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THE RELATION OF THE POTENTIAL VITAMIN D DEFICIENCY WITH PREGNANT WOMEN IN TRIMESTER

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MOHAMMED NAJEEB SAFAR AL-BAYATI

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THE RELATION OF THE POTENTIAL VITAMIN D DEFICIENCY WITH PREGNANT WOMEN IN TRIMESTER

By Mohammed Najeeb Safar AL-BAYATI
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We certify that we have read this thesis and that in our opinion it is fully adequate, in scope and in quality, as a thesis for the degree of Master of Science

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Mohammed Najeeb Safar AL-BAYATI

ABSTRACT

THE RELATION OF THE POTENTIAL VITAMIN D DEFICIENCY WITH PREGNANT WOMEN IN TRIMESTER

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Iraqis, particularly pregnant women, suffer from vitamin D deficiency. There are no exact statistics about it in Iraq. The study's main goal was to find out how common vitamin D deficiency was among pregnant women getting prenatal care and giving birth at Fallujah General Hospital in Anbar, Iraq. The purpose of this thesis was to look at vitamin D, calcium, hemoglobin, iron, and serum ferritin levels in pregnant women. The volunteers were divided into two groups: 50 patients and 50 controls, note that the two groups of patients and healthy people are the same people, but the healthy group was taken in the first week of pregnancy and we conducted tests for them, and the group of patients in the third trimester of pregnancy we conducted tests for them. In the patients group, blood vitamin D levels were (14.70 ± 6.164 ng/mL), they had hypovitaminosis D (less than 30 ng/mL; P=0.016), they had low calcium (8.192 ± 0.30 mg/dL; P=0.49), they had low Iron (31.59 ± 7.85 µg/dL; P=0.001), they had low hemoglobin (10.28 ± 0.73 g/dL; P=0.34) and they had low ferritin (38.35 ± 17.28 ng/dL; P=0.71) as compared to control group. This research recommends that all pregnant women take a vitamin D supplement, as well as calcium and iron supplements, especially in the third trimester.

2022, 42 pages

Keywords: Pregnant women, Vitamin D deficiency, Trimester

ÖZET

D VİTAMİNİ EKSİKLİĞİNİN DÖNEMDEKİ HAMİLE KADINLARLA İLİŞKİSİ

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Temmuz 2022

Iraklılar, özellikle hamile kadınlar, D vitamini eksikliği çekiyor. Irak'ta bununla ilgili kesin bir istatistik yok. Çalışmanın temel amacı, Irak'ın Anbar kentindeki Felluce Genel Hastanesi'nde doğum öncesi bakım alan ve doğum yapan hamile kadınlar arasında D vitamini eksikliğinin ne kadar yaygın olduğunu bulmaktı. Bu tezin amacı hamile kadınlarda D vitamini, kalsiyum, hemoglobin, demir ve serum ferritin düzeylerini incelemekti. Gönüllüler iki gruba ayrıldı: 50 hasta ve 50 kontrol, iki hasta ve sağlıklı grubun aynı kişi olduğunu, ancak sağlıklı grubun hamileliğin ilk haftasında alındığını ve onlar için testler yaptık ve Hamileliğin üçüncü trimesterindeki hasta grubu onlar için testler yaptık. Hasta grubunda kan D vitamini düzeyleri (14.70 ± 6.164 ng/mL), hipovitaminozu D (30 ng/mL'den az; P=0.016), kalsiyum düşüklüğü (8.192 ± 0.30 mg/dL; P=) idi. 0.49), düşük Demir (31.59 ± 7.85 µg/dl; P=0.001), düşük hemoglobin (10.28 ± 0.73 g/dL; P=0.34) ve düşük ferritin (38.35 ± 17.28 ng/dL; P) vardı. =0.71) kontrol grubuyla karşılaştırıldığında. Bu araştırma, tüm hamile kadınların özellikle üçüncü trimesterde kalsiyum ve demir takviyelerinin yanı sıra D vitamini takviyesi almasını önermektedir.

2022, 42 sayfa

Anahtar Kelimeler: Hamile kadınlar, D vitamini eksikliği, Trimester

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Mohammed Najeeb Safar AL-BAYATI
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CONTENTS

LIST OF SYMBOLS

%	Percent
/	Divide
+	Plus
<	The Lesser than
>	The Greater than
µL	Microliter
D	Deci
dL	Deciliter
Fe	Iron
IU	International Unit
K+	Potassium Ion
L	Litre
mg	Milligram
mIU	Milli-International Units
mL	Milliliter
Na+	Sodium Ion
ng	Nanogram
nm	Nanometer
nmol	Nanomole
ºC	Degrees Celsius
uL	Unit Litre
α	Alpha

LIST OF ABBREVIATIONS

AI	Adequate Intake
D3	Cholecalciferol
CBC	Complete Blood Count
D2	Ergocalciferol
GRAN	Granulocytes
HGB	Hemoglobin
HPLC	High Performance Liquid Chromatography
HPT	Hypovitaminosis
LYM	Lymphocytes
MID	Mid-Sized
PTH	Parathyroid Hormone
PTHrP	Parathyroid Hormone Related Peptide
POL	Physician Office Laboratories
PLT	Platelets
RBC	Red Blood Cells
SAS	Statistical Analysis System
UVB	Ultraviolet B
VDBP	Vitamin D Binding Protein
WBC	White Blood Cells

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1. INTRODUCTION

Vitamin D is essential for a long and healthy life. Two probable sources are the creation of skin and the ingestion of food. The majority of people get their vitamin D via the sun's UVB 290–315 nm rays. 7-dehydrocholesterol is turned into vitamin D3 (cholecalciferol) in the skin by the sun's ultraviolet B rays. There are a lot of things that could affect how much Vitamin D3 your body makes, like the time of day and the colour of your skin. People who wear sunscreen play a big role in how vitamin D3 makes itself. The liver produces vitamin D3, which is subsequently converted into 1.25-dihydroxyvitamin D3 in the kidney. There are many people who don't get enough vitamin D. This isn't just a problem for young people (Pittas *et al.* 2006). Children who don't get enough vitamin D can get rickets, which can lead to bone loss in adults and osteomalacia in kids. Colon and prostate cancer, Type 1 and Type 2 diabetes, and moo vitamin D levels have all been connected to these wellbeing issues (Pittas et al. 2006, Wreath et al. 2006). Extrarenal 1alphahydroxylase may require blood levels of 25-hydroxyvitamin D to remain above 80 nmol/L (about 30 ng/ml), which is found in most tissues and makes 1.25-dihydroxyvitamin D3 (Holick 2004, Alia and Kerr 2021).

Aim of study

1. To determine the relationship between vitamin D levels in the first and third trimester pregnancy of Iraqi women.
2. To look into the prevalence of other parameters (calcium, hemoglobin, ferritin, and iron) in the first and third trimesters of pregnancy among Iraqis.

2. LITERATURE REVIEW

2.1 Vitamin D Physiologic Components

There are two sorts of vitamin D: vitamin D2 (ergocalciferol) and vitamin D3 (cholecalciferol); both of which are found in nourishment. It's conceivable to induce vitamin D3 and vitamin D2 within the nourishment we eat. Both shapes of vitamin D are made within the skin of individuals and creatures. In individuals who aren't pregnant, the address of whether D2 or D3 is way better at keeping vitamin D levels within the blood isn't clear (Holick *et al.* 2008, Alia and Kerr 2021).

The term "vitamin D" in this review should be taken to mean either vitamin D2 or vitamin D3. Foods like meat, poultry, dairy products, and most fruits and vegetables that aren't fortified are low in vitamin D. Fish, some plants, and some foods that aren't fortified have vitamin (Food and Nutrition Board 2004). Wild salmon (3.5 oz) has 600–1000 IU in each serving; cultivated salmon has almost 25% of this sum in each serving (Lu *et al.* 2007).

In case you eat a few mackerel, sardines, or fish, it has 200–300 universal units in it (IU). 600–1000 universal units are made after you take 1 teaspoon of cod liver oil each day. Shiitake mushrooms, which grant you 1600 IU of vitamin D, are a uncommon source of vitamin D from a nourishment plant. Within the Joined together States, vitamin D comes generally from nourishments that have been made with vitamin D. A few cases of invigorated nourishments that have vitamin D in them are 8 ounces of braced drain or orange juice, 3oz of invigorated cheese, or invigorated morning cereal (Table 2.1). (Ko et al. 2008). When it comes to wellbeing, vitamin D from nourishment isn't as vital as the hormone the body makes itself when it's uncovered to bright light (Webb *et al.* 1989).

