduction in omega-3 DHA and eicosapentaenoic acid (EPA) intake and a decline in blood levels of these fatty acids are associated with a markedly elevated risk of premature birth (PTB) and early PTB.		(I. Cetin et al., 2024)
Vitamin D	It may reduce the risk of severe postpartum hemorrhage and the risk of low birth weight.	Vitamin D supplementation alone has produced uncertain evidence on PE, gestational diabetes, preterm birth or nephritic syndrome.	(Dwarkanath et al., 2024)
Calcium	Calcium supplementation has been demonstrated to lower blood pressure by reducing parathyroid hormone release and		(Palacios et al., 2019)

Nutraceuticals	Maternal Benefits	Adverse Effects	References
	intracellular calcium, thereby reducing vascular smooth muscle contractility. Consequently, it can reduce uterine smooth muscle contractility and prevent preterm labor.		
Vitamin B6 (Pyridoxine)	Vitamin B6 reduces nausea and vomiting in pregnancy. It supports fetal neurological development.	High chronic doses may cause neuropathy. Mild gastrointestinal upset may occur.	("ACOG Practice Bulletin No. 189: Nausea And Vomiting Of Pregnancy," 2018; He et al., 2025)
Prenatal Multivitamins	Ensure adequate micronutrient intake and reduce the risk of neural tube defects by consuming folic acid. Prevent maternal deficiencies.	Excess vitamin A may be teratogenic. May cause mild gastrointestinal discomfort.	(Cai et al., 2024)
Calcium Carbonate	Reduces risk of preeclampsia, especially with low dietary calcium. Supports fetal bone development.	May cause constipation. May interfere with iron absorption.	(Gerede et al., 2025)
Magnesium Oxide	Supports neuromuscular function and may reduce leg cramps. Helps maintain electrolyte balance.	Excess intake may cause diarrhea. May cause electrolyte imbalance in renal impairment.	(Spatling et al., 2017)
Fish Oil (DHA & EPA)	Supports fetal brain and retinal development. May reduce preterm birth risk.	May cause nausea or aftertaste. Liver-derived oils may cause vitamin A excess.	(Irene Cetin et al., 2024)

Nutraceuticals	Maternal Benefits	Adverse Effects	References
Ferrous Fumarate	Treats and prevents iron-deficiency anemia. Improves maternal hemoglobin and fetal oxygenation.	May cause constipation or nausea. May irritate the GI tract when taken on an empty stomach.	(Ubom et al., 2025)
Cholecalciferol (Vitamin D3)	Enhances calcium absorption and fetal bone development. Associated with reduced maternal metabolic complications.	High doses may cause hypercalcemia. Severe overdose may affect kidney function.	(Tammo & Yıldız, 2022)
Ferrous Sulfate	Prevents and treats iron-deficiency anemia. Reduces risks of low birth weight and preterm birth.	May cause constipation or dark stools. May irritate GI tract at high doses.	(Ubom et al., 2025)
Vitamin B-Complex	Supports maternal metabolism and red blood cell formation. Essential for fetal neurological development.	High doses of certain B vitamins may cause neuropathy or flushing. Adverse effects rare at recommended doses (NIH.	(He et al., 2025)

2.8 Preview on the use of nutraceuticals during Pregnancy period

A study performed by Sharma et al. (2022) emphasized the significance of nutraceuticals, the combined effects of nutrients with medicinal values, in aiding the well-being of mothers as well as their babies during pregnancy period. Findings reinforced the fact that there has been a growing demand over the years for nutritional supplements, because of their potential in normalizing nutritional deficiencies, and providing the baby with proper growth characteristics during the early stages of development. Additionally, they mentioned the critical set of vitamins and minerals required during a prenatal condition of the body, including folic acids, iron, calcium, vitamin D3, omega-3 fatty acids, and antioxidants. The study also reinforced the fact that the lack of availability of these minerals may result intranatal complications like anemia, neural tube defects, intrauterine growth restriction, and other. Further, the study reinforced the fact that the application of these nutraceuticals results in elevations in the immune system of the individual, due to the reduction of oxidative stress during the period of pregnancy.

In a study performed by Perna et al. (2024) to evaluate the scientific literature on the role of dietary supplements, particularly probiotics, regarding the development of the placenta and the effects on maternal and fetal well-being. The study examined the various phases of placental development and how the environment (diet, exercise, and dietary supplements) affects this development. The study cited the fact that probiotics used during pregnancy are linked with favorable results concerning the prevention of preterm births, favorable preeclampsia outcomes, and the improvement of the woman's own health conditions (gut microbiome homeostasis, lipid profiles, vaginal infections, gestational diabetes mellitus, and allergies). As a result of this knowledge, it can be understood that probiotics during pregnancy are safe. The study further reinforced that maternal nutrition, including the consumption of dietary supplements and probiotics during pregnancies, should play a critical part regarding successful pregnancies and the future health of the newborns.

A multicentric cross-sectional study published by (Han et al., 2025) examined the trimester-wise pattern of different vitamin supplement usage during pregnancies. A remarkable number (98.16%) of the participants consumed at least one supplement. The average consumption of supplements increased gradually from (2.92 ± 1.27) in the first trimester, to (4.04 ± 1.63) during the second trimester, and further to (4.37 ± 1.52) during

the third trimester, associated with marked increase in the consumption of iron supplements.

Result also showed that the age of the mothers significantly affected the consumption of calcium supplements; the older the age group (≥ 35 years), showed higher intake of calcium during the third trimester. Additionally, the study found that parity and BMI neither significantly affected the consumption of any supplemental vitamins, nor of the other vitamins. Moreover, consumptions of vitamins D and folic acid remained high throughout the three different trimesters, suggesting broad knowledge of the significance of these vitamins.

The study conducted by Liu et al. (2023) examined the prevalence of the use of dietary supplements during the respective trimesters of pregnancy and its potential correlates. Findings revealed that the prevalence of use of at least one dietary supplement during the different trimesters of pregnancy (first, second, and third trimesters) stood at 96.2%, 93.8%, and 94.4%, respectively. There were significant differences found with respect to the consumption of dietary supplements with folic acid, calcium, iron, vitamins, and docosahexaenoic acid (DHA) during the three respective trimesters of gestation. A higher proportion of the prevalence of the supplement usage had a negative association with the categories of expectant mothers who were housewives, with low educational attainment, obese, and received low levels of social support. On the other hand, there existed a positive association with the gestation age.

The study performed by Cetin et al. (2025) aimed to assess the extent of expert consensus on maternal nutrition issues and the requirements of various micronutrients during the pre-conception, prenatal, and post-natal phases. In addition, the study examined the significance and extent of scientific evidence on the application of various micronutrients among low- and high-risk groups of pregnant individuals, during the pre-conception, prenatal, and post-natal phases. The micronutrients under investigation were folic acid, choline, iodine, magnesium, calcium, iron, selenium, docosahexaenoic acid (DHA), and vitamins B1, B2, B6, B12, D, and K. Consensus existed on the significance of diet and the application of nutritional supplements during the prenatal phases. Results revealed that this group acknowledged a lack of consistency and clarity on various guidelines on the significance of the prescription of these micronutrients during the prenatal phases. Consensus existed on the application of iron and vitamin D during the

pre-conception and post-natal phases among low-risk mothers. Additionally, the group required folic acid and iodine during the pre-conception phases of the second and third trimesters, respectively. Further requirements were made during the first trimester of DHA until the post-natal phases and during the post-natal phases of calcium. This group indicated the existence of scientific evidence on the application of these micronutrients during the mentioned phases of improvement and the development of the fetus. Findings did not apply to the application of vitamin D during the pre-conception phases; DHA during the first prenatal phases; and iron during both phases.

2.9 Preview on the use of herbal medicine and nutraceuticals among Iraqi women

A cross sectional survey design by was used to carry out face-to-face interviews with 335 Iraqi pregnant women. Determinants of CAM use were assessed through the logistic regression analysis. Findings reported (56.7 %) of participants using at least one form of CAM modalities. In total, 24 different types of CAM were used; with herbal medicine (53.7 %) and multivitamins (36.3 %) are the most commonly used modalities. The variables positively associated with CAM use were rural residence, no occupation, high income, perceived healthy status, and ever use of contraception. Only (0.5 %) of CAM users disclosed their CAM use to physicians.

Chapter Three:
Study Methodology (Methods and Procedures)

3.1 Introduction

This chapter will focus on study design and variables, target population and sample size calculation, inclusion and exclusion criteria, study tools, study setting and time frame, as well as ethical considerations and statistical analysis methods.

3.2 Study design

A descriptive cross-sectional study design was employed to achieve the study's purpose. The researchers selected face-to-face interviews for data collection rather than self-administered questionnaires, as this approach allowed for clarification of questionnaire items and reduced the likelihood of arbitrary responses and misinterpretations.

This study was conducted using a structured questionnaire composed of seven parts:

Part 1: Demographic and socioeconomic information.

Part 2: Conventional Medications used during pregnancy.

Part 3: Type, , reason, and frequency of use of herbal medicine and nutraceuticals.

Part 4: Source of information on the use in herbal medicines and nutraceuticals.

Part 5: Perception of using herbal medicines and nutraceuticals.

Part 6: Blood test laboratory data.

Part 7: Adverse reactions and side effects as reported by the participants.

3.3 Study Variables

The following table (3.1) presents the study variables, along with a detailed description of each.

Table No (3.1): Study Variables and their description

Variable	Description
Part 1: Demographic and socioeconomic information.	Participants Age (years), Educational level, Household income, Place of residence, Work and Number of children
Part 2: Conventional Medications used during pregnancy.	Types of medications, dose, frequency and period of treatment.
Part 3: Type, does, reason, and frequency of use of herbal medicine and nutraceuticals.	Types, number, dose, reason and frequency of use of herbal medicines and nutraceuticals by participants.
Part 4: Source of information on the use in herbal medicines and nutraceuticals.	The main reasons for using herbal medicines and nutraceuticals.
Part 5: Perception of using herbal medicines and nutraceuticals.	The expected benefits for using herbal medicines and nutraceuticals.
Part 6: Blood test laboratory data.	The blood test laboratory data that was collected for the patients includes counts of red blood count (CBC), white blood cells (WBC) and platelets count.
Part 7: Adverse reactions and side effects as reported by the participants.	Including signs and symptoms during pregnancy period or after delivery before discharge from the hospital.

3.4 Study Population and Sampling Techniques

3.4.1 Study Population

- **Inclusion criteria:** This study was conducted among pregnant women attending hospitals for delivery in selected centers during the study period in Iraq, who were eligible for inclusion. Patients who were generally well and can provide information on their consumption of herbal medicine and nutraceuticals were included. All pregnant women aged 18 years or older, with stable health conditions, who were admitted to the hospital for preparation for full-term delivery, would be enrolled in the study.
- **Exclusion criteria:** This study excluded women who were not Iraqi (excluded women of differing cultural backgrounds because they anticipated that different women may have different practices in the use of home remedies). Pregnant

women who were extremely sick or in a coma, and younger than 18 years old, were all excluded.

3.4.2 Sample size calculation

The sample size was calculated based on the formula (Cochran, 1963):

$$n = [z^2 * p * (1 - p)] / e^2.$$

In this equation, n represents the required sample size, Z2 is set at 1.96 for a 95% confidence interval, e denotes the margin of error fixed at 0.05, and p represents the expected proportion.

