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Assessment of Vitamin D Status among Pregnant Women in Surman Region in Western Libya

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Abstract

The prevalence of vitamin D deficiency differs in various parts of the world based on ethnicity, latitude, environmental factors, and sociocultural practices; vitamin D deficiency is more common in pregnant women than non-pregnant women. Vitamin D deficiency is a common concern during pregnancy due to increased demands on the mother's body to support fetal development. It is a significant public health problem for pregnant women in Libya. The present study aimed to assess the vitamin D status among pregnant women in the Surman region in Western Libya. An observational study was conducted among 200 subjects (100 pregnant women and 100 non-pregnant women) in the Surman region in Western Libya, over seven months from the 1st September 2024 to 31st March 2025. Serum 25-hydroxyvitamin D levels were measured using an enzyme immunoassay method. The associations of the levels of 25 hydroxyvitamin D with age groups and pregnancy periods were assessed using the Chi-square test, ANOVA test, and Person correlation by SPSS version 25. The results showed that the serum vitamin D levels were <10 ng/mL, (10-20 ng/mL), and (21-29 ng/mL) in 79%, 17%, 4% of pregnant women, respectively. The mean serum vitamin D concentrations were significantly ($P<0.01$) decreased in pregnant (8.611±0.47 ng/ml) compared to non-pregnant women (18.874±0.90 ng/ml). These decreases were significant ($P<0.05$) in the second period of pregnancy (7.795±0.54 ng/ml) compared to the first period of pregnancy (10.648±1.22 ng/ml), and significantly ($P<0.01$) decreased (7.649±0.50 ng/ml) in the third period of pregnancy compared to the first period of pregnancy (10.648±1.22 ng/ml). The mean serum vitamin D concentrations were significantly ($P<0.01$) decreased, 8.293±0.72, 9.22±0.82, and 8.614±0.47 ng/ml in age groups, (20-29), (30-39),

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and (>39) years in pregnant women compared with the same age groups in non-pregnant women, 16.05±1.88, 20.13±1.82, and 19.09±0.63 ng/ml, respectively. The mean serum vitamin D concentrations were significantly (*P<0.01*) decreased in severe deficiency vitamin D pregnant women (6.821±0.20 ng/ml) compared to insufficient vitamin D in the same group (15.770±1.34 ng/ml). The mean serum vitamin D concentration in insufficient vitamin D in pregnant women significantly decreased (15.770±1.34 ng/ml) compared with that in insufficient vitamin D in non-pregnant Women (19.372±0.69 ng/ml). A significant negative correlation (r = -0.586) at (*P<0.01*) was observed between vitamin D concentrations with Pregnancy and a significant negative correlation (r = -0.237) with the periods of pregnancy at (*P<0.05*). The results showed that vitamin D deficiency was extremely common among pregnant women in the Surman region of Western Libya. A significant negative correlation was observed between vitamin D concentrations with Pregnancy and the periods of pregnancy. Pregnant women should consume foods high in vitamin D and expose their skin to sunlight for a sufficient amount of time to boost their body's natural synthesis of vitamin D. The information might be used to create health promotion programs that maximize pregnant women's vitamin D levels. More study is needed to determine if untreated vitamin D deficiency in the early stages of pregnancy has an impact on the mother and the unborn child and to assist Libyan women in selecting suitable therapy. Our findings highlight the need for increased awareness and potential interventions to address vitamin D inadequacy in pregnant women to enhance outcomes for both mothers and babies.

Keywords: Vitamin D deficiency, Vitamin D Levels, Pregnant women, Correlation with pregnancy and its periods, Surman region, Western Libya.

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تقييم حالة فيتامين د لدى النساء الحوامل في منطقة صرمان غرب ليبيا

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الملخص

يختلف انتشار نقص فيتامين (د) في أجزاء مختلفة من العالم بناءً على العرق وخط العرض والعوامل البيئية والممارسات الاجتماعية والثقافية؛ نقص فيتامين (د) أكثر شيوعًا لدى النساء الحوامل منه لدى النساء غير الحوامل. نقص فيتامين (د) هو مصدر قلق شائع أثناء الحمل بسبب زيادة المتطلبات على جسم الأم