Table 2.1 Vitamin D content

Source of vitamin D	Amount of vitamin D (IU)
8 oz of vitamin D-enriched milk from a cow	98
8 oz of vitamin D-enriched soy milk	100
8 oz. of fortified orange juice	100
1 cup of fortified oatmeal.	40–50
Canning 3 oz. of pink salmon	530
3 oz of canned sardines	231
fish (mackerel), 3 ounces	306
3 oz. of Herring.	1,383
3 oz. catfish	425
3 ounces of canned tuna	200
1 package of Quaker Nutrition for Women's Instant Oats	154
Goat's milk	25
Most multivitamins are multivitamins.	400
1 drop of Tri-Vi-Sol baby dietary supplement	400
Vitamins for expectant mothers	400
Vitamin D3 pills available over-the-counter	2000 (max)
Supplements for vitamin D2 insufficiency that are often provided	50,000 (given weekly until replete)

Vitamin D3 is made within the skin when individuals are uncovered to the sun. When this happens, previtamin D3 is made within the skin, which binds to vitamin D official protein for transport within the circulatory framework, and rapidly stores fat or breaks down within the liver (Alia and Kerr 2021). Many enzymes in the liver called cytochrome P-450 may be able to make vitamin D molecules 25-hydroxylate them. In Figure 2.1, as more vitamin D is made and consumed, the level of 25-hydroxyvitamin D 25(OH)D in the blood rises, which is the best way to measure vitamin D levels because this process isn't very well controlled (Alia and Kerr 2021).

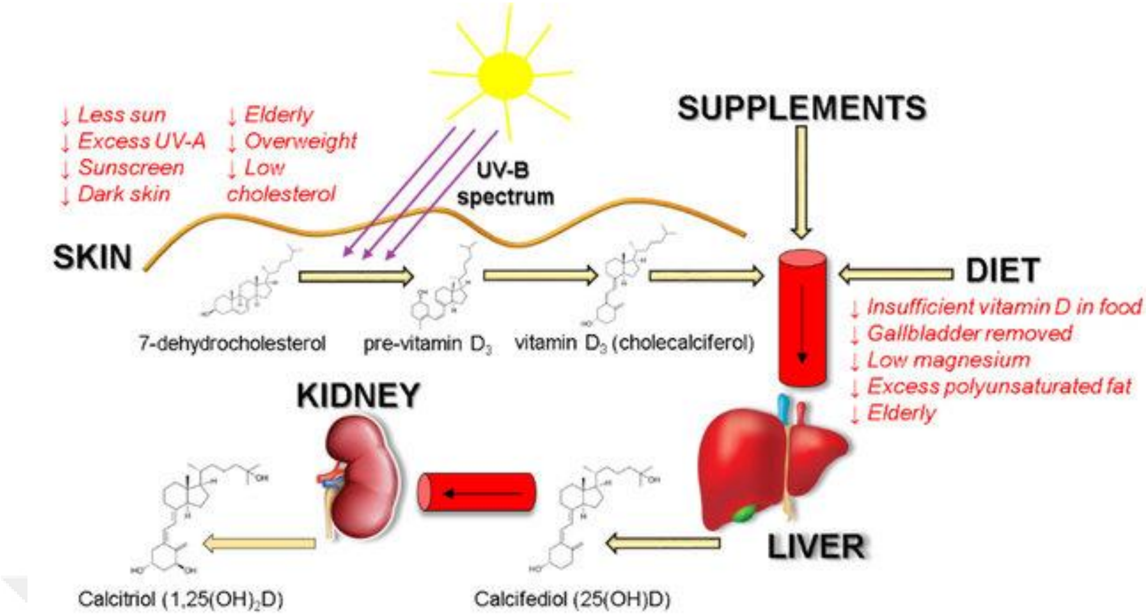

Figure 2.1 Biosynthesis and absorption of vitamin D3. Downward arrows indicate factors that reduce vitamin D absorption and synthesis (Šimoliūnas *et al.* 2019)

Actuated vitamin D, too called 1,25(OH)2D, is made within the kidneys by the chemical 1-hydroxylase. Typically the moment step in vitamin D enactment. In 1970, (Fraser and Kodicek) said that There are many places where 25(OH)D can be turned into its active hormone form, including the placenta (prostate), breast (colon), lung (parathyroid), pancreas, safe framework, and vascular divider. The vitamin D receptor and the 1-hydroxylase can offer assistance make this happen (Zehnder *et al.* 2002, Zehnder *et al.* 2001). 1.25(OH)2D, which is synthesized within the body, acts as an autocrine and paracrine calculate within the early stages of cell multiplication, separation, and work (Dusso *et al.* 2005).

The amount of UVB photons that enter the epidermis is the foremost basic component in deciding vitamin D generation proficiency. Sunlight exposure has declined as a consequence of people spending more time inside and the widespread usage of sunscreen. The amount and quality of UVB rays are also influenced by geographic location and time of year, particularly by latitude. During the months of November and March in latitudes of more than 42 degrees north, the skin's capacity to deliver vitamin D is nearly nonexistent (Webb *et al.* 1988).

Ageing and increasing melanin in those with darker skin diminish the efficacy of sunlight in changing over provitamin D to vitamin D, coming about in a lessening in vitamin D generation. When it comes to 25(OH)D levels, vitamin D consumption via food additives or supplements is the primary source (Holick 1994).

2.2 Risk Factors for Vitamin D Deficiency

For both children and adults, exposure to sunshine is the primary source of vitamin D. As a result, sunlight is the main cause of vitamin D deficiency. Factors that make it harder for UVB radiation to get into the skin or make it harder for it to be absorbed can also lower 25(OH)D levels (Alia and Kerr 2021).

Age, being indoors, having dark skin, wearing sunscreen, and having low cholesterol are some of the contributing variables, may interfere with the skin's ability to produce vitamin D3 and cause levels of vitamin D to drop. Having the gastrointestinal conditions and having gallbladder removed like celiac, Crohn's, cystic fibrosis, disease, all significantly lower the bioavailability of vitamin D3 from food sources. Because magnesium plays a role in the activation of vitamin D, Low magnesium intake can lead to a lack of active vitamin D3 since magnesium is involved in the process (Uwitonze and Razzaque 2018).

2.2.1 Among these risk factors

1. When a sunscreen with a security calculate of 30 is utilized, more than 95% of the generation of vitamin D within the skin is cut down.
2. In this case, darker skinned people have to spend 3-5 times as long in the sun to make the same sum of vitamin D as individuals with light skin.
3. vitamin D production is decreased as the skin ages since of a diminishment within the accessibility of 7-dehydrocholesterol (Alia and Kerr 2021).

2.3 Determination of Vitamin D in Serum

The foremost common vitamin D metabolite within the blood is 25-hydroxyvitamin D 25(OH)D, which is the foremost common circulating form and may be connected to how much vitamin D is within the skin and what individuals eat. Serum concentrations of 10 to 55 ng/mL are considered normal by commercial assays, but these results don't tell you if you have a deficiency or not enough. According to one study, these levels ought to be at slightest 20 ng/mL in individuals over the age of 65 (Rosen *et al.* 1994).

When it comes to 25(OH)D levels in the blood, there isn't much of a consensus. The lower limit of normal ranges from 20 to 37 ng/mL. When Chapuy *et al.* 1997 and Thomas and Demay 2000 came out, they said that. The best level of vitamin D is one that doesn't raise parathyroid hormone (PTH) levels. Circulating 25(OH)D tests must be checked in the lab of the person who is using them, even if the manufacturer says they are accurate (Binkley *et al.* 2004). It took the researchers a long time to look at the blood 25(OH)D levels of postmenopausal women who sent them to different labs. Human serum 25(OH)D 2 and 25(OH)D 3 were easy to find with the DiaSorin RIA method, which outperformed the industry standard HPLC method (Binkley *et al.* 2004, Hollis 2004).

2.4 Lack of Vitamin D and Time in the Sun

Vitamin D deficiency may be prevented by regular exposure to sunshine, according to long-held belief (Alia and Kerr 2021). The frequency of vitamin D insufficiency has been shown to be as high as 97% in the Middle East, despite the region's low latitude. Wearing clothes that cover most of one's body is a possible explanation for these results (Matsuoka *et al.* 1992, Mishal 2001). Although the European nations surrounding the Mediterranean are exposed to direct sunlight and aren't entirely protected, the Euronut SENECA research of elderly Europeans found that vitamin D levels might still be poor. Many individuals who live in sunny countries such as Italy or Spain have low levels of vitamin D, compared to those who live in locations with little sunlight exposure. In that investigate, 83 percent of senior Greek ladies had vitamin D inadequate (levels < 12 ng/ml), compared to fair 18 percent of elderly Norwegians. Expanded angle admissions, vitamin D fortification in food, and a rise in vitamin D supplement use might all contribute to this discrepancy.

In many nations, vitamin D deficiency has been linked to poor health. 20 to 40% Of pregnant women have vitamin D insufficiency prevalence rates, making them a high-risk category (Mulligan *et al.* 2010).