A systematic review of data revealed that 32.4% of women use herbal medicines during pregnancy worldwide (Heydarpour et al., 2022). Below is a detailed explanation of how to calculate the study sample using the Cochran (1963) equation:

$$n = \frac{1.96^2 \times 0.324(1-0.324)}{0.05^2} = \frac{3.8416 \times 0.324 \times 0.676}{0.0025}$$

n= 380

Based on this formula, the required sample size is about 380. A convenience sampling method was employed for the survey.

3.5 Study Tool

A structured data collection sheet was developed by the principal investigator, revised by two experts in phytotherapy and clinical pharmacy, and approved by a panel of randomly selected academic experts in clinical pharmacology from the Faculty of Pharmacy at Middle East University. The questionnaire was composed of 7 parts consisting of 17 questions (Kennedy et al., 2013; Hwang et al., 2016; Eid & Jaradat, 2020; Illamola et al., 2020; Adane et al., 2020) as follows:

Part 1: Demographic and socioeconomic information.

1) Age (years)

18-20

20–30

31–40

>40

2) Educational level Primary and illiterate

Middle school

High school

Graduate

Postgraduate

3) Household income

High

Average

Low

4) Place of residence

Village

City

5) Work

Yes

No (housewife)

6) Number of children

First child

Second

Third

Fourth

Fifth

>5

Part 2: Conventional Medications used during pregnancy.

7) Did you use any medication during pregnancy period?

Yes, mention:

No.

8) Frequency:

Part 3: Type, reason, and frequency of use of herbal medicine and nutraceuticals.

9) Do you use herbs during your pregnancy period?

Yes, mention:

No

10) Frequency :

11) What are the reasons for the use of herbal medicine?

More effective than conventional medicine

Safer than medication

Not harmful in pregnancy

When conventional medicine fails

Cultural to use herbs

More accessible treatment than conventional medicine

Cost is less than medication

Cannot afford conventional medicine

Complements conventional medicine

Others

Part 4: Source of information on the use in herbal medicines and nutraceuticals.

12) Who recommended the use of herbal medicine and nutraceuticals?

Myself

Family

Friends

Doctor

Pharmacist

Media and internet

13) At what trimester of pregnancy, did you start using herbal medicine and nutraceuticals?

First

Second

Third

Part 5: Perception of using herbal medicines and nutraceuticals.

14) Do you get any benefit from herbal medicine and nutraceuticals?

Yes, mention:

No

Part 6: Blood test laboratory data.

These data were collected from the medical/ laboratory tests reports of the patients before being discharged from the hospital.

Part 7: Adverse reactions and side effects as reported by the participants.

15) Have you suffered from side effects?

Yes, mention:

No

3.6 Study Tool validation

In this study, researchers defined herbal medicine and nutraceuticals. Participants were asked open-ended questions to assess whether they used any herbal medicine or nutraceuticals. This was followed by displaying a list of everyday herbal products and nutraceuticals to help participants recall, prevent misunderstandings, and provide an opportunity to clarify items on the questionnaire. The questionnaire was piloted among 30 pregnant women to assess its validity and reliability.

3.7 Study setting and time frame

Location: The data was gathered by contacting Al-Batoul Teaching Hospital in Iraq.

Timeframe: This study was conducted over 4 months (June-September 2025), during which data collection and analysis were completed.

3.8 Ethical Consideration

This study received ethical approval from the Institutional Review Board of Middle East University (Appendix I). This was followed by ethical approval from administrative committees at the hospital included in this study (Appendix II).

Consent forms were obtained from participants to participate in the study, and confidentiality was maintained by ensuring the security and privacy of all respondents. The researcher informed participants that their participation in the study was voluntary and that they could withdraw at any time. Patients' confidentiality and anonymity were ensured so that disclosure could not occur, and patients were assured that their collected data remained confidential and private.

All data was coded and secured by the researchers and used for the purpose of the study.

3.9 Statistical Procedures

The raw data were coded and checked for missing data using Microsoft Excel 2016. The Statistical Package for the Social Sciences (SPSS) version 21 was used to analyze the data, with a significance level set at $p < 0.05$. The methods of statistical analysis are described as follows:

1. **Descriptive statistics:** Frequencies and percentages were used to describe the types of herbs and nutraceuticals used during pregnancy, the reasons for their use, their sources of information, frequency, does, and any reported side effects.
2. **Fisher Exact:** It is applied to predict the impact of using herbal medicines and nutraceuticals on the health status of pregnant women during and after childbirth, the herbal medicines and nutraceuticals used during pregnancy, and the association between demographic, economic, and occupational variables and the type of nutraceutical, or herbs, consumed.
3. **Binominal Logistic Regression:** It was applied to predict the impact of using herbal medicines and nutraceuticals on the health status of pregnant women during and after childbirth.

Chapter Four:
Results of the Study

4.1 Introduction

This chapter presents the findings of a study investigating the potential effects of herbal medicines and nutraceuticals on pregnant women in Iraq. The results are displayed in tables and graphs, with p-values indicating the statistical significance of the tests.

4.2 Description of Demographic Characteristics of the Study participants

The total number of participants in this study was 411 patients, which exceeded the calculated sample size of 380 patients. Table 4.1 presents the descriptive statistics of demographic characteristics for Iraqi pregnant women participated in this study.

The majority (59%) of the pregnant women who participated in the current study were between 20 and 30 years old, while only 2.4% were over 40 years old. In addition, most of participants were with primary-middle school graduates, with average-level of household income, mainly as housewives, resident in the city, and having multiple children.

Table No (4.1): Description of Demographic Characteristics of participants (N=411)

Variable	N (%)
Age	
Less than 20 Years	57 (13.8%)
21-30 Years	244 (59.2%)
31-40 Years	101 (24.5%)
More than 40 Years	10 (2.4%)
Educational Level	
Not Educated	32 (7.8%)
Primary School	229 (55.6%)
Middle School	76 (18.4%)
Graduate	69 (16.7%)
Post-Graduate	6 (1.5%)
Household Income	
High	8 (1.9%)
Average	339 (82.3%)
Low	65 (15.8%)

Variable	N (%)
Place of Residence	
Village	164 (39.8%)
City	248 (60.2%)
Work	
Yes	59 (14.3%)
No (Housewife)	353 (85.7%)
Number of Children	
First Child	142 (34.5%)
Second Child	83 (20.1%)
Third Child	86 (20.9%)
Fourth Child	57 (13.8%)
Fifth	18 (4.4%)
More than Five	26 (6.3%)

***Categorical variables were described using frequencies and percentages N (%)**

4.2.1 Prevalence and pattern of use of medications, herbal medicines and nutraceutical during pregnancy period by Iraqi pregnant women

Percentages were calculated to describe the prevalence of use of herbal remedies, nutraceuticals, and medications during pregnancy period among the study participants (Figure 4.1).

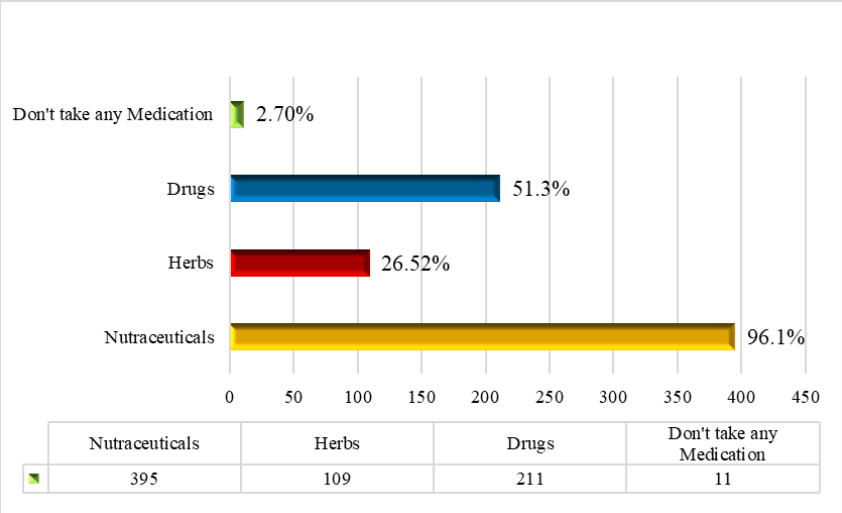

Figure (4.1): The percentages of participants who use herbal medicine, nutraceuticals, and medications during pregnancy (N=411)

Results from Figure (4.1) indicate that more than 96% of pregnant women, consumed nutraceuticals during their pregnancy. In contrast, 51.3% of mothers reported using drugs,

while 26.50% used herbal medicine. A small percentage only (2.10%), did not use any form of drugs, herbs, or nutraceuticals during their pregnancy period.

4.2.2 Types of medications used during pregnancy period by Iraqi pregnant women

Table (4.2) presents types and percentages of medications used by Iraqi pregnant women during pregnancy period participated in this study.

Table No (4.2): Medications (n%) used by Iraqi pregnant women during pregnancy period (N=211)

Drugs	N (%)
Dydrogesterone	66 (31.3%)
Norethisterone	65 (30.8%)
Acetylsalicylic acid	61 (28.9%)
Enoxaparin Sodium	53 (25.1%)
Iron	25 (11.9%)
Nifedipine	7 (3.3%)
Metformin Hydrochloride	7 (3.3%)
Methyldopa	5 (2.4%)
Amoxicillin	4 (1.9%)
Doxylamine + Pyridoxine	2 (0.9%)
Ondansetron	1 (0.5%)
Progesterone	1 (0.5%)
Esomeprazole	1 (0.5%)

***The percentage was calculated based on a total of 211 women used medications during pregnancy period.**

The most frequently used medications were dydrogesterone (31.3%) and norethisterone (30.8%). In addition, acetylsalicylic acid (28.9%) was also prominent.

Among the less common medications, enoxaparin (25.1%), and Iron-related therapies (11.9%) were the most common. A smaller but notable proportion received metformin hydrochloride (3.3%), while nifedipine (3.3%) and methyldopa (2.4%) were also used

4.2.3 Types of nutraceuticals used during pregnancy period by Iraqi pregnant women

The types and percentage of nutraceuticals consumed by Iraqi pregnant women during their pregnancy period are listed in Table 4.3.

Table No (4.3): Nutraceuticals (n%) used by Iraqi pregnant women during pregnancy period (N=411)

Nutraceutical	n (%)
Folic Acid	265 (65.9%)
Vitamin B complex	1 (0.2%)
Ferrous Fumarate + Folic Acid	71 (17.6%)
Multivitamins	56 (13.9%)
Calcium Carbonate	72 (17.9%)
Magnesium Oxide	3 (0.75%)
Fish Oil (Eicosapentaenoic acid+ Docosahexaenoic acid)	46 (11.4%)
Ferrous Fumarate	2 (0.49%)
Multivitamins + Minerals+Folic Acid	2 (0.49%)
Ferrous Sulfate	9 (2.2%)
Cholecalciferol	31 (7.7%)

***The percentage was calculated from the overall sample of women who used herbs and nutraceuticals.**

The above table illustrates a clear dominance of folic acid, reported by 265 women, which represents 65.9% of the sample. Calcium Carbonate was also common 17.9% (n = 72), followed by multivitamins composing13.9% (n = 56), and (Ferrous Fumarate + Folic Acid) of 17.6% (n = 71).

The less commonly used supplements include calcium, and multivitamins, Fish Oil (eicosapentaenoic acid + docosahexaenoic acid), and cholecalciferol. The least frequently used nutraceuticals include Vitamin B, Magnesium Oxide, Ferrous Fumarate, and Ferrous Sulfate.

4.2.4 Sources of recommendations and information on the use of nutraceuticals during pregnancy period

Figure (4.2) shows the percentages of different sources of recommendations and information on the use of nutraceuticals by pregnant Iraqi women during pregnancy period.