Pregnant women who take vitamin D supplements can avoid Vitamin D deficiency, but many babies are born with this deficit, which raises questions about how and why VDD affects pregnancy, the fetus, and the health of a new-born child (Dawodu and Wagner 2012).

Pregnant women who have tall levels of 25(OH)D don't have issues with their wellbeing, whether it is skeletal or not skeletal (such as autoimmunity, cardiovascular illness, diabetes, and a few shapes of cancer) It's imperative to see at Vitamin D lack in moms and their children so that able to figure out how to anticipate Vitamin D deficiency during pregnancy and lactation so that it doesn't have an effect on the foetus, the newborn, and childhood, which could help prevent chronic diseases in adulthood Vitamin D (Mulligan *et al.* 2010, Dawodu and Wagner 2012).

2.5 Vitamin D Deficiency in Pregnancy and Fetal Programming

Throughout the fetal life, the tissues and organs of the fetus go through important developmental stages that correspond with periods of intense cell division (Cunninghan and Cameron 2003). When a stimulation or injury is delivered to the fetus at a given point in its development, it might have long-term ramifications. Mechanisms that govern the response of the fetus to changes in gene-environment interactions are referred to as "fetal adaptation mechanisms" (Cunninghan and Cameron 2003).

Fetal growth, as well as organ and system development, may be affected by dietary and environmental exposures throughout these critical times in life. The expression patterns of genes may be altered permanently by this programming, affecting phenotypes and functions (epigenetic mechanisms) (Amarasekera *et al.* 2013).

As a result, epigenetic modifications and their corresponding changes in neonates are more likely to develop in response to environmental changes the closer they occur to conception. These alterations in the placenta, embryo, and fetus support the theory that adult illnesses have prenatal origins. Recent studies have shown that early life nutrition and other environmental variables have an important influence in illness etiology and propensity that seems to spread to succeeding generations. Disease phenotypes may occur as a result of epigenetic alterations that are linked to a person's dietary condition throughout crucial developmental stages (Jang and Serra 2014).

The immunological and metabolic programming of fetuses and newborns may be altered by nutrition, according to new research. Consequently, current dietary habits may raise the risk of a broad variety of no communicable diseases, such as cardiovascular disease, obesity, and diabetes (Amarasekera *et al.* 2013).

These nutrients include Vitamin D, which has been connected to a wide extend of wellbeing focal points all through life because of its role in prenatal programming and gene regulation (Hossein–Nezhad and Holick 2012).

Because there is evidence that maternal smoking, diet, and Vitamin D deficiency can affect a fetus's lung development and the development of asthma and COPD later in life, early life risk factors that make people more likely to get these diseases should not only be looked at after birth (Hykema and Blacuire 2009).

Identifying how genetics and epigenetics interact throughout important periods of development might help us better predict an individual's vulnerability to a broad variety of illnesses, since most of the reprogramming that happens during infancy may go unrecognized until maturity (Jang and Serra 2014).

Indeed in spite of the fact that these epigenetic changes appear to be reversible, small is known around how rapidly and how much they progress in reaction to positive changes within the environment, such as way better sustenance; and how much they depend on how long they were uncovered to a destitute maternal environment." As a result, despite the influx of new data, maternal nutrition has gotten less attention when it comes to setting and achieving realistic preventative targets (Millennium Development Goals). Because of this, it's reasonable to assume that the vast amount of work necessary to enhance the nutritional health of all women of reproductive age isn't being done (Shrimpton 2012). Knowing how diet affects fetal programming and how to utilize this knowledge to better the wellbeing of pregnant women and their unborn children and dodge the onset of inveterate ailments within the future is basic, particularly for individuals with VD (Jang and Serra 2014, Hossein–Nezhad and Holick 2012).

In the course of a pregnancy, a woman's need for 1,25(OH)2D can quadruple or even multiply by a factor of five, in order to ensure that her baby receives the adequate amount of calcium for healthy skeletal development (Mulligan *et al.* 2010). It is estimated that between 25 and 30 grams of calcium are passed on to the developing fetus by the time pregnancy is over, with the majority of this process taking place in the third and final trimester (Specker 2004, Pérez-López 2007).

As the pregnancy proceeds, the maternal total blood calcium concentrations decline, emphasizing the importance of active transport across the placenta. Prenatal calcium levels are higher in the third trimester fetus than in mother plasma (Salle *et al.* 2000)

According to studies, the incidence varies from 18 to 84 percent depending on the place of residency and regional dress codes. A global problem that affects women all over the world is vitamin D insufficiency during pregnancy (Dawodu and Wagner 2007In the United States, it is believed that between 5 and 50% of expectant mothers experience a vitamin D deficit (Lee *et al.* 2007). Due to a reduced food intake and increased skin pigmentation. Compared to other women, African American women are far more likely to be vitamin D deficient. This is because the risk is much higher in African American women (Mulligan *et al.* 2010). According to the findings of Bodnar *et al.* (2007), neonatal neonates born to pregnant women of both white and black ethnicities were found to have an equivalent rate of vitamin D deficit and insufficiency in the cord blood. Compared to white pregnant women, African American pregnant women had a vitamin D deficiency prevalence of 29.2 percent and an insufficiency prevalence of 54.1 percent. In comparison, white pregnant women had respective prevalence rates of 5 percent and 42.1 percent. The study's subjects reported utilizing prenatal vitamins at a rate of 90%, which is interesting to note. Comparatively, vitamin D deficiency and insufficiency were discovered at birth in 9.7% and 56.4% of white newborns, respectively. Deficiency was found in 45.6 percent of black neonates, and insufficiency was found in 46.8 percent of black neonates (Mulligan *et al.* 2010).

2.6 Vitamin D and Calcium Metabolism in Pregnancy

To meet the demands of fetal bone mineralization, major alterations in Vitamin D and calcium metabolism occur throughout breastfeeding and pregnancy. Pregnancy increases the baby' calcium intake from 2-3 milligrams per day to a whopping 10 milligrams per day by the third trimester (Mulligan *et al.* 2010). Early in pregnancy, the body of a pregnant woman changes to meet the requests of the developing embryo and increments calcium assimilation, reaching a peak in the third trimester (Mulligan *et al.* 2010). Increased intestine absorption and reduced urine excretion of calcium counteract the calcium transfer.

When a woman is pregnant, her plasma levels of 1.25(OH)2D rise, peaking in the third trimester, and then fall back to normal when she breast feeds. Because PTH levels don't change during pregnancy, it's not clear what is causing the body to make more 1.25(OH)2D. When PTHrP (PTH-related peptide) is found in the foetal parathyroid and placental tissues, it is a powerful stimulant for the transfer of calcium and the production of Vitamin D in the placental tissues. PTHrP is able to get into the mother's bloodstream. By acting on the PTH/PTHRP receptor in the kidney and bones, it increases 1.25(OH)2D levels while regulating calcium and PTH levels during pregnancy (Mulligan *et al.* 2010).

2.7 Implications of Vitamin D Deficiency in Pregnancy

Recent studies have shown how important Vitamin D deficiency non-classical activities are in pregnancy and the placenta. They also linked Vitamin D deficiency to preeclampsia, insulin resistance, and early labour in pregnant women who took part in the studies (Kaushal and Magon 2013).

Studies, both experimental and observational, Studies indicate a possible link between low vitamin D levels and an increased risk of gestational diabetes mellitus, preeclampsia, and insulin resistance. Vitamin D may have an effect, either directly or indirectly, the pathophysiology of preeclampsia depends on a variety of biological processes (LaMarca *et al.* 2008).

These biological processes include abnormal placental implantation, immune dysfunction, hypertension, excessive inflammation, and abnormal angiogenesis (Halhali *et al.* 2000). 1,25(OH)2D concentrations are reduced in preeclamptic pregnancies due to decreased expression and activity of the human placenta's placenta 1a-hydroxylase (Díaz *et al.* 2002).

Supplementation with Vitamin D decreases the chance of preeclampsia. Preeclampsia-affected women have been shown to have poor calcium excretion in their urine, low amounts of ionized calcium, PTH levels are high but 1.25(OH)2D levels are low (Taufield *et al.* 1987, Zhang *et al.* 2008). Gestational diabetes is associated with a maternal VDD of less than 50 nmol/L. Pregnant women who took 4,000IU of vitamin D a day throughout their pregnancy had a lower risk of complications such as maternal infections, cesarean sections, and premature birth (Bodnar *et al.* 2009, Taufield *et al.* 1987). Women with Vitamin D deficiency (37.5nmol/L) compared to women with normal levels of Vitamin D insufficiency, are four times more likely to give birth via caesarean section (Merewood *et al.* 2009).

2.8 Prevent and Treat Vitamin D Deficiency

Many people, including patients and doctors, believe that getting enough vitamin D through food is sufficient. This is a false presumption. Vitamin D levels in most meals, even fortified dairy products, are low to nonexistent, with the exception of fatty fish. Even in the United States, not all dairy products are fortified with vitamin D, so it's crucial to check the nutrition facts on the items you eat.

It is safe and affordable to take vitamin D supplements, yet vitamin D insufficiency is commonly overlooked or undertreated. AI for vitamin D may have been set before studies found that 25(OH)D levels greater than 30 ng/mL are needed to keep PTH levels in the normal range, which is why the AI for vitamin D may have been set. Diet or taking a multivitamin every day can easily meet the current recommended amount of vitamin D. Many people may still not get enough vitamin D at this level, so they may need to get more (Hathcock *et al.* 2007).

Vitamin D toxicity is rare compared to vitamin D insufficiency, thus that anxiety is often unjustified. The kidney's capacity to control the generation of active calcitriol may be a factor in the low incidence of vitamin D poisoning. It happens both directly and indirectly when there is too much calcitriol in the body. Vitamin D response elements on the PTH gene make it easier for calcitriol to be made in the kidneys. This is because the PTH gene has these parts (through increasing intestinal calcium absorption). Calcitriol, which is 1,24,25-trihydroxyvitamin D and calcidiol, is even more difficult to get because of the kidneys' ability to make inactive metabolites of it (24,25-dihydroxyvitamin D). It's very hard for calcitriol to control the 24-hydroxylase gene, which leads to a strong negative feedback loop (Saponaro *et al.* 2020).

2.8.1 Vitamin D_2 and vitamin D_3 supplements: how much is enough

Supplements for D2 and D3 are available for people who don't get enough of them from their food (cholecalciferol). As far as we can tell, both D2 and D3 are good for humans when it comes to preventing and treating a number of diseases. There may be a difference in how well the D2 and D3 formulations work in terms of how long they stay in the blood. In terms of 25(OH)D concentration, a single dose of 50,000 IU of D2 or D3 results in the same rise, but the longer half-life of D3 means that less often you may need to take it

(Armas *et al.* 2004). It didn't make a difference in 25(OH)D2, 25(OH)D3, or total 25(OH)D levels when people took 1000 IU of D2 and D3 every day for a month (Holick *et al.* 2008). It turns out that both D2 and D3 can raise the level of 25(OH)D3 in the body. D3 can only raise 25(OH)D3 levels over the course of a year, according to a recent study that looked at this question. Some people who don't get enough vitamin D may have a different reaction than people who get enough total 25(OH)D (33 ng/L). The use of D3, even if it is only given on a few occasions (ie, less than once weekly). If you are vegetarian or vegan, D2 might be a better choice than D1. To get the most out of Vitamin D2 and D3, they should be taken with a fat-heavy meal (Binkley *et al.* 2009).

Oral vitamin D supplements are the most common way to treat vitamin D deficiency, which can be corrected by doing so. According to the recommendations made by the Endocrine Society, an adult needs to consume between 1500 and 2000 international units (IU) of vitamin D on a daily basis in order to maintain serum 25(OH)D concentrations of more than 30 ng/mL in order to avoid developing a vitamin D deficiency (Holick *et al.* 2011, Del Valle 2011).

However, its absorption efficiency does not depend on the amount of fat content that is consumed with food, despite the fact that lipid composition influences vitamin D bioavailability). Studies that used radiolabeled vitamin D3 showed that its absorption efficiency ranges from 55 percent to 99 percent (Wagner *et al.* 2008, Goncalves *et al.* 2013).

Nutritionists from the Food and Nutrition Board recommend getting 200 to 600 IU/d of vitamin D as an AI. Lack of data or ambiguity in the data prevents the AI from recommending a daily allotment that can be securely determined. Total serum 25(OH)D levels of at least 11 ng/Ml are required for the AI for vitamin D. Vitamin D fortress in nourishment and supplementation are both based on these guidelines, however it is commonly recognised that they are out-of-date (Yetley *et al.* 2009).

If your body doesn't have enough vitamin D, how much do you need to make up for it, say, 10 ng of vitamin D per millilitre. "Loading doses" is common, even though there is no scientific evidence to back this up (eg, 50,000 IU of vitamin D orally once weekly for 2-3 months, or 3 times weekly for 1 month). It was best to use loading algorithms with at least 600,000 IU of vitamin D in order to get good results. At the end of the treatment, 25(OH)D levels over 30 ng/mL were best predicted. This was the best method (Pepper *et al.* 2009). There was no evidence of hypercalcemia in any of the individuals in this study. It's possible that a shorter treatment time or lower dose could help people who have a mild to severe deficit (11-25 ng/mL). Indeed in spite of the fact that there are numerous ways to treat vitamin D inadequate, a common botch is to halt treatment or donate as well small vitamin D upkeep after the 25(OH)D level comes to the perfect extend. To keep vitamin D insufficiency from happening once more, you wish to require 800 to 2000 IU of vitamin D every day, even if you started taking vitamin D. This is even if you haven't changed your lifestyle or food habits (Heaney 2005). As of now, the safe upper limit for taking vitamin D is 2000 IU/day for maintenance (Hathcock *et al.* 2007).

Malabsorption or the need for tube feeding or parenteral nutrition should get extra attention. The same amount of vitamin D is needed by tube-fed patients as those who eat by mouth. Ergocalciferol capsules, on the other hand, contain D2 in oil and should not be used since it might clog the feeding tube. It is possible to utilize cholecalciferol capsules and tablets without blocking the feeding tube since they include powdered D3. Vitamin D maintenance doses are often increased in patients with malabsorption. If a patient has had a malabsorptive gastric bypass treatment, for example, they may need to take 50,000 IU of D2 or D3 every week or perhaps every day to maintain adequate levels. There are usually only 200 IU of vitamin D in most IV parenteral nutrition multivitamins. This makes a difference keep 25(OH)D levels ordinary within the brief term but may not address vitamin D insufficiency. In people who can't take in a lot of vitamin C through food, UVB exposure (e.g., sunshine or phototherapy) may be good (Chandra *et al.* 2007). Only a few pharmacies in the United States can make vitamin D intramuscularly accessible for local use, but it is not sold commercially (Bertino *et al.* 1981).

2.9 It's Important to Know about Calcium and Vitamin D Toxicity

Calcium nutrition: what is its function? It takes a lot of work to keep blood calcium levels in a good range. Intestinal calcium retention, the take-up and discharge of calcium from the bone, and renal calcium handling all work together to do this. There's a huge part for vitamin D in each of these things, as we've already said. Impaired calcium absorption in the intestine due to hypovitaminosis D may cause secondary hyperphosphatemia and increase the risk of bone loss (Heaney *et al.* 2001). In males, 25(OH)D levels of 30 to 40 ng/mL were shown to be optimal for calcium absorption, which is in line with the vitamin D levels required to decrease PTH. A lack of oral calcium consumption might lead to secondary HPT even if vitamin D levels are normal. For men and women under the age of 50, the National Osteoporosis Foundation recommends consuming 1000 milligrams of elemental calcium per day; for those over 50, the recommendation is 1200 milligrams per day. When it comes to calcium supplementation, doctors need to keep several things in mind. As a first step, it is possible to absorb up to 500 to 600 mg of elemental calcium in a single dosage, with any extra calcium passing through the digestive tract (Heaney *et al.* 2001).

There are two reasons why stomach acidity is essential to calcium absorption: Patients with achlorhydria may still benefit from calcium supplementation when it is given with food. calcium citrate is better than calcium carbonate for people with achlorhydria who have had gastric surgery or bariatric surgery, or who are taking acid-blocking medicine (e.g. protein pump inhibitor usage). Calcium citrate, on the other hand, can clog feeding tubes, so it should not be given through a tube at all (Heaney *et al.* 2001).

When vitamin D levels are good, about 30% of calcium that is ingested is absorbed, no matter how it is ingested: through food or supplements (Heaney *et al.* 2001). In other words, if you eat 1000 mg of calcium, and only absorb 300 mg of it (assuming you need 50 mg per day for bone health), your kidneys will eliminate the remaining 250 mg (a typical 24-hour excretion ranges urine calcium between 100 and 250 mg/d). Calcium absorption might be as low as 10% in those with a vitamin D deficit. Since there would be a reduced excretion of calcium (Only 50 mg for a 1000 mg dose). The 24-hour urine calcium excretion test is a useful one for determining whether or not a person is getting enough calcium and vitamin D. A low-sodium diet and thiazide diuretics lower renal calcium excretion, but an excessive sodium intake increases it. This is vital to keep in mind when evaluating urine calcium readings (Heaney *et al.* 2001).