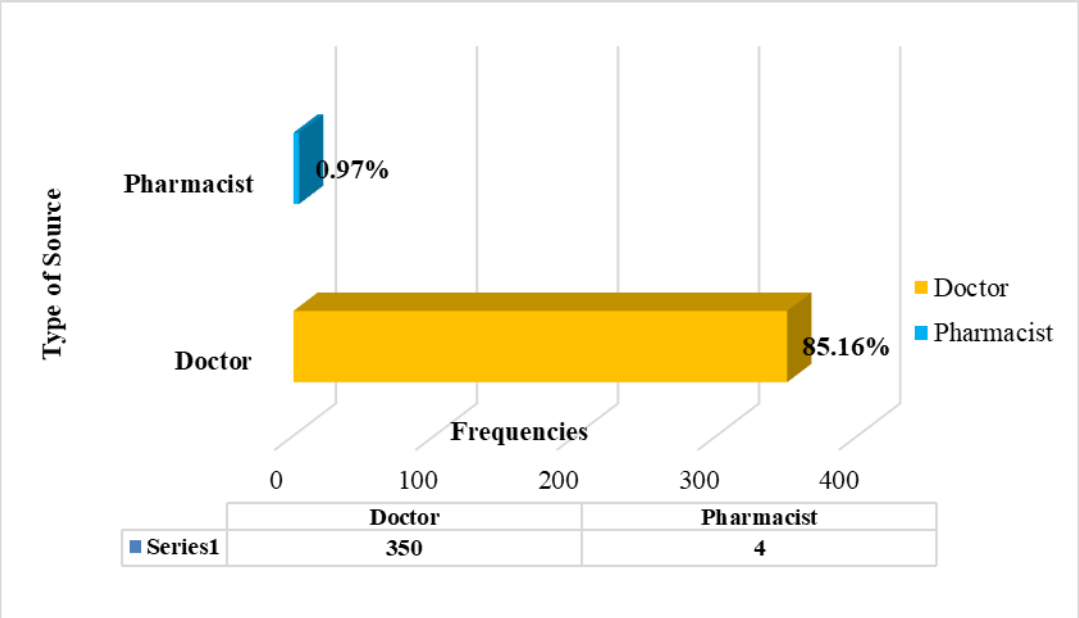

Figure (4.2): Percentages of sources of recommendations and information on the use of nutraceuticals by pregnant Iraqi women during pregnancy period (N=411)

Findings show that most participants who consumed nutraceuticals receive information about the necessity of using these nutraceuticals during pregnancy primarily from their doctor, while a smaller percentage obtained this information from their pharmacist.

4.2.5 Types of herbal medicines used during pregnancy period by Iraqi pregnant women

Types of herbal medicines used by participants during pregnancy period are shown in Table (4.4).

Table No (4.4): Herbal medicines (n%) used by Iraqi pregnant women during pregnancy period (N=109)

Herbs	Family	Scientific Name	N (%)*
Chamomile	Asteraceae	*Matricaria chamomilla*	11 (10%)
Ginger Tea	Zingiberaceae	*Zingiber officinale*	8 (7.2%)
Cinnamon	Lauraceae	*Cinnamomum verum / cassia*	22 (20%)
Cranberry	Ericaceae	*Vaccinium macrocarpon*	7 (6.3%)
Mint	Lamiaceae	*Mentha spicata (spearmint)*	4 (3.6%)
Spirulina	Oscillatoriaceae (Cyanobacteria)	*Arthrospira platensis / maxima*	3 (2.7%)
Cumin	Apiaceae	*Cuminum cyminum*	3 (2.7%)
Fenugreek	Fabaceae	*Trigonella foenum-graecum*	3 (2.7%)
Castor oil	Euphorbiaceae	*Ricinus communis*	13 (11.8%)
Cardamom	Zingiberaceae	*Elettaria cardamomum*	44 (40%)
Dates	Arecaceae	*Phoenix dactylifera*	7 (6.3%)
Saffron	Iridaceae	*Crocus sativus*	4 (3.6%)

***The percentage was calculated from a total of 109 women who took herbs.**

The findings indicate variations in the herbal medicines used by pregnant women, highlighting both traditional practices and personal preferences. Cardamom was the most common, with 40% of participants using it. Cinnamon followed in popularity with 20% use, suggesting it is a favored warming herb.

Chamomile (10%) and castor oil (11.8%) were also relatively common, each linked to relaxation and labor induction, respectively. In contrast, other herbs such as ginger tea (7.2%), cranberry (6.3%), and dates (6.3%) were used less frequently, reflecting more individualized choices. Mint (3.6%), saffron (3.6%), cumin, fenugreek, and spirulina (each at 2.7%) were among the least commonly utilized remedies.

4.2.6 Sources of recommendations and information on the use of herbal medicine during the pregnancy period

Figure (4.3) shows the sources of recommendations and information on the use of herbal medicine by pregnant Iraqi women during the pregnancy period.

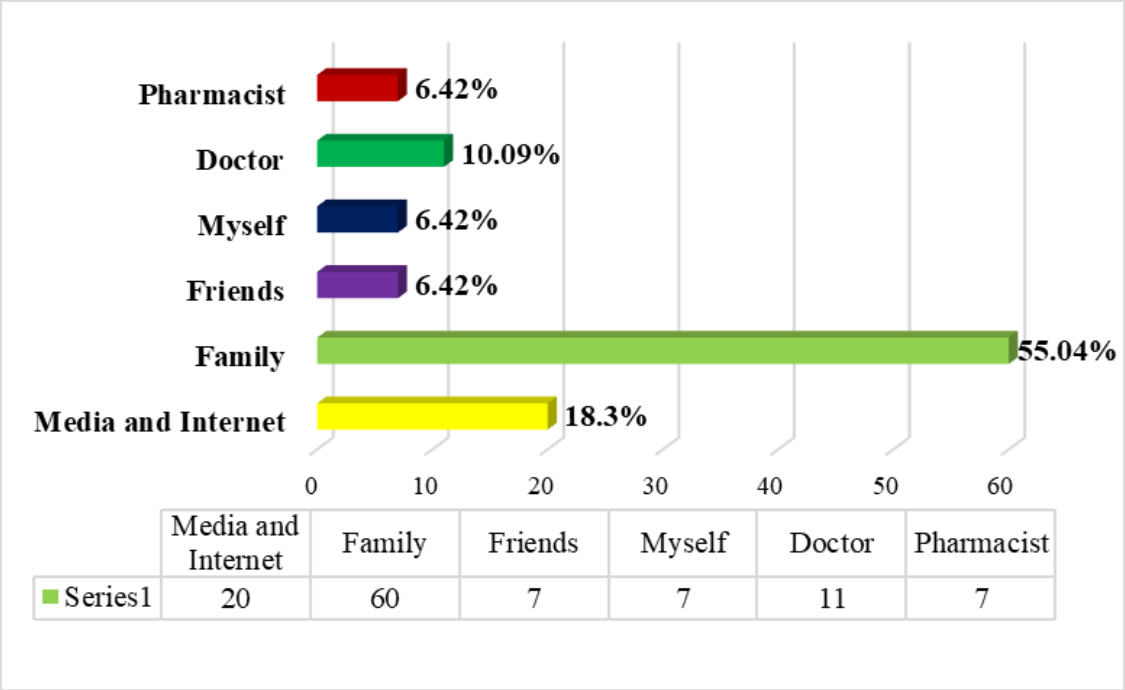

Figure (4.3): Percentages of sources of recommendations and information on the use of herbal medicine by pregnant Iraqi women during pregnancy period (N=109)

As shown in Figure (4.3), most women used herbal medicine during pregnancy primarily receive information from their family members (55.4%). They also obtain guidance from the media and the internet (18.3%). In contrast, a smaller percentage of women get this information from doctors (10.09%). Very few rely on friends, personal experience, or pharmacists.

4.2.7 Reasons for using herbal medicine during pregnancy period

Figure (4.4) illustrates the key reasons for Iraqi pregnant women to choose to incorporate herbal medicine into their diets and healthcare practices during pregnancy period.

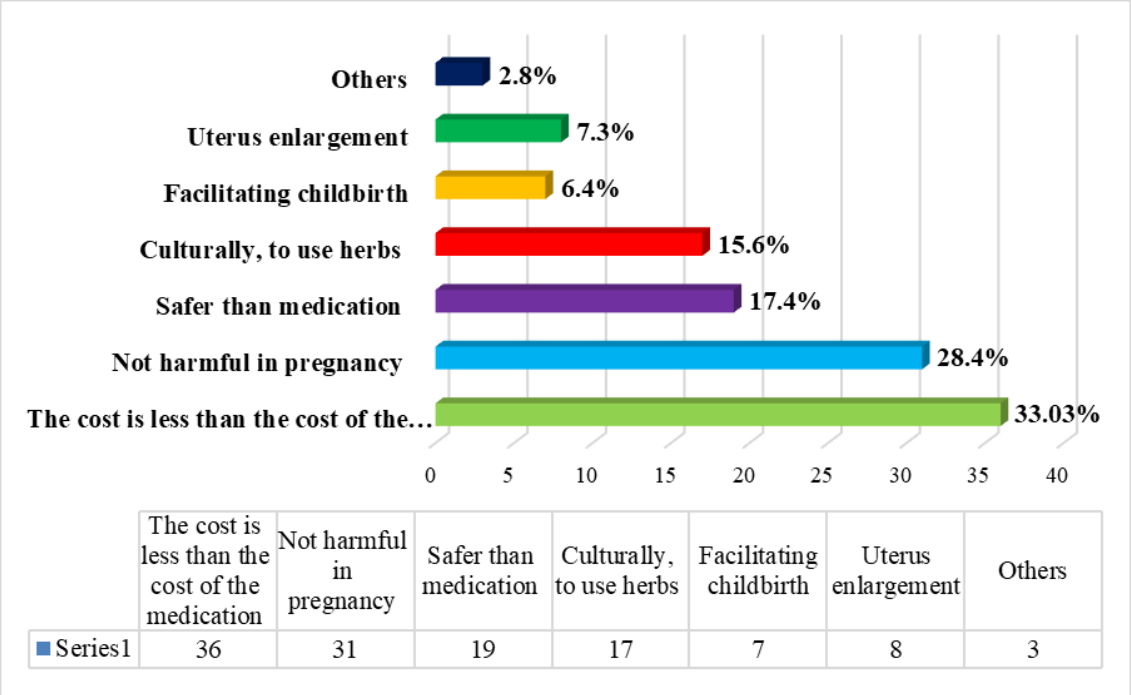

Figure (4.4): Reasons for using herbal medicine during pregnancy period by pregnant Iraqi women (N=109)

The results revealed that the main reasons for use of herbal medicines among participants, emphasis on both practical and cultural reasons. The most common reason given was that the herbal medicines are cheaper than the conventional medications as reported by 33.0% of the participants. A considerable proportion of (28.4%) thought that herbal medicines are harmless during pregnancy, and nearly one-fifth (17.4%) thought that herbal medicines were safer than the conventional medicines.

Nevertheless, 15.6% of the participants used herbal medicines based on cultural and traditional beliefs, which clearly underlines that herbal medicines are an integral part of the customs of this society. Some of the participants even provided reasons based on their individual physiology; these include encouraging the delivery of the baby (6.4%) and the enlargement of the uterus (7.3%).

4.2.8 Perceptions on the benefits of using herbal medicine during pregnancy period

Figure (4.5) illustrates the perceptions on the benefits of consuming herbal medicines during pregnancy period among Iraqi women.