In the past, people who didn't get enough 25(OH)D were more likely to have secondary HPT and a problem with bone mineralization. People who have high PTH, high total or bone alkaline phosphatase values, and decrease 24-hour levels of urine calcium should be checked for vitamin D insufficiency. If an otherwise healthy person has a high level of alkaline phosphatase, vitamin D deficiency should be looked into, even if other liver enzyme tests come back normal (Saponaro *et al.* 2020).

2.10 Vitamin D Toxicity

In order to properly identify vitamin D toxicity, the 25(OH)D level should not be the only thing to look at. Because both hypervitaminosis D and hypercalcemia are present, it should be thought of as a medical condition in which both are present. Hyperphosphatemia and hypercalciuria are also very common in this case (though not always). There are signs and symptoms of hypercalcemia and hypercalciuria in people who are getting too much vitamin D. These include nausea, dehydration, and constipation (eg, polyuria and kidney stones).

A high vitamin D level without a high calcium level does not mean that there is a medical emergency, but more research may be needed to figure out what is causing the high vitamin D levels to be so high in the first place. Vitamin D can cause hypercalcemia, but vitamin D toxicity is very rare and only happens when people with normal gut absorption or people who eat a lot of calcium also take in a lot of vitamin D (more than 10,000 IU/day). 25(OH)D levels that are less than 80 ng/mL have been shown to be dangerous in people who don't have primary HPT and don't have good kidney function, according to previous studies. There are more than 150 ng/mL in the blood of most people who have vitamin D toxicity. They found that supplementation with either 1600 IU/day (equivalent to 16 IU/day per day) or 50,000 IU monthly (equivalent to 16 IU/day per day per day) was not linked with any laboratory measures indicating harmfulness, such as 25(OH)D, PTH, bone antacid phosphatase, and 24-hour urine calcium (Binkley *et al.* 2009).

3. MATERIALS AND METHODS

3.1 Study Design

The vitamin D status of pregnant women attending government health clinics at Fallujah General Hospital, Anbar, Iraq, is investigated in this thesis. There were 100 female participants in the case-control research among the first and third trimester of pregnancy. They were between the ages of 18 and 40. Cases' or their parents' verbal agreement was acquired for all patients and controls. During the first trimester, we tested a group of pregnant volunteers and documented their findings as control group (50 female). During the third trimester, we tested the same group of volunteers and recorded their results at the chemical and hormonal center as a patients group (50 female).

3.2 Sample Collection

Each participating lady had a sample of venous blood drawn via aseptic venipuncture. Biochemical indicators are analyzed in blood samples. 5 cc of blood was required. Blood samples were centrifuged to separate the serums from the plasma. For 10 minutes at 3000 rpm, the samples were centrifuged as many times as possible. They were taken out of their refrigerator and allowed to come to room temperature when they had completed the appropriate amount of samples. The samples were then subjected to a series of specialized tests. The following characteristics were utilized as possible determinants based on a questionnaire and data obtained by physicians: age, week of pregnancy and use of vitamin D-containing supplements.

Inclusion criteria: Iraqi pregnant women in their first and third trimesters, aged 18 or older.

Exclusion criteria: If a woman possessed one or more of the following, she was not allowed to participate: Chronic illnesses such as cardiovascular diseases, neurological disorders, diabetes mellitus of any kind, renal diseases, polycystic ovarian syndrome, thyroid disease and abortion are all examples of chronic diseases.

3.3 Chemicals and Test Kits Used in Study

Reagents and kits for biochemical analysis are included in Table 3.1.

Table 3.1 Used in research include chemicals and test kits

Vitamin D (total)	05894913190
S. calcium	Dray chemistry
S. ferritin	04491785190
S. iron	05401658190
HGB	1504462, 1504463

3.4 Laboratory Equipment and Tools

Table 3.2 shows the instruments and equipment that were used in this study, as well as their names. Researchers used them so they could get the right information and speed up the process if it ran on its own, which is what they did.

Table 3.2 Equipment and tools used in the laboratory

Equipments and tools	Made	Note
Cobas e411 30006059	Germany	Laboratory diagnostics made use of it. The following tests were run on this device and the results were recorded: Serum ferritin levels with vitamin D
Cobas c311	Germany	Laboratory diagnostics made use of it. The following tests were run on this device and the results were recorded: Iron in blood serum
Fuji 86561945	Japan	Laboratory diagnostics made use of it. The following tests were run on this device and the results were recorded: Calcium levels in the bloodstream
CBC swelab 110270	Sweden	Laboratory diagnostics made use of it. The following tests were run on this device and the results were recorded: HGB
Centrifuge	Germany	Because of their larger densities, red blood cells and egg yolks were placed at the bottom of the tube while serum and plasma were placed on top
Incubator	Germany	Because the tests need serum at 37 °C, it was utilized to store blood, serum, and plasma.

3.5 Method

3.5.1 Working method of vitamin D (total) by cobas e411

Principle: The assay took a total of 27 minutes to complete.

- First incubation: To release VDBP-bound 25hydroxyvitamin D from the sample, pretreatment reagents 1 and 2 are incubated with the sample (20 L).
  - When the pretreatment test is blended with the ruthenium-labeled vitamin D authoritative protein, the 25-(OH)D and the ruthenium-labeled VDBP shape a gather. To make sure there isn't any cross-reactivity, the material is treated with an unlabeled antibody that only binds to the 24-25-dihydroxyvitamin D metabolite.
- For the third time, streptavidin-coated microparticles and ruthenylated labelled vitamin D binding proteins are bound to streptavidin-coated microparticles and biotin-labeled 25-(OH)D. There are two things that help the complex of biotinylated 25-(OH)D and the ruthenylated vitamin D binding protein cling to the solid phase. They are biotin and streptavidin.
  - An electromagnet on the electrode's surface attracts microparticles from the reaction mixture, which is breathed into the measuring cell. Unbound chemicals are at that point evacuated with ProCell or ProCell M. For example, a photomultiplier is used to put voltage on an electrode and then measure its chemiluminescence.
- It takes a two-point calibration on the instrument and a master curve that is given by the reagent barcode or Ebarcode to get the results.

Procedure

All of the following specimens were tested and determined to be satisfactory. Serum was collected utilizing standard test tubes or tubes with isolating gel. EDTA-K2 and EDTA-K3 in plasma. Using plasma tubes and separating gel is an option. 0.9-1.1 + intercept within + intercept within + intercept 3 ng/mL + coefficient of correlation 0.95 - method comparison serum vs plasma

EDTA K2, K3, and Li heparin in the blood: For 8 hours at 20 25 °C, 4 days at 2 8 °C, and 24 weeks at 20 °C (5 °C), 25 hydroxyvitamin D is stable. Freeze once only. Elecsys Vitamin D total II showed that 25-(OH)D is stable, which is consistent with prior study employing a vitamin D official protein test and mass spectrometry.

There were only a few commercially available sample collection tubes available for testing at the time of this study, therefore not all tubes from every manufacturer were included. Sample collecting procedures from various manufacturers may include varying amounts of different elements, which might change test findings in certain circumstances. When using main tubes for sample processing, follow the tube manufacturer's instructions (sample collection systems). Any samples that have precipitates should be centrifuged before the test. The use of samples that have been heated is not recommended. Do not use samples or controls that have been kept in place with azide, because they could be dangerous. It's important to keep the temperature of samples, calibrators, and controls in a range of 20-25 °C before taking the readings. Analyzer tests, calibrators, and controls ought to be examined or measured inside two hours since they may evaporate.

3.5.2 Working method of serum calcium by fuji

Principle

1- This is an in vitro test for quantifying calcium in human blood, plasma, and urine using Roche / Hitachi Cobas c311 equipment.

2- Under alkaline circumstances, calcium ions form a compound with 5-nitro-5'-methyl-BAPTA (NM-BAPTA). In the second stage, this complex reacts with EDTA.

3- The change in absorbance is photometrically recorded and is directly proportional to the calcium content.

Procedure: Universal Precautions apply. Serum, Li-heparin and urine are acceptable. A drop in calcium levels may be caused by prolonged contact with the clot, thus serum or plasma should be evacuated from blood cells immediately. Because EDTA chelates calcium and prevents it from being accessed by the NM-BAPTA reaction, sera from patients receiving EDTA therapy (for hypercalcemia treatment) cannot be used for analysis. The precipitation of calcium with fibrin (heparin plasma), lipids, or denatured protein has been seen when calcium is stored or frozen.

3.5.3 Working method of serum ferritin cobas e411

Principle: The sandwich complex in the cobas e411 test is made up of two monoclonal mouse antibodies. The experiment lasted a total of 18 minutes.

1. Ferritin-specific antibodies biotinylated and tagged with the ruthenium complex were incubated with 10 uL of material in the first incubation.
2. Streptavidin-coated microparticles are added during the second incubation to ensure that complexes are firmly attached to the solid phase.
3. Microparticles are magnetically attracted to the electrode surface by aspiration of the reaction mixture into the measurement cell. ProCell is then used to eliminate any unbound chemicals. Chemiluminescent emission is then detected by the photomultiplier when a voltage is applied to the electrode.
4. Use the bar code on the bottle of reagent to get the master curve. Then use two-point calibration to make a calibration curve.

3.5.4 Working method of serum iron by cobas c311

Human serum and plasma may be quantified using IRON on Roche / Hitachi cobas c equipment in an in vitro assay. Iron from transferrin is released when the solution is acidic. Detergent is used to clear up lipemic samples. In this case, ascorbate converts the released Fe3+ ions to Fe2+ and FerroZine to produce a colorful complex. The iron content has a direct relationship with the color intensity, which may be determined photometrically.

3.5.5 Working method of hemoglobin

An automated hematology analyzer for use in the laboratory, the Swelab Alfa Plus system is available from Swelab. The analyzer is intended for determination of hemoglobin (HGB) concentration, for counting of red blood cells (RBC) and platelets (PLT) as well as for counting and differentiation of white blood cells (WBC) into three subpopulations, namely lymphocytes (LYM), mid-sized white cells (MID, mainly monocytes), and granulocytes (GRAN, mainly neutrophils, eosinophils and basophils). The measurement principles of the Swelab Alfa Plus are based on impedance for cell counts and spectrophotometry for HGB.

Although such a 3-part hematology analyzer provides enough information for the smaller local hospital laboratory, trends show an increased interest in 5-part instruments, typically used in larger central hospital and hematology laboratories, also for use in small physician office laboratories.

3.6 Statistics Analysis

In order to determine the influence of various factors on questions concerning parameters, the SAS (Statistical Analysis System–2019) application is used. The t-test is utilized to compare the basic suppositions of two factors. In each study, the statistical significance was determined at less than p 0.05.

4. RESULTS AND DISCUSSION

Vitamin D is necessary for maintaining excellent health. Vitamin D deficiency in pregnant women has been established as a health issue. In Iraq, there is a scarcity of statistics about this community. The first group consisted of 50 patients who were pregnant in their first trimester (control group), while the second group consisted of 50 patients who were pregnant in their third trimester (patients group). From August 2021 to April 2022, this case-control research was carried out. A group of healthy people was compared to a group of sick people.

4.1 The Results of the Patient and Control in the Group Study

4.1.1 Age

In the Table 4.1 and Figure 4.1, we took the age between the two groups; the mean age was (27.08 ± 6.285 years) in the patients and (27.16 ± 6.20 years) in control. It will not show any difference (P-value=0.90), because the two groups are the same volunteers, because the patient group is in the trimester of pregnancy and the healthy group is in the first week of pregnancy. These findings are consistent with those of Woon *et al.* (2019), who showed no link between age and vitamin D deficiency in pregnant women.

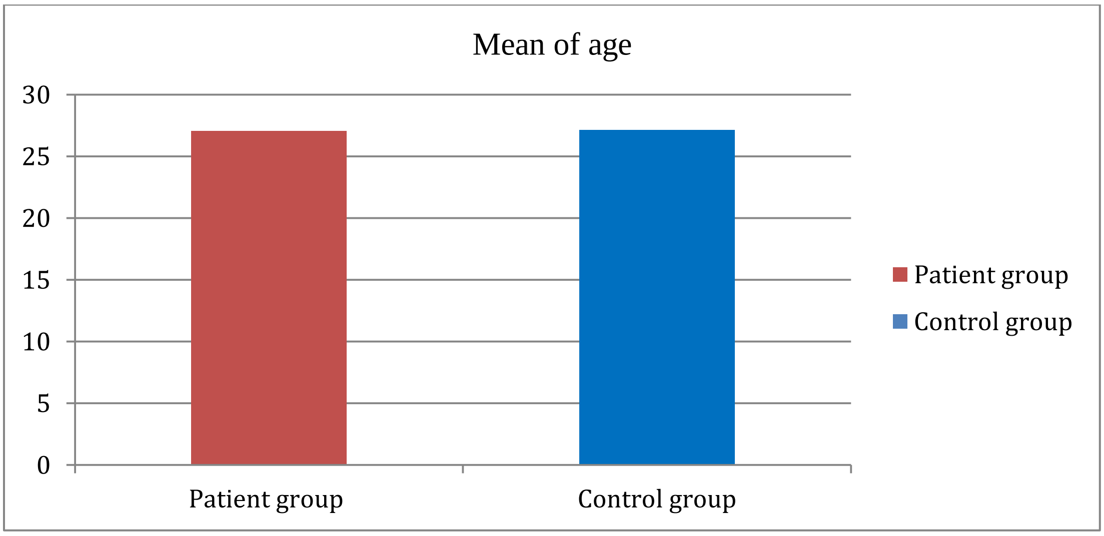

Figure 4.1 The chart of age in study

4.1.2 The result of vitamin D (total)

Vitamin D for the group of women who are in the trimester of pregnancy, the mean was (14.70 ± 6.164 ng/mL), and the normal value was (30-70 ng/mL), we found a high significant (P= 0.016) compared to the control group (33.40 ± 4.8133 ng/mL), as showing in Figure 4.2 and Table 4.1. We found the patient in third trimester of pregnancy bunch endure from vitamin D lack instead of those within the control bunch (first trimester of pregnancy). We found the vitamin D was normal in control group, because they are in early pregnancy.

Despite the fact that Iraq gets year-round sunshine, third-trimester vitamin D deficiency was widespread among pregnant women. Overall, the patients group had an 82 percent prevalence of vitamin D insufficiency. The findings are consistent with those of Christoph *et al.* (2020), who discovered that the vast majority (73.23 percent) of all pregnant women investigated were vitamin D deficient.

Our findings are also similar to those of Woon *et al.* (2019), who discovered that 42.6 percent of the 535 Malaysian pregnant women surveyed were vitamin D deficient with nearly half having insufficient vitamin D. (49.3 percent). According to Krieger *et al.* (2018), women in the third trimester of pregnancy in Switzerland had a 53 percent prevalence of vitamin D deficiency. Al-Rubaye *et al.* (2021) discovered that 96.6 percent of Iraqi pregnant women had Vitamin D deficiency. Furthermore, according to Idan (2018), more than half of the women in Iraq who were pregnant in the third trimester had vitamin D deficiency (52.2 percent). All of these findings corroborated those in the thesis.

Future nutrition education should concentrate on pregnant women's consumption of vitamin D-fortified foods due to the implications of vitamin D deficiency on their long-term health.

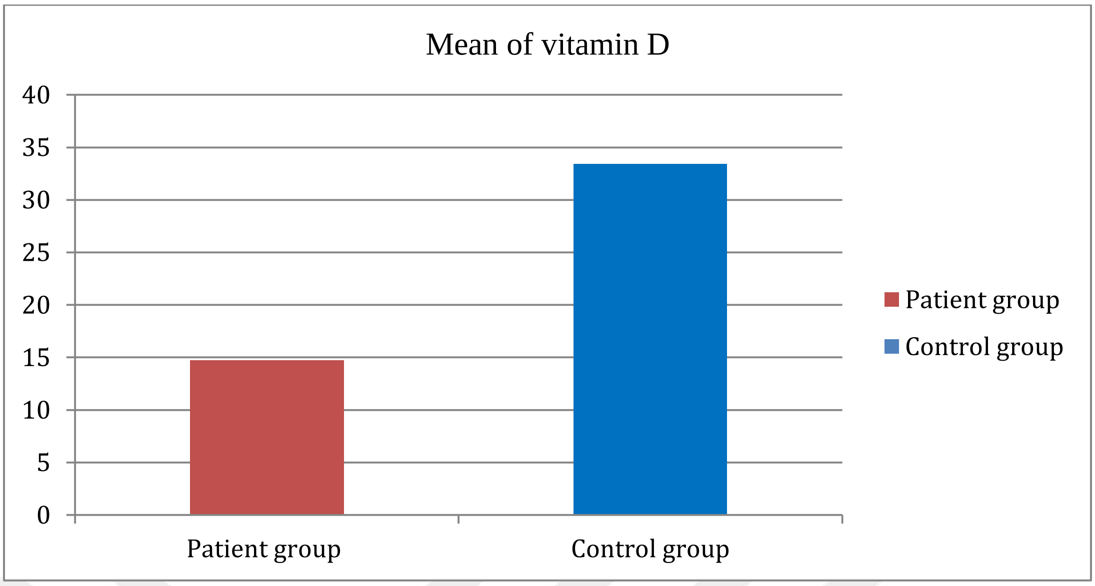

Figure 4.2 The chart of vitamin D in our study

4.1.3 The result of serum calcium

As for calcium, we also used it in our thesis because it is considered one of the important elements in the human body, no less important than vitamin D. Calcium builds bones, while vitamin D facilitates the absorption of calcium in the body. It's in charge of bone formation and hormone and enzyme activity.