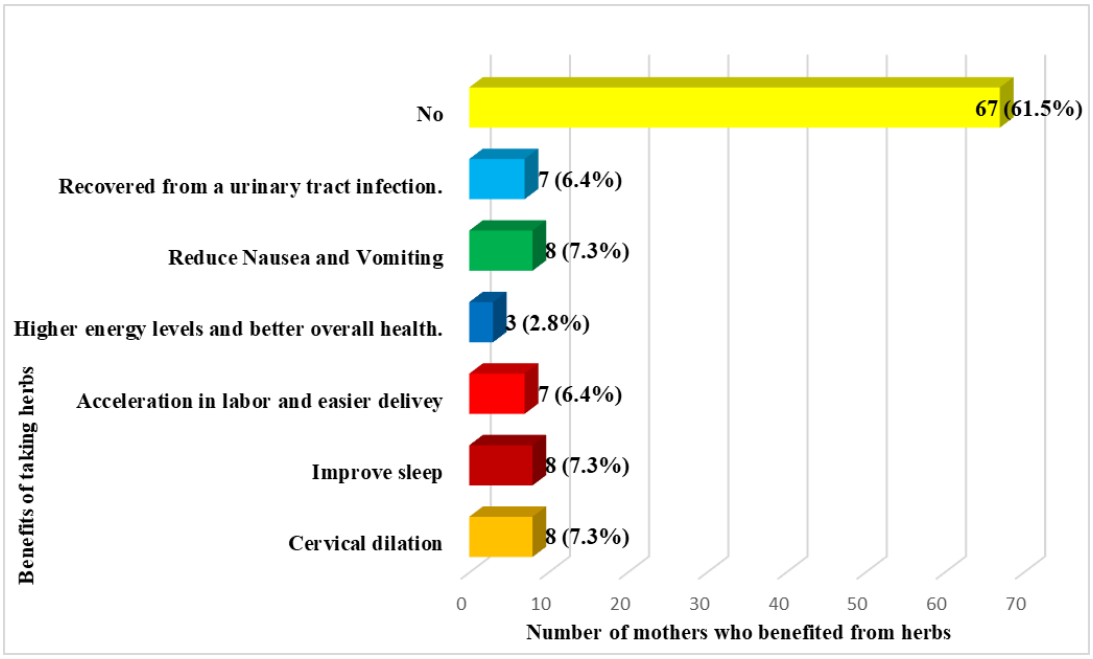

Figure (4.5): Perceptions on the benefits of using herbal medicine by pregnant Iraqi women during the pregnancy period (N=109)

The findings reveal that most participants (61.5%) did not perceive any clear benefit from using herbal medicines during pregnancy. Among the participants who reported positive effects, the most frequently mentioned benefits were cervical dilation (7.3%), improved sleep (7.3%), and reduced nausea and vomiting (7.3%), which align with common folk uses of herbs such as chamomile and ginger. Additionally, smaller proportions of women reported improvements, including the acceleration of labor and easier delivery (6.4%), recovery from urinary tract infections (6.4%), increased energy, or better general well-being (2.8%).

Table 4.5 illustrates the perceptions of the benefits of consuming each type of herbal medicine during pregnancy among Iraqi women.

Table No (4.5): Perceptions on the benefits of using each type of herbal medicine by pregnant Iraqi women during the pregnancy period

Herbs	Benefits	N	Percentage (From 109)
(Cardamom)	No	35	32.1%
(Cardamom)	Yes (Cervical Dilatation)	8	7.3%
(Chamomile)	No	7	6.4%
(Chamomile)	Yes (Enhance sleeping quality)	4	3.7%
(Chamomile)	Yes (improve sleep)	4	3.7%
(Dates)	No	7	6.4%
(Fenugreek)	No	3	2.8%
(Saffron)	No	4	3.7%
(Ginger)	Yes (Reduce Nausea and Vomiting)	4	3.7%
(Ginger)	Yes (Reduce Nausea and Vomiting)	4	3.7%
(Castor oil)	No	12	11.0%
(Castor oil)	Yes	1	0.9%
(Spirulina)	Yes (increase in energy levels and improvement in overall well-being)	3	2.8%
(Stachys)	No	7	6.4%
(Fennel)	No	7	6.4%
(Cinnamon)	No	11	10.1%
(Cinnamon)	Yes (Acceleration in labor and easier delivery)	7	6.4%
(Cranberry)	Yes (Recovered from a urinary tract infection)	7	6.4%
(Cumin)	No	3	2.8%
(Mint)	Yes (Reduce Nausea and Vomiting)	4	3.7%

The findings show that the majority of participants reported no perceived benefits from herbal medicine use, with the highest proportion observed for cardamom (35 women, 32.1%) and castor oil (12 women, 11.0%). In contrast, reported benefits were relatively low, with reductions in nausea and vomiting being the most frequently mentioned benefits for ginger and mint (4 women each, 3.7%). Other perceived benefits, such as improved sleep quality, labor facilitation, and recovery from urinary tract infections, were each reported by small proportions, ranging from 0.9% to 7.3%, indicating generally limited perceived effectiveness of herbal medicines during pregnancy.

4.2.9 Side effects correlated to the use of herbal medicines as reported by participants

Figure (4.6) provides a detailed illustration of the various side effects that pregnant women experience caused by consuming different herbs during the pregnancy period.

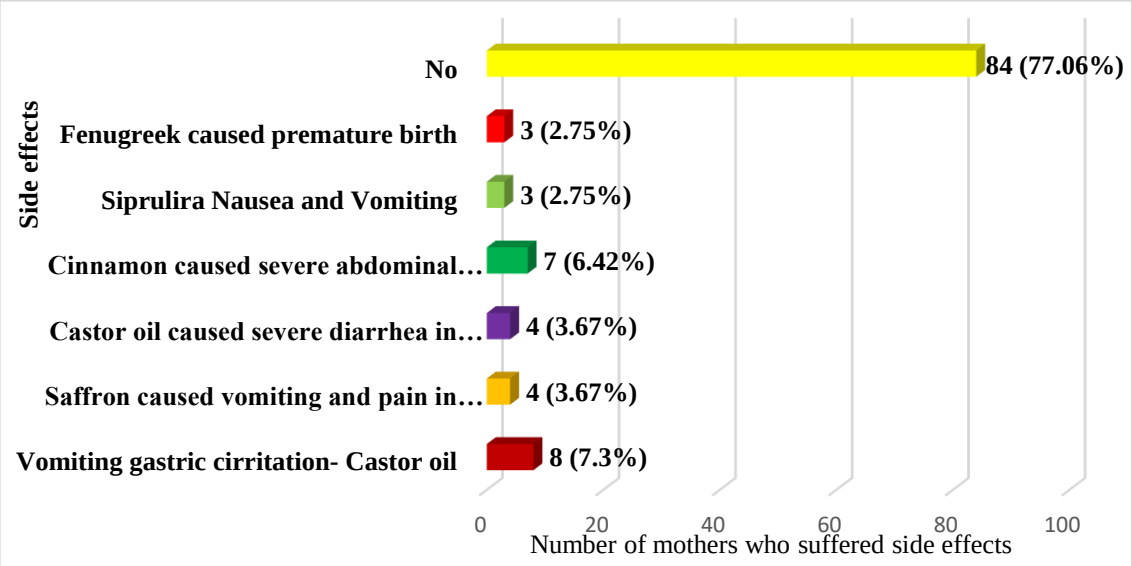

Figure (4.6): Association of various side effects that pregnant women experienced caused by consuming different herbs during pregnancy period (N=109)

The findings indicate that majority of participants (77.1%) did not experience any side effects from using herbal medicine during pregnancy, suggesting that most users view these products as relatively safe. However, about one in four women (22.9%) reported experiencing some form of side effects.

The most reported side effects included vomiting and gastric irritation, which were linked to castor oil (7.3%), and severe abdominal pain associated with cinnamon use (6.4%). Additionally, saffron (3.7%) and fenugreek (2.8%) were connected to more serious symptoms such as pelvic pain, uterine contractions, or even premature labor, reinforcing existing warnings against their unsupervised use of herbal medicines during pregnancy. A few participants also reported experiencing nausea and vomiting related to the use of spirulina (2.8%).

4.3 Association of demographic and socioeconomic variables, residential area, and occupational status with the type of nutraceutical or herbal medicines used during pregnancy period

The association of demographic and socioeconomic variables, residential area, and occupational status and the type of nutraceutical or herbal medicine consumed by pregnant women was examined. The results are shown in detail below.

4.3.1 Association of demographic variables with the type of nutraceutical or herbal medicine used by participants

The associations between demographic variables and the type of nutraceutical or herbs consumed by pregnant mothers were investigated. Findings are shown in detail in figure 4.7.

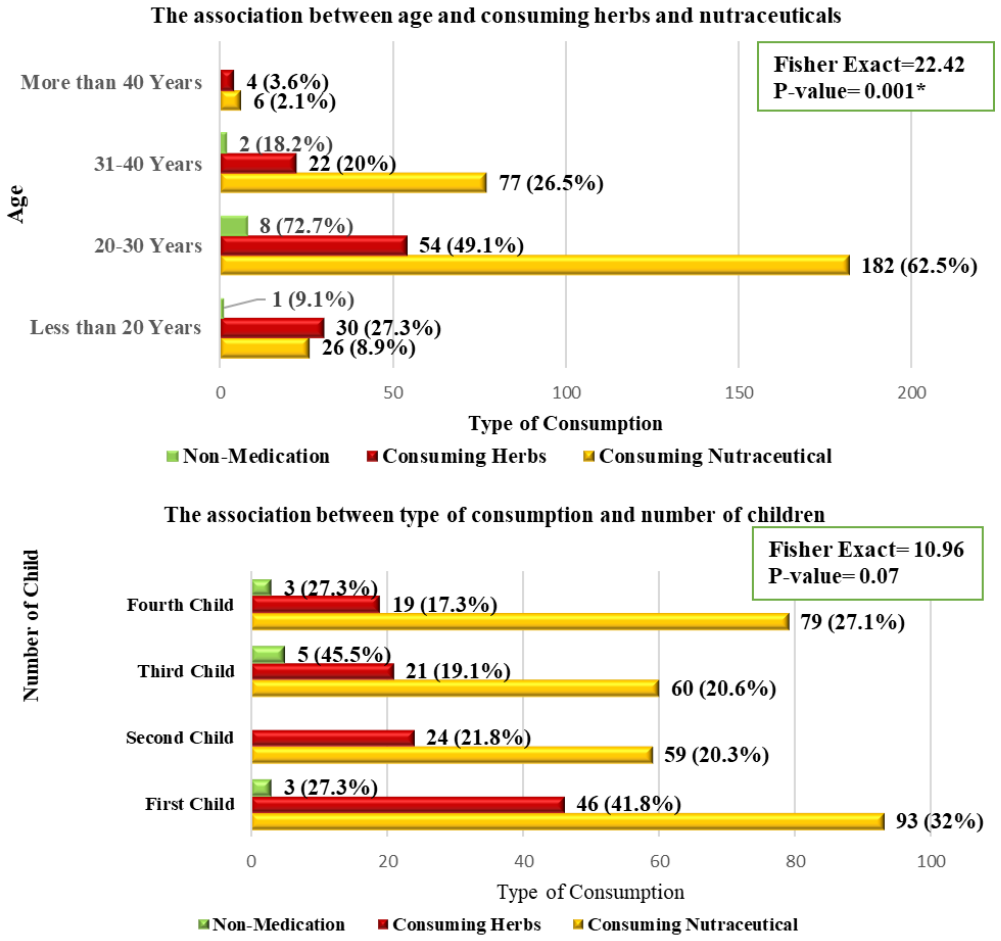

Figure (4.7): Association of demographic variables and the type of nutraceutical or herbs consumed by pregnant women

Results showed a statistically significant association (p-value <0.001) between maternal age and the prevalence of herbal medicine and nutraceutical use during pregnancy. A significant majority of mothers aged 20-30 years were practicing such medicines and nutraceuticals, where a proportion of (62.5%) reported the consumption of nutraceuticals and (49.1%) used herbs.

On the other hand, very few women above the age of 40 used these products. Only 2.1% of them used nutraceuticals, and 3.6% used herbs. In addition, there was no statistically significant association (p-value >0.001) between the use of these products and the total number of children a woman had. These findings indicate that the rate of consumption of nutraceuticals or herbal medicines remained unaffected by the women's experience or the order of pregnancies.

4.3.2 Association of socioeconomic variables with the type of nutraceutical or herbal medicine used by participants

The associations between socioeconomic variables and the type of nutraceutical or herbs consumed by pregnant women were investigated. The results are shown in detail in figure (4.8).

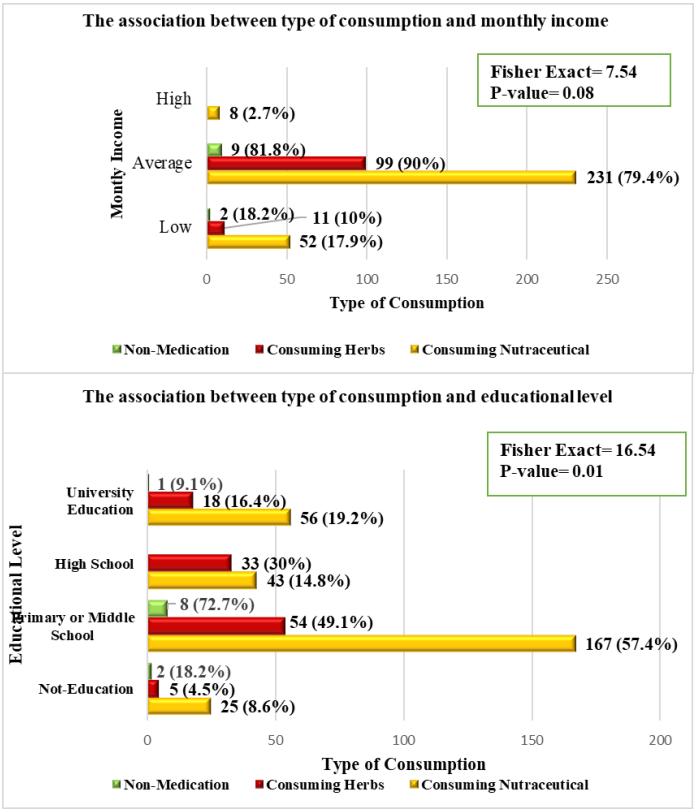

Figure (4.8): Association of socioeconomic variables and the type of nutraceutical or herbal medicines consumed by pregnant women

The results showed a highly significant association (p-value <0.001) between women's education and the consumption of herbal medicines and nutraceuticals during pregnancy. A very high proportion of participants who only attained secondary education used nutraceuticals (57.4%), followed by those who used herbs (49.1%).

On the other hand, only 8.6% of women who never attended school used nutraceuticals, and only 4.5% used herbs. At the same time, a very significant proportion of women with higher education used nutraceuticals (19.2%), followed by those who used herbs (16.4%).

These findings confirm that knowledge and awareness are directly correlated with the practice of healthier choices. There was no highly significant association between the consumption of herbal medicines and nutraceuticals and participants' monthly income (p-value >0.001), indicating that the women's education levels were unaffected by their income in their choice of nutraceuticals or herb use.

4.3.3 Association of residential areas with the type of nutraceutical or herbal medicine used by participants

The associations between residential area and the type of nutraceutical or herbs consumed by pregnant women were investigated. The results are shown in detail in figure (4.9).

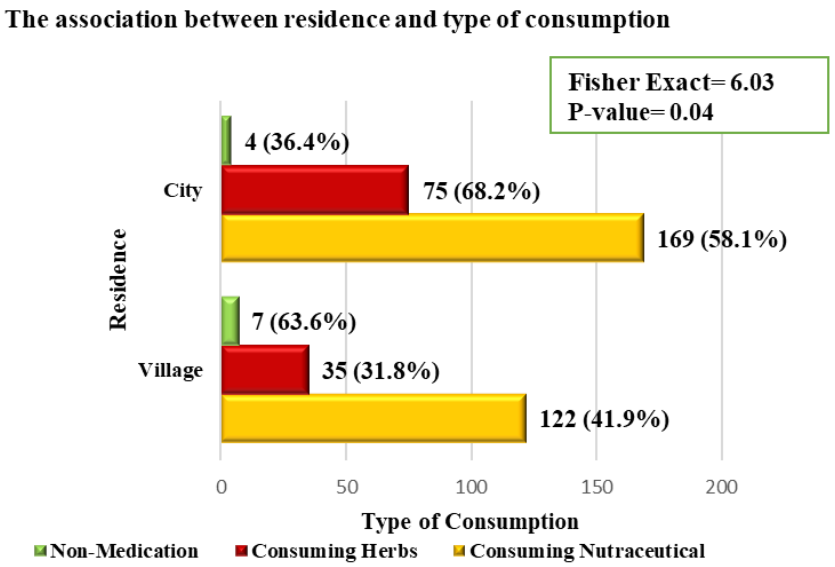

Figure (4.9): Association of residential area and the type of nutraceutical or herbal medicines used by pregnant women

The study findings find a statistically significant association (p-value <0.001) between the use of herbal medicines and nutraceuticals and place of residence. The majority of participants living in urban areas reported using nutraceuticals (58.1%) and herbs (68.2%). In contrast, a smaller proportion of those in rural areas used these products: 41.9% used nutraceuticals and 31.8% used herbs.

4.3.4 Association of occupational status with the type of nutraceutical or herbal medicine used by participants

The associations between occupational status and the type of nutraceutical or herbs consumed by pregnant women were investigated. The results are shown in detail in figure (4.10).

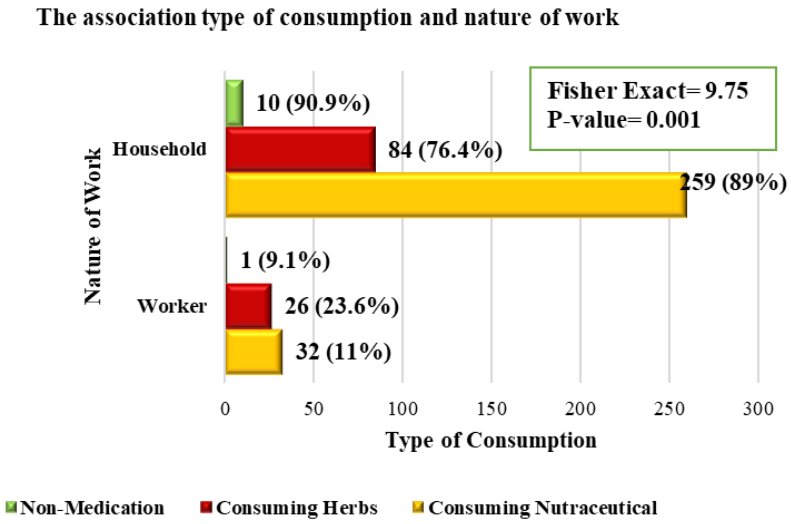

Figure (4.10): Association of occupational status and the type of nutraceutical or herbal medicines used by pregnant women

The study results indicated a statistically significant association (p-value <0.001) between occupation and the use of herbal medicines and nutraceuticals during pregnancy. Among housewives, a high percentage (89%) reported using nutraceuticals, while 76.4% used herbs. In contrast, only 11% of working women reported using nutraceuticals, and only 23.6% reported using herbs.

4.4 Investigation of the impact of using herbal medicines and nutraceuticals on the blood laboratory tests results among the study participants

Table 4.5 shows the association between the type of products used (herbal medicines/ nutraceuticals) and the blood laboratory test results of pregnant women as reported in this study.

Table No (4.6): Association of the type of herbal medicines/ nutraceuticals product used and the blood laboratory test results among pregnant women

Blood tests status		Type of products			χ^2	P-value
		Non-Medication N=11 N (%)	**Nutraceuticals N=291 N (%)**	**Herbal medicines N=109 N (%)**		
RBC	Non-Normal	6 (54.5%)	100 (34.4%)	8 (7.3%)	37.85	**0.01***
	Normal	5 (45.5%)	191 (65.6%)	101 (92.7%)		
WBC	Non-Normal	2 (18.2%)	32 (11%)	6 (5.5%)	4.06	0.121
	Normal	9 (81.8%)	259 (89%)	103 (94.5%)		
Platelets count	Non-Normal	0.0 (0.0%)	5 (1.7%)	0.0 (0.0%)	1.90	0.41
	Normal	11 (100%)	286 (98.3%)	109 (100%)		

***If the p-value is less than 0.001, the association is considered significant.**

Findings show the association between the type of consumption (no medication, nutraceuticals, herbs) and the laboratory status of blood cells (normal/abnormal). There was a significant difference in red blood cell counts (RBC); the percentage of abnormal results was 54.5% in the no-medication group and 34.4% in the nutraceuticals group, compared to only 7.3% in the herbal medicines consuming group. These are statistically significant differences, as indicated by the chi-square test ($\chi^2 = 37.85$, $p = 0.01$), demonstrating a significant association between the type of consumption and RBC abnormalities.

In contrast, no significant association was found between the type of consumption and the normality of white blood cells (WBC), or platelets count. The percentage of abnormal results was low in all groups (e.g., Platelets count remained almost 100% normal), and the associated p-values were higher than the accepted significance level ($p > 0.05$; e.g., $p = 0.121$ for WBC, and $p = 0.41$ for platelets counts). These findings suggest that the differences between groups indicate random and not statistically significant.

A binary logistic regression was performed to assess the impact of nutraceutical and herbal medicines consumption on the health status of pregnant Iraqi women throughout pregnancy. The findings are displayed in Table 4.5.

Table No (4.7): Coefficients of the logistic regression model to predict blood tests results and the consumption of herbal medicines or nutraceuticals

Variable	Coefficient B	S.E.	Wald	Df	p-Value	OR	95% C.I.	
							Lower	Upper
Constant	1.123	0.22	25.69	1	0.000	3.074		
Consuming Nutraceuticals	-1.305	0.64	4.10	1	0.043*	0.27	0.08	0.96
Consuming Herbs	-1.212	0.25	23.38	1	0.001*	0.30	0.18	0.49

The results showed that women who used herbs were less likely to have normal test results (odds ratio [OR] = 0.30, $p < 0.05$). Similarly, the results showed that women who used nutraceuticals were less likely to have normal test results (odds ratio [OR] = 0.27, $p < 0.05$).

These findings suggest that women may consider using nutraceuticals or seeking more affordable, effective options, such as herbs, if their blood test results indicate deficiencies in specific nutrients, such as iron, calcium, or magnesium.

4.5 Investigation of the pattern of use of herbal medicines and nutraceuticals during each pregnancy trimester

Herbal medicines and nutraceuticals used during pregnancy were predicted during each trimester of pregnancy by studying the association between the type of supplements used and the type of herbs used with each trimester of pregnancy, using Fisher's Exact.

4.5.1 Nutraceuticals

Table 4.7 shows the association between the types of supplements used during each trimester of pregnancy.