The PTH and vitamin D work together to maintain calcium homeostasis. Calcium consumption is especially important during pregnancy and breastfeeding because maternal calcium reserves might be depleted, This may be harmful to both the mother and the fetus's bone health. Because both the fetus and the breastfed baby get their entire calcium from the mother, proper maternal calcium consumption can benefit fetal bone health (Brown *et al.* 2021).

In the patient group the mean serum calcium was (8.192 ± 0.30 mg/dl), while in the control group the mean was (8.48 ± 0.25 mg/dl), and the normal value (8.4-10.2 mg/dL), as show in Figure 4.3 and Table 4.1.

We found the patients group suffer from slight calcium deficiency, Due to the fact that calcium absorption increases during pregnancy (Güler *et al.* 2019), but the volunteers in second group (control group) calcium in them at a normal level, because they are in the beginning of pregnancy. According to to Kumar *et al.* (2009), pregnant women's average blood calcium levels were below the recommended limit at 8.1 mg/dl. According to Kant *et al.* (2019), 24 percent of pregnant women had hypocalcaemia.

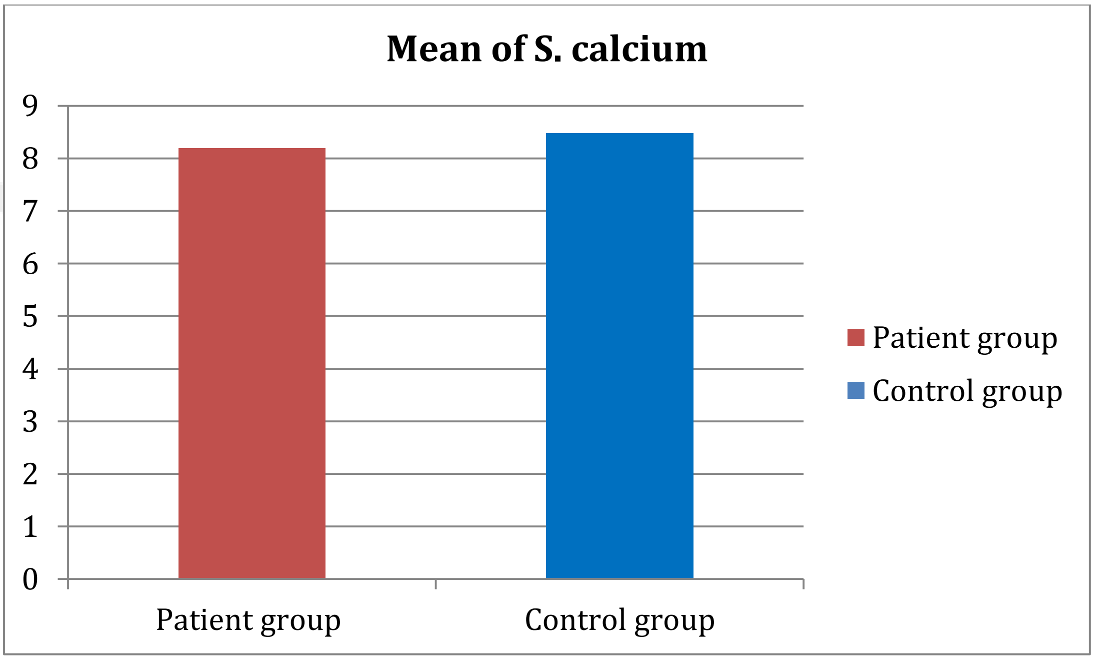

Figure 4.3 The chart of calcium in our study

4.1.4 The result serum ferritin

As for serum ferritin, it was a mean (38.35 ± 17.28 ng/dL) in the patient group and the mean in the control group was (40.46 ± 16.12 ng/dL). As showed in Figure 4.4 and Table 4.1. The normal range was (13-150 ng/dL). We did not find the effect of pregnancy on the level of ferritin (P-value= 0.71) except in a few section of patients compared to healthy group, due to iron intake by pregnant women. Measurements of serum ferritin, a biomarker for iron reserves; the occurrence of anemia was linked to ferritin levels, it is comprehensible given its function as a gauge of the total iron reserve for hematopoiesis. Additionally, ferritin is a vital angiogenic agent that supports the growth of tissues, including bone (Yuniati *et al.* 2020). On the other hand, are more commonly used as a metric indicating poor iron status (Brown *et al.* 2021).

Our findings were also consistent with those of Yuniati *et al.* (2020), they looked into the connection between maternal vitamin D, serum ferritin, first-trimester hemoglobin levels, and newborn birth weight. First-trimester serum ferritin levels, maternal blood vitamin D levels, and neonatal birth weight were not significantly correlated with one another. While, according to Noshiro *et al.* (2022), the ferritin and iron levels fell from early to late pregnancy.

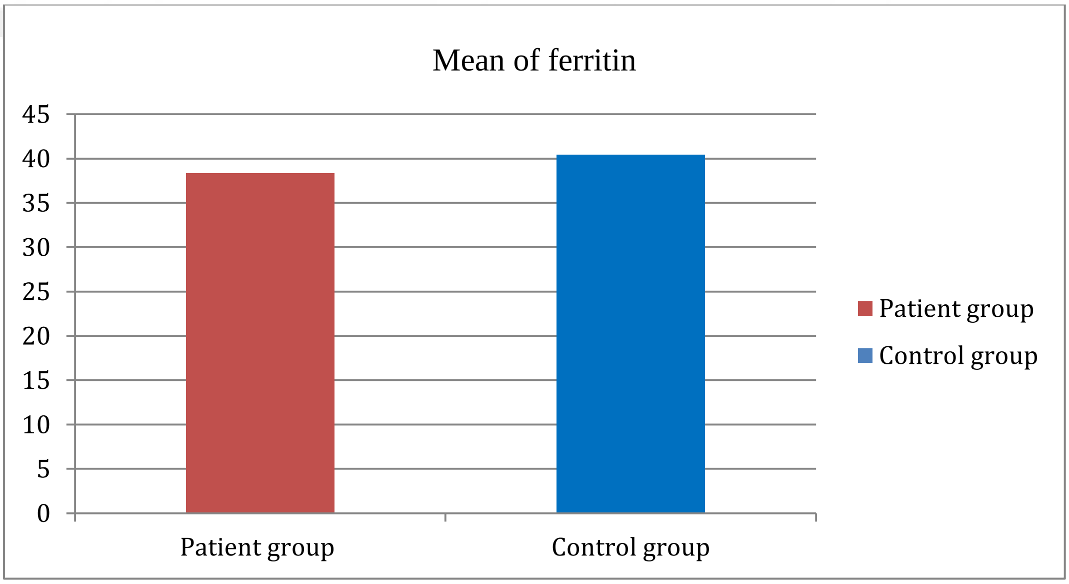

Figure 4.4 Chart of ferritin in study

4.1.5 The result serum iron

Hemoglobin, a protein found in red blood cells that helps red blood cells carry oxygen from the bloodstream to the tissues, is an important part of the body's iron metabolism. Providing the fetus with oxygen is the exclusive responsibility of the pregnant lady. Anemia due to iron deficiency may occur if the lady does not consume enough iron-rich foods or takes iron supplements. The result of serum iron was the mean (31.59 ± 7.85 ug/dL) and the normal value (37-145 ug/dL). We found a significant (P-value= 0.001) compared with the healthy group (58.43 ± 13.71 ug/dL). As shown in Figure 4.5 and

Table 4.1. Our results are consistent with the results of the study by Yuan *et al.* (2019) where it was found that the prevalence of iron deficiency was 51.82% as defined by low serum ferritin (< 12 μg/L), and pregnant women are particularly vulnerable to iron deficiency because of increasing iron requirements of pregnancy. In the United States, up to 35% of women have reduced or almost exhausted iron levels and are classified iron deficient (Fernández-Ballart, 2000).

In reality, the physiologic iron needs of pregnant women change throughout time. Due to the end of menses, iron needs drop during the first trimester, and iron reserves may rise. The rise of maternal blood volume and red cell mass during the second trimester increases physiologic iron needs. As iron accumulates in the placenta to promote the formation of newborn red blood cells, iron needs continue to rise linearly during the third trimester (Brown *et al.* 2021). Due to the rise in blood volume to satisfy the fetal and placental demands, iron requirements grow in the second and third trimesters of pregnancy, and women with first trimester pregnancy anemia had not yet begun (Güler *et al.* 2019).