Table No (4.8): Nutraceuticals type used during each pregnancy trimester

Nutraceuticals		1st trimester N= 308 N (%)	2nd trimester N= 312 N (%)	3rd trimester N= 284 N (%)	χ2	p-value
Folic Acid	**No**	14 (4.5%)	24 (7.7%)	23 (8.1%)	60.9	0.001
	Yes	294 (95.5%)	288 (92.3%)	261 (91.9%)		
Vitamin B 6	**No**	307 (99.7%)	311 (99.7%)	283 (99.6%)	0.95	0.81
	Yes	1 (0.3%)	1 (0.3%)	1(0.4%)		
Multivitamins	**No**	270 (87.7%)	269 (86.2%)	250 (88%)	7.76	0.06
	Yes	38 (12.3%)	43 (13.8%)	34 (12%)		
Calcium Carbonate	**No**	239 (77.6%)	245 (78.5%)	224 (78.9%)	33.17	0.001
	Yes	69 (22.4%)	67 (21.5%)	60 (21.1%)		
Magnesium Oxide	**No**	302 (98.1%)	309 (99%)	282 (99.3%)	9.19	0.03
	Yes	6 (1.9%)	3 (1%)	2 (0.7%)		
Fish Oil	**No**	263 (85.4%)	271 (86.9%)	247 (87%)	21.88	0.001
	Yes	45 (14.6%)	41 (13.1%)	37 (13%)		
Ferrous Fumarate	**No**	307 (99.7%)	311 (99.7%)	283 (99.6%)	2.36	0.51
	Yes	1 (0.3%)	1(0.3%)	1 (0.4%)		
Multivitamins + Folic Acid	**No**	306 (99.4%)	310 (99.4%)	282 (99.3%)	1.91	0.59
	Yes	2 (0.6%)	2 (0.6%)	2 (0.7%)		
Cholecalciferol	**No**	275 (89.3%)	283 (90.7%)	261 (91.9%)	9.25	0.03
	Yes	33 (10.7%)	29 (9.3%)	23 (8.1%)		
Ferrous Sulfate	**No**	304 (98.7%)	312 (100%)	284 (100%)	26.41	0.001
	Yes	8 (2.6%)	9 (2.9%)	7 (2.5%)		
Ferrous Fumarate + Folic Acid	**No**	305 (99%)	312 (100%)	284 (100%)	19.76	0.001
	Yes	3 (1%)	00.0 (0.0%)	00.0 (0.0%)		

Findings show consumption of the various nutraceuticals across the three gestational stages, and the chi-squared test assesses the association between gestational stage and consumption of the respective products. This indicates that folic acid consumption, among other products, occurs at a very high frequency throughout the three levels of gestation, but with a significant variation between the first and the third levels of gestation

(χ^2 = 60.9; p <0.001), with an increase throughout the levels of gestation as indicated by the calcium levels (p <0.001), with magnesium demonstrating a nonsignificant association (p = 0.03).

On the other hand, some nutraceuticals have shown considerable differences (p <0.001), with their use higher in the later months of the second and third trimesters due to medical requirements to aid fetal development. Some other supplements, such as omega-3 fatty acids and vitamin D, show only relatively minor differences.

4.5.2 Herbal Medicine

Table 4.8 shows the association between the type of herbal medicines used and each trimester of pregnancy.

Table No (4.9): Types of Herbal medicines used during each pregnancy trimester

Herbal medicines		**1st trimester** N= 15 N (%)	**2nd trimester** N= 53 N (%)	**3rd trimester** N= 80 N (%)	$\chi 2$	p-value
Cardamom	**No**	15 (100%)	26 (49.1%)	37 (46.3%)	42.78	0.001
	Yes	00.0 (0.0%)	27 (50.9%)	43 (53.8%)		
Dates	**No**	15(100%)	46 (86.8%)	73 (91.3%)	11.81	0.001
	Yes	00.0 (0.0%)	7 (13.2%)	7 (8.8%)		
Castor oil	**No**	15 (100%)	52 (98.1%)	67 (83.8%)	17.60	0.001
	Yes	00.0 (0.0%)	1 (1.9%)	13 (16.3%)		
Chamomile	**No**	15 (100%)	49 (92.5%)	73 (91.3%)	3.28	0.35
	Yes	00.0 (0.0%)	4 (7.5%)	7 (8.8%)		
Ginger Tea	**No**	7 (46.7%)	53 (100%)	80 (100%)	86.09	0.001
	Yes	8 (53.3%)	00.0 (0.0%)	00.0 (0.0%)		
Cranberry	**No**	15 (100%)	46 (86.8%)	80 (100%)	29.73	0.001
	Yes	00.0 (0.0%)	7 (13.2%)	00.0 (0.0%		
Mint	**No**	11 (73.3%)	53 (100%)	80 (100%)	41.41	0.001
	Yes	4 (26.7%)	00.0 (0.0%)	00.0 (0.0%)		
Cumin	**No**	12 (80%)	53 (100%)	80 (100%)	30.76	0.001
	Yes	3 (20%)	00.0 (0.0%)	00.0 (0.0%)		
Fenugreek	**No**	15 (100%)	53 (100%)	77 (96.3%)	4.53	0.21
	Yes	00.0 (0.0%)	00.0 (0.0%)	3 (3.8%)		
Spirulina	**No**	15 (100%)	50 (94.3%)	80 (100%)	12.26	0.007
	Yes	00.0 (0.0%)	3 (5.7%)	00.0 (0.0%)		
Saffron	**No**	15 (100%)	53 (100%)	76 (95%)	6.10	0.11
	Yes	00.0 (0.0%)	00.0 (0.0%)	4 (5%)		
Cinnamon	**No**	11 (73.3%)	42 (79.2%)	62 (77.5%)	1.48	0.69
	Yes	4 (26.7%)	11 (20.8%)	18 (22.5%)		

Findings illustrate the association between the first, second, and third trimesters of pregnancy and the consumption of various medicinal herbs among pregnant women. The

majority of herbs used were not used during the first trimester (N = 15), while their use gradually increased in the second and third trimesters, with statistically significant differences observed in some varieties.

Statistically significant differences were observed in the consumption of cardamom, cloves, castor oil, ginger, and cumin (high chi-square values, and all p-values approximately 0.001). For example, cardamom went from being unused in the first trimester to being consumed by nearly half the sample in the second and third trimesters. Similarly, cumin use appeared in the first trimester and then almost disappeared in later stages, indicating that the consumption pattern of these herbs is significantly related to the stage of pregnancy.

4.6 Investigate the association of the pattern of use of herbal medicines and nutraceuticals with blood tests

Herbal medicines and nutraceuticals used during pregnancy were predicted from normal/non-normal blood test results by studying the association between the type of supplements and the type of herbs used, using Fisher's Exact test.

4.6.1 Nutraceuticals

Table 4.7 shows the association between supplement types and blood tests during pregnancy.

Table No (4.10): Nutraceutical type used during pregnancy that associated with blood tests

Nutraceuticals		WBC		p-value	RBC		p-value	Platelets count		p-value
		Non-Normal N=32	Normal N=259		Non-Normal N=100	Normal N=191		Non-Normal N=5	Normal N=286	
Folic Acid	**No**	3 (9.4%)	23 (8.9%)	0.93	8 (8%)	18 (9.4%)	0.69	1 (20%)	25 (8.7%)	0.38
	Yes	29 (90.6%)	236 (91.1%)		92 (92%)	173 (90.6%)		4 (80%)	261 (91.3%)	
Vitamin B 6	**No**	32	259	**	100	191	**	5	286	**
	Yes	-	-		-	-		-	-	
Multivitamins	**No**	26 (81.3%)	217 (83.8%)	0.72	82 (82%)	161 (84.3%)	0.62	5 (100%)	238 (83.2%)	0.32
	Yes	6 (2.1%)	42 (16.2%)		18 (18%)	30 (15.7%)		0	48 (16.8%)	

Nutraceuticals		WBC		p-value	RBC		p-value	Platelets count		p-value
		Non-Normal N=32	Normal N=259		Non-Normal N=100	Normal N=191		Non-Normal N=5	Normal N=286	
Calcium Carbonate	**No**	27 (84.4%)	211 (81.5%)	0.69	87 (87%)	151 (79.1%)	0.10	4 (80%)	234 (81.8%)	0.92
	Yes	5 (15.6%)	48 (18.5%)		13 (13%)	40 (20.9%)		1 (20%)	52 (8.2%)	
Magnesium Oxide	**No**	32 (100%)	256 (98.8%)	0.54	100 (100%)	188 (98.4%)	0.21	5 (100%)	283 (99%)	0.82
	Yes	0	3 (1.2%)		0	3 (1.6%)		0	3 (1%)	
Fish Oil	**No**	29 (90.6%)	225 (86.9%)	0.55	96 (96%)	158 (82.7%)	**0.001***	4 (80%)	250 (87.4%)	0.62
	Yes	3 (9.4%)	34 (13.1%)		4 (4%)	33 (17.3%)		1 (20%)	36 (12.6%)	
Ferrous Fumarate	**No**	32 (100%)	257 (99.2%)	0.62	100	189 (99%)	0.31	5 (100%)	284 (99.3%)	0.85
	Yes	0	2 (0.8%)		0	2 (1%)		0	2 (0.7%)	
Multivitamins + Folic Acid	**No**	32 (100%)	257 (99.2%)	0.62	99 (99%)	190 (99.5%)	0.64	5 (100%)	284 (99.3%)	0.85
	Yes	0	2 (0.8%)		1 (1%)	1 (0.5%)		0	2 (0.7%)	
Cholecalciferol	**No**	29 (90.6%)	232 (89.6%)	0.85	93 (93%)	168 (88%)	0.18	5 (100%)	256 (89.5%)	0.44
	Yes	3 (9.4%)	27 (10.4%)		7 (7%)	23 (12%)		0	30 (10.5%)	
Ferrous Sulfate	**No**	31 (96.9%)	251 (96.9%)	0.99	95 (95%)	187 (97.9%)	0.18	5 (100%)	277 (96.9%)	0.69
	Yes	1 (3.1%)	8 (3.1%)		5 (5%)	4 (2.1%)		0	9 (3.1%)	
Ferrous Fumarate + Folic Acid	**No**	23 (71.9%)	214 (82.6%)	0.14	70 (70%)	167 (87.4%)	**0.001***	2 (40%)	235 (82.2%)	**0.016***
	Yes	9 (28.1%)	45 (17.4%)		30 (30%)	24 (12.6%)		3 (60%)	51 (17.8%)	

The analysis demonstrated that most nutraceuticals were not significantly associated with abnormal WBC, RBC, or platelet counts, as most comparisons yielded non-significant results ($p > 0.05$). Regarding RBC counts, a statistically significant association with fish oil supplementation was observed: abnormal RBC levels were more frequent among non-users (96%) than among users (4%) ($p = 0.001$).

Additionally, the combined intake of ferrous fumarate and folic acid was significantly associated with RBC status, with higher abnormal values reported among users (30%) than among non-users (12.6%) (p = 0.001). A similar pattern was observed for platelet counts, where abnormal platelet levels were higher among users of ferrous fumarate plus folic acid (60%) than non-users (17.8%), indicating a statistically significant association (p = 0.016). In contrast, no significant differences in WBC counts were detected across all nutraceutical types.

4.6.2 Herbal Medicine

Table (4.8) shows the association between the type of herbal medicines used and each trimester of pregnancy period.