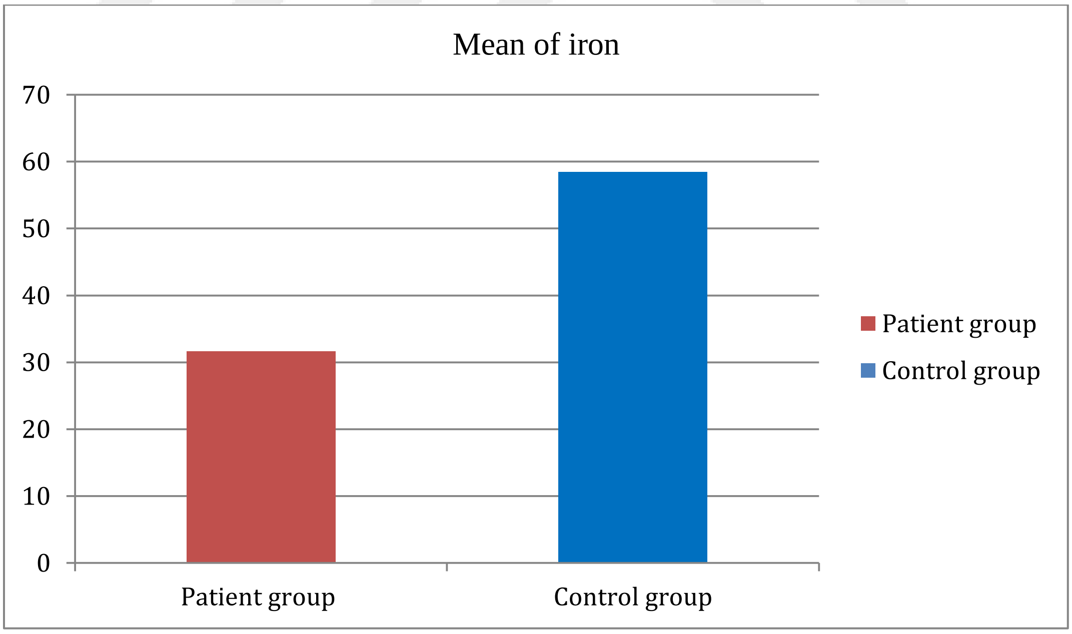

Figure 4.5 Chart of iron in our study

4.1.6 The result of hemoglobin

Most pregnant women suffer from anemia problem, and anemia is defined as the lack of sufficient red blood cells in the blood to transport oxygen to the body tissues and to the fetus as well. Daily iron or nutrients The body is not able to manufacture red blood cells responsible for the production of extra blood, and it is normal for any pregnant woman to suffer from mild anemia, but some women suffer from severe anemia due to a low level of iron in the blood and for other reasons. HGB less than (11.0 g/dL) in the first trimester and less than (10.5 g/dL) in the second and third trimesters is considered anemia of pregnancy, according to UK guidelines (Pavord *et al.* 2020). These criteria were used to diagnose anemia during pregnancy in this research. For the patient group the mean was (10.28 ± 0.73 g/dl), this means the presence of slight anemia. While in control group was (11.61 ± 0.589 g/dl). The normal value is (11.5-16.5 g/dl). As shown in the Figure 4.6 and Table 4.1.

Anemia is a frequent pregnancy condition that can have serious consequences for both the mother and the baby. The significant rise in plasma volume causes anemia (Güler *et al.* 2019). The study by Noshiro *et al.* (2022) showed that 231 women without first trimester anemia in total were screened for the study, and that anemia developed in roughly one-fifth of the participants by the third trimester, and that HGB, ferritin, and iron levels dropped from early to late pregnancy. In the second trimester, 16% of women had HGB less than (10.5 g/dL), and in the third trimester, 20% had Hb less than (10.0 g/dL).

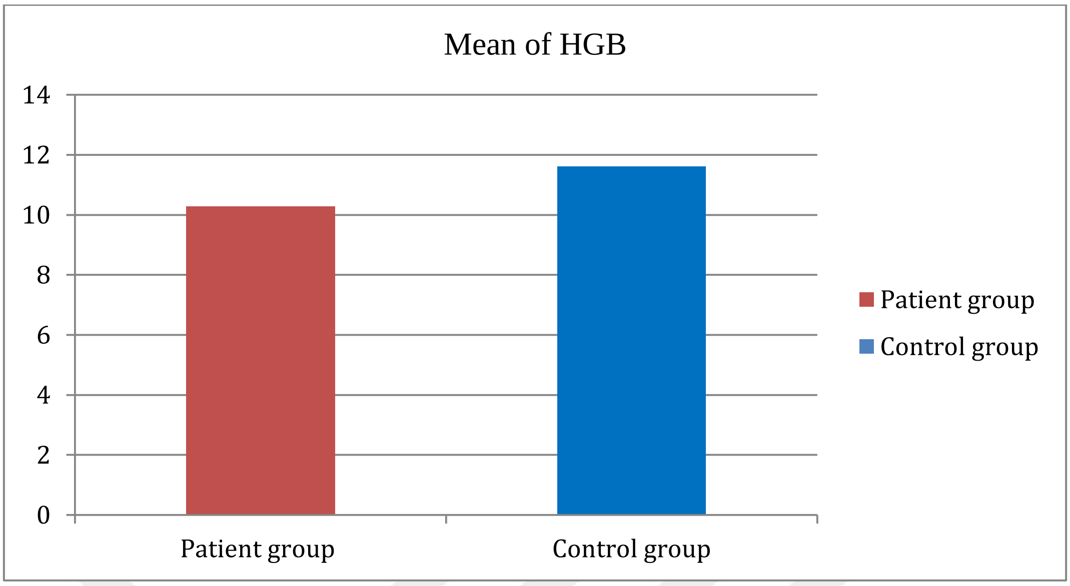

Figure 4.6 Chart of HGB in study

4.1.7 The result of parameters

The result of parameters shown in table 4.1

Table 4.1 The result of parameters

Parameters	**Mean ± SD**		**Sig.**
	Patient group (n=50)	**Control group (n=50)**	
Age	27.08 ± 6.285	27.16 ± 6.20	0.90
Pregnancy (week)	30.08 ± 3.318	1.0 ± 0.000	0.0001
Vitamin D (ng/ml)	14.70 ± 6.164	33.40 ± 4.8133	0.016
S. Calcium (mg/dl)	8.192 ± 0.30	8.48 ± 0.25	0.49
S. Ferritin (ng/dl)	38.35 ± 17.28	40.46 ± 16.12	0.71
S. Iron (µg/dl)	31.59 ± 7.85	58.43 ± 13.71	0.001
HGB (g/dl)	10.28 ± 0.73	11.61 ± 0.589	0.34

5. CONCLUSION AND RECOMMENDATION

Vitamin D is essential for a long and healthy life. Skin production and food intake are two potential sources of this information. An individual's ability to make vitamin D3 from their skin is influenced by a wide range of factors.

During our research, we looked at the impact of pregnancy on various nutrients such as vitamin D, calcium, hemoglobin, and iron. Pregnancy was plainly evident in the results of the next tests, which revealed low levels of vitamin D, calcium, and hemoglobin. Perhaps this deficiency develops into other diseases in pregnant women and causes problems. It also has a direct effect on the fetus, as it will not be fed with sufficient quantities of vitamin D and calcium.

Studies have shown a possible link between vitamin D deficit and pregnancy-related health issues, such as pre-eclampsia and a higher risk of preterm delivery and low birth weight, as well as a conceivable connect between vitamin D insufficiency and contamination. Bacterial vaginosis and the need for a cesarean section are both more likely in women with gestational diabetes than in those without it. When a pregnant woman is exposed to vitamin D deficiency, the level of calcium in her newborn's blood decreases, potentially leading to convulsions, rickets, abnormal bone growth, tooth enamel damage, and possibly low bone density or osteomalacia. This deficiency may also affect the later stages of MS, cancer, and type 1 diabetes. Pregnancy may raise a child's chance of developing a food allergy in the first two years of life, according to a new study.

We can conclude this thesis as follows:

1. Our findings show that patients in the third trimester of pregnancy are more likely to have vitamin D insufficiency than those in the healthy group (first trimester).
2. Our findings show that patients in the third trimester of pregnancy are suffering from slight calcium deficiency.

3. Our results are did not find the effect of pregnancy on the level of ferritin except in a few section of patients compared to healthy group.
4. Our findings show that patients in the third trimester of pregnancy are suffering from significant iron deficiency than those in the healthy group.
5. Our results are found that most pregnant woman to suffer from mild anemia,

Recommendations

1. We suggest that pregnant women should take iron and vitamin D, especially in the last trimester of pregnancy.
2. We propose that clinical practice should pay more attention to vitamin D supplementation during pregnancy.
3. Increase the number of volunteers and women work in remote areas and consider the difference between women in the city and remote areas.

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