Table No (4.11): Types of Herbal medicines used during pregnancy that associated with blood tests

Herbal medicines		WBC			RBC			Platelets count		
		Non-Normal N=6	Normal N=103	p-value	Non-Normal N=8	Normal N=101	p-value	Non-Normal	Normal	p-value
Cardamom	**No**	0	66 (64.1%)	0.002	8 (100%)	58 (57.4%)	0.002	-	66 (60.6%)	
	Yes	6 (100%)	37 (35.9%)		0	43 (42.6%)		-	43 (39.4%)	
Dates	**No**	6 (100%)	96 (93.2%)	0.51	8 (100%)	94 (93.1%)	0.44		102 (93.6%)	
	Yes	0	7 (6.8%)		0	7 (6.9%)			7 (6.4%)	
Castor oil	**No**	6 (100%)	90	0.35	0	96 (95%)	0.001		96 (88.1%)	
	Yes	0	13		8 (100%)	5 (5%)			13 (11.9%)	
Chamomile	**No**	6 (100%)	92 (89.3%)	0.40	8 (100%)	90 (89.1%)	0.33		98 (89.9%)	
	Yes	0	11 (10.7%)		0	11 (10.9%)			11 (10.1%)	
Ginger Tea	**No**	6 (100%)	95 (92.2%)	0.48	8 (100%)	93 (92.1%)	0.41		101 (92.7%)	
	Yes	0	8 (7.8%)		0	8 (7.9%)			8 (7.3%)	
Cranberry	**No**	6 (100%)	96 (93.2%)	0.51	8 (100%)	94 (93.1%)	0.44		102 (93.6%)	
	Yes	0	7 (6.8%)		0	7 (6.9%)			7 (6.4%)	
Mint	**No**	6 (100%)	99 (96.1%)	0.62	8 (100%)	97 (96%)	0.57		105 (96.3%)	
	Yes	0	4 (3.9%)		0	4 (4%)			4 (3.7%)	
Cumin	**No**	6 (100%)	100 (97.1%)	0.67	8 (100%)	98 (97%)	0.62		106 (97.2%)	

Herbal medicines		WBC			RBC			Platelets count		
		Non-Normal N=6	Normal N=103	p-value	Non-Normal N=8	Normal N=101	p-value	Non-Normal	Normal	p-value
	Yes	0	3 (2.9%)		0	3 (3%)			3 (2.8%)	
Fenugreek	**No**	6 (100%)	100 (97.1%)	0.67	8 (100%)	98 (97%)	0.62		106 (97.2%)	
	Yes	0	3 (2.9%)		0	3 (3%)			3 (2.8%)	
Spirulina	**No**	6 (100%)	100 (97.1%)	0.67	8 (100%)	98 (97%)	0.62		106 (97.2%)	
	Yes	0	3 (2.9%)		0	3 (3%)			3 (2.8%)	
Saffron	**No**	6 (100%)	99 (96.1%)	0.62	8 (100%)	97 (96%)	0.57		105 (96.3%)	
	Yes	0	4 (3.9%)		0	4 (4%)			4 (3.7%)	
Cinnamon	**No**	6 (100%)	81 (78.6%)	0.21	8 (100%)	79 (78.2%)	0.14		87 (79.8%)	
	Yes	0	22 (21.4%)		0	22 (21.8%)			22 (20.2%)	

The findings show that the use of most herbal medicines during pregnancy was not significantly associated with abnormalities in WBC, RBC, or platelet counts, as indicated by non-significant p-values ($p > 0.05$) across the majority of comparisons. Notably, cardamom use was associated with statistically significant changes in both WBC and RBC parameters. All cardamom users exhibited non-normal WBC counts (6 cases, 100%) compared with non-users, who showed normal WBC values (66 cases, 64.1%), resulting in a significant difference ($p = 0.002$). Similarly, non-normal RBC counts were observed among all non-users (8 cases, 100%), whereas none of the cardamom users had abnormal RBC values ($p = 0.002$).

In addition, castor oil use was significantly associated with RBC counts, as abnormal RBC values were detected exclusively among non-users (8 cases, 100%) and not among users ($p = 0.001$). In contrast, platelet counts showed no statistically significant associations with the use of any herbal medicine ($p > 0.05$), suggesting no observable effect on platelet status in this cohort.

Chapter Five
Discussion of Findings and Recommendations

5.1 Introduction

To achieve the objectives of this study, investigating the pattern of use of herbal medicines and nutraceuticals among pregnant women in Iraq, both descriptive and inferential statistical tests were applied.

5.1.1 Prevalence and pattern of use of nutraceutical products during pregnancy period among Iraqi women

The results obtained from the current study revealed that the utilization rate of **nutraceutical** supplements among pregnant women was higher compared to the utilization of herbal medicines in Iraq. The most commonly used nutraceutical were folic acid and calcium, while the least used were B-complex vitamins. Additionally, the source of information and advice on the use of nutraceutical supplements was primarily obtained from health professionals, including physicians. The pattern that is reflected in the consumption of nutraceutical supplements aligns with the world's focus on the importance of micronutrient supplements during the period of pregnancy (De-Regil et al., 2015).

The prevalence of folic acid being used, as indicated within the current study, is justified by the widespread accepted clinical practice of prescribing of folic acid, on daily recommended does, prior to and during early pregnancies as a preventive approach against congenital neuronal tube defects (WHO, 2023). Various studies (Matthews et al., 2014) have significantly indicated the pivotal role of folic acid supplement administration within the prevention of congenital disabilities, and the enhancement of early fetal growth. This is reinforced by Sharma et al. (2022), who found that folic acid was a critical ingredient of the essential nutraceutical supplements administered during pregnancies, within females and the fetus within the context of DNA formation and playing a pivotal role in the development of the neuronal tube. Similarly, a very high rates of female patients consuming folic acid supplement throughout the various phases of pregnancies were indicated by Liu et al. (2023), showing the widespread knowledge of the critical role played by the folic acid supplement.

Calcium supplements are ranked as the second most used supplement in this study. This aligns with the global results (WHO, 2023). Calcium has proven essential in the

formation of the fetal skeleton, as well as the prevention of hypertensive disorders among pregnant women. Through the conducted multi-centric study, the observations made by Han et al. (2025), point out that the consumption of calcium supplements increased significantly during the second and third trimesters of pregnancies, particularly among older pregnancies. This aligns with significance, which is important for the need for this supplement to be used during the later stages of pregnancy. Furthermore, Cetin et al. (2025) validates the existence of a required need among pregnant women on the consumption of this supplement during pregnancies, due to poor nutritional levels.

On the other hand, B-complex vitamins showed the least consumption of nutraceuticals. Though B vitamins have remarkable functions in the metabolism of energy and the development of the nervous system, they tend to be less used compared with other supplements like folic acid, iron, calcium, and vitamin D in this study. Similarly, recent studies performed by Liu et al. (2023) and Han et al. (2025) revealed that the predominant used nutraceuticals among pregnant women were folic acid, iron, vitamin D, and DHA more than B vitamins.

Notably, this study revealed that physicians are the major source of information for women regarding their uses of nutraceuticals. This study findings confirms other research that indicated women frequently seek information on the supplement consumption through official healthcare settings. To illustrate, the study conducted by Perna et al. (2024), indicated that there was a significant association between the pregnancy outcomes of women and their nutritional well-being informed by the consumption of medical advice, supplements, and foods. On the other hand, Cetin et al. (2025) illustrate for the need for more inclusive and holistically official advice on the consumption of nutraceutical supplements among women offered by healthcare experts. Note that physicians being the major source of information on nutraceuticals, again illustrate that the advice of these experts are considered central in informing the behavior of women, with regards to supplement consumption.

5.1.2 Prevalence and pattern of use of herbal medicine during pregnancy period among Iraqi women

In this study, findings showed that the use of herbal medicine remained common among pregnant women, although it was less prevalent than the use of nutraceutical supplements. Moreover, the primary source of information on the use of herbal medicine

was family members, rather than healthcare professionals. These findings were explained by Mohammed et al. (2024), found that the use of herbs during the pregnancy in Ethiopia was greatly affected by the indigenous perception system and particularly among the uneducated mothers.

In addition, the low cost of herbs use emerged as the major motive for using them. Similarly, observations made by (Ouoba et al., 2023) stated that different herbal medicines are collected freely within their natural environment with no need for any financial support, which makes the cost of using medicinal herbs significantly lower compared to the costs of utilizing nutraceutical and pharmaceutical health products. Additionally, the observations made by Eid and Jaradat (2020) are also in agreement, as stated that the easy of accessibility and affordability makes the use of herbal medicine significantly reliable during periods of pregnancies and breastfeeding.

Of the herbs used, as expected, the high prevalence of cinnamon use in this study was based on cultural observations of the commonly used herbs during pregnancy (Ahmed et al., 2022). Similarly, the commonly used herbs among the pregnant and lactating women, were elucidated by Eid and Jaradat (2020) to include sage, anise, mint, and cinnamon being frequently used. These findings could be attributed to the food culture and perception of the women, and its exploration of the acceptability and safety of these herbs to treat the pregnancy-related discomforts and complaints of the patients, including gastrointestinal discomforts (Kennedy et al., 2013), considered as safe alternative options to conventional medications during pregnancy, used for treatment of nausea and vomiting (Matthews et al., 2014).

Despite the popularity of herbal medicine, there could be associated risks involved with their use among the pregnant woman, that was underestimated by the participants. A study by Illamola et al. (2020), showed that the combined use of herbal and conventional medicines among pregnant women might result into health complications, especially if the woman was previously diagnosed with epilepsy and/ or asthma. The lack of dosage adjustments and quality regulations on the use of herbs could potentially contribute to toxicity (Ouoba et al., 2023).

5.1.3 The impact of demographic and socioeconomic variables, residential area, and occupational status on the type of nutraceutical products or herbal medicines used among the study participants

In the current study, significant associations were found between the use of nutraceuticals and herbal medicines with certain key demographic variables, specifically maternal age, parity, and educational level. Moreover, studies conducted by Shanshal et al. (2023) and (Shihab et al., 2022) revealed that females have tendencies to use Dietary Supplements more frequently than their counterparts, without laboratory testing or consultation with their physicians. It can be concluded that using herbal or nutritional supplements in an unsupervised manner could be attributed to socio-economic factors.

Data revealed that pregnant women aged 20-30 years, were the predominant users of nutraceutical supplements. Younger childbearing women may be more likely to access health information online, be more receptive to antenatal advice, or be more aware of health-related risks during pregnancy. These findings are in line with the observations made by Han et al. (2025), who noted that maternal age influenced certain supplement practices, particularly calcium supplements, which were significantly higher among women aged 35 and older in the later stages of pregnancy.

In addition, findings revealed that the first-time pregnant women, known as primigravida, were also the most likely to use nutraceutical supplements. The observation that primigravida women were more likely to use supplements like folic acid and calcium is consistent with the literature. Sharma et al. (2022), and Perna et al. (2024), support the conclusion that supplement use is strongly linked with perceived risk and health consciousness, both of which are likely to be greater within the context of primigravida, who are often faced with greater uncertainties and, therefore, place a greater reliance on health advice.

Moreover, in this study it was observed that women possessing a moderate level of education were the most likely women to use both nutraceutical and herbal medicines. The study is partially in line with findings by Liu et al. (2023), argued that ‘low educational level is linked to nonuse of supplements and reliance on non-science sources of health information, indicating a positive association between education and supplement use. Women may have enough education to understand the medicinal value of supplements. Yet, they ‘could remain rooted in their families’ traditions, which are

often centered on herbs and other forms of ‘alternative’ healing practices. (Mohammed et al., 2024), explaining the causes for women with low or moderate education levels, are often partial to the official health systems and trust their ‘traditional’ health practices. Additionally, Eid and Jaradat (2020) argued that ‘herbal practices were common among those women who were loyal to their culture, regardless of education level.’

This study findings revealed a significant association between the utilization of nutraceuticals and herbs and two significant socioeconomic variables, namely, place of residence and employment status. More specifically, the study showed women residing in urban areas are significantly more likely than women residing in rural areas to use nutraceutical supplements and herbs. In the context of urban areas, women usually have easy access to health facilities, pharmacies, and antenatal care; therefore, they are more likely to receive health education and counseling. In the context of urban areas, women are more likely to purchase herbs and supplements that are available in retail shops, compare to rural areas residence, whereas the availability of health facilities appears to remain underdeveloped. This may indirectly connect with the study conducted by Liu et al. (2023), which revealed that consumption of supplements relates to health facilities based on their study on education, employment, and social support. The study conducted by Ouoba et al. (2023) points out that the major source of herbal supplements used by women in rural areas is the collection of health supplements from the wilderness.

In addition, this study showed that housewives were significantly more likely than working women to use nutraceutical supplements and herbs during pregnancy. A study conducted by Mohammed et al. (2024) on Ethiopian women, showed the strong association of the consumption of herbs with women’s association with their families. On the other hand, time limitations and occupational stress may challenge these women to adhere to the use of supplements and herbal medicine. Liu et al. (2023) claimed that the unemployed females could potentially use supplements irregularly and possibly through unofficial channels of knowledge acquisition.

A higher prevalence of housewives using herbal medicine could very, based on their financial freedom. This corresponds with the study conducted by Eid and Jaradat (2020), which cited financial aspects as the most pivotal decision-making factors for the usage of herbs.

5.1.4 The impact of using herbal medicines and nutraceuticals products on the blood laboratory tests results among the study participants

Findings from the present study reveal that women using herbal medicine and nutraceuticals have significantly associated with variations in red blood cell (RBC) counts, while no significant associations were observed for white blood cells (WBC) or platelet counts. These results align with existing literature highlighting both the potential benefits and risks of herbal and nutraceutical use during pregnancy.

Women consuming herbal medicines had the lowest proportion of abnormal RBC results (7.3%), compared to nutraceutical users (34.4%) and non-medication users (54.5%). Literature suggests that herbal medicine use may be linked to better hematological outcomes, possibly due to iron-rich or hematopoietic properties of certain herbs. Certain herbs may improve iron status, reducing anemia risk (Im et al., 2023). Others, such as Aristolochia or Ephedra, have been linked to renal and cardiovascular toxicity (Naga Mounica et al., 2025).

Naga Mounica et al. (2025) explained the observed lower odds of normal test results among nutraceutical users may reflect self-selection bias, where women with pre-existing deficiencies are more likely to consume supplements (UNICEF, 2023).

5.1.5 The pattern of use of herbal medicines and nutraceuticals during each pregnancy trimester

This study revealed that most of the pregnant women used folic acid and calcium supplements during the first trimester of their pregnancies. Likewise, women who used herbal medicines had also started their consumption early during their pregnancies. These results confirm the observations of the study conducted by Hwang et al. (2016), who reported that herbal medicine and multivitamins were used extensively by the mothers during the early stages of pregnancies without consulting the practitioners. The widespread consumption of calcium and vitamins during early pregnancies is further confirmed by the study of Shanshal et al. (2023).

The early usage of herbal medicine during the first trimester of pregnancy as recorded in this study, supports the findings of the study conducted by Fadheel and Mohammed (2024), who indicated the widespread practice of herbs usage in Iraq due to various cultural and individual reasons, rather than the scientific-base rational. Nevertheless,

Humadi et al. (2023) suggested that most herbal practitioners base herbal treatment only on their individual experience and thus sustain the issue of early usage of herbal medicine without medical supervision.

The implications of this study, therefore, confirming that health education campaigns on antenatal care practices are required, in order to inform and advise pregnant women on the associated risks of misuse of herbal medicine and nutraceutical products. Maternal care health programs must focus on different approaches toward dealing with nutrition-directed supplements and herbal medicine consumption, based on strong cultural beliefs associated with their use. The sociocultural aspects contributed significantly to the pattern of use of these products and should therefore never be overlooked. Additionally, interventions to avoid missus of these products should ideally take place before or at the onset of the first trimester.

Moreover, healthcare providers should carefully monitor pregnant women using herbal medicines or nutraceuticals, as these products may alter laboratory test outcomes and complicate diagnosis. Stronger regulation and pharmacovigilance are needed to ensure product safety and efficacy during pregnancy. Larger, controlled studies are required to clarify causal associations and identify specific herbs or nutraceuticals that are beneficial versus harmful.

5.1.6 Investigate the association of the pattern of use of herbal medicines and nutraceuticals with blood tests

Most nutraceuticals included in the analysis were not significantly associated with abnormalities in WBC or platelet counts ($p > 0.05$), indicating that routine prenatal supplementation generally does not disrupt leukocyte or platelet homeostasis when used appropriately. Recent international expert consensus emphasizes that standard micronutrient supplementation during pregnancy is considered safe when tailored to maternal needs and administered under clinical supervision (Cetin et al., 2025; Perna et al., 2024).

A statistically significant association was observed between fish oil supplementation and RBC status, where abnormal RBC counts were markedly higher among non-users (96%) compared to users (4%) ($p = 0.001$). Contemporary evidence suggests that omega-3 fatty acids contribute to maternal physiological regulation through effects on cell membrane composition and oxidative balance; however, direct hematological outcomes

are considered secondary effects rather than primary targets of supplementation (Cetin et al., 2025; Cai et al., 2024).

In contrast, the combined use of ferrous fumarate and folic acid was associated with higher proportions of abnormal RBC values (30% vs. 12.6%; p = 0.001) and platelet counts (60% vs. 17.8%; p = 0.016). Current clinical literature indicates that such associations often reflect reverse causation, as iron supplementation is commonly initiated in response to pre-existing anemia or abnormal hematological findings. Moreover, recent reports highlight that excessive or unmonitored iron intake during pregnancy may contribute to hematological imbalance, underscoring the importance of individualized supplementation based on laboratory assessment (Shishii et al., 2024; FIGO, 2025)

Cardamom use showed a statistically significant association with both WBC and RBC parameters (p = 0.002 for each). All cardamom users exhibited non-normal WBC values, while abnormal RBC values were observed only among non-users. Although cardamom possesses documented anti-inflammatory and antioxidant properties, recent pharmacological reviews emphasize the lack of robust clinical data regarding its hematological effects during pregnancy. Therefore, this association may reflect confounding factors or small subgroup sizes rather than a direct biological effect (Ashokkumar et al., 2020; Im et al., 2023).

Similarly, castor oil use was significantly associated with RBC status, with abnormal RBC values occurring exclusively among non-users (p = 0.001). Contemporary obstetric literature consistently reports that castor oil neither provides clear clinical benefit nor demonstrates consistent harm during pregnancy, and no direct hematological toxicity has been established. Consequently, this finding should be interpreted cautiously and may reflect contextual or selection effects rather than causality (Boel et al., 2009; Perna et al., 2024).

5.2 Conclusions

This study highlighted patterns in the consumption of herbal medicine and nutraceutical products across demographic variables and during different phases of pregnancy. Findings point out the significance of the combined effects of the culture on maternal health behavior and the relevance of education pertaining to the study participants.

In general, the results of this study are consistent with the existing literature in highlighting the significant, medically driven, and globally recommended use of nutraceutical supplementation among pregnant women. The associations uncovered by this study suggest the complex associations between various demographics and women's health practices during pregnancy. Younger ages, pregnancy for the first time, and educational levels attained are factors that show associations with women’s choices concerning nutraceuticals and herbal medicines used. Rural and urban health care delivery systems have different requirements due to their distinct patterns of accessibility. Additionally, the result of this study concludes that there are enormous cultural, social, as well as financial implications involved in the prevalence of use of herbal medicine.

5.3 Study Recommendations

1. Early initiation of antenatal counseling should occur ideally prior to conception or during the first trimester of the pregnancy.
2. Enhance communication pathways about the use of key nutraceuticals for pregnant women, with the healthcare community, regarding underutilized herbal products and nutraceuticals such as B-complex vitamins
3. Develop educational programs on the safety of herbs and the health risks of their use.
4. Tailor the health message according to specific target groups specifically, who are relatively young, primigravida, and moderately well-educated.
5. Improve rural outreach and access through the strengthening of antenatal care services, supplement availability, and proper education.
6. Supply well-structured information to housewives, who greatly depend on the community, to get the proper information on maternal health care requirements.

5.4 Study Limitations

Despite the important scientific contributions of this study, certain constraints were identified regarding sample size, geographical distribution, the availability of knowledge, the presence of certain variables (such as medicines and pre-existing health conditions), obtaining consent from the mother, and collecting sensitive information. Besides other constraints set on this study, certain deterrent aspects of this study are detailed further below:

- **Geographical limitations:** The study was limited to a single hospital in Iraq, specifically Al-Batoul Teaching Hospital. This, in turn, contributed to the inability to generalize the results to pregnant women in other regions of the country.
- **Time limitations:** The study was a short-term, deterministic study; therefore, it does not reflect long-term effects on women's experience, attitudes and opinions regarding the use of these supplements.

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Appendices

Appendix I Scientific Research Ethics Approval

جـامـعـة الـشـرق الأوسـط
MEU MIDDLE EAST UNIVERSITY
Amman - Jordan

مكتب رئيس الجامعة
Office of the President

الرقم: د ر/د/1485
التاريخ: 2025/01/09

قرار رقم (2025/2024-695)

وبناءً على الصلاحيات المخولة لنا وما تقتضيه مصلحة العمل

تقـــرر

الموافقة على طلب مشروع بحث على الإنسان (استبانات/مقابلات) للطالب **مبين عبدالخالق عبدالله**/ماجستير العلوم الصيدلانية، والباحث المشارك الدكتورة **ريم عيسى**/كلية الصيدلة، المعنون بـ: "**الآثار المحتملة للأدوية العشبية والمستحضرات الصيدلانية النباتية بين النساء الحوامل: دراسة مقطعية في العراق**"، على أن يتم تطبيق سياسة أخلاقيات البحث العلمي دون تحمّل الجامعة أية أعباء أو تكلفة مادية أو مسؤولية قانونية.

وتفضلوا بقبول فائق الاحترام والتقدير...

رئيسة الجامعة

أ. د. سلام خالد المحادين

جامعة الشرق الأوسط
مكتب رئيس الجامعة
MEU
Office of the President
Amman-Jordan
MIDDLE EAST UNIVERSITY

Appendix II Hospital no objection


السيد مدير مستشفى البتول المحترم
السيد مسؤول لجنة البحوث الطبية المحترم

م/ طلب

تحية طيبة...

يرجى التفضل بالموافقة على تخويلي بإجراء إستبيان علمي لغرض إجراء بحث علمي على المرضى الراقدين في مستشفانا. علماً بان الاستبيان مرفق طياً.

تقبلوا لكم أسمى آيات الاحترام

مقدم الطلب
الدكتور الصيدلي
مُنز عبد الخالق عبد الله
B.Pharm
٢٧/٣/٢٠٢٥

الدكتور
بسام محمد مشخال
27-03-2025
مدير مستشفى البتول التعليمي

توقيع الحال السيد المدير المحترم
للتفضل بالاطلاع. امركم م/ احترام

الصيدلي
ابراهيم كريم عطا الله
مسؤول لجنة البحوث الطبية
٢/٢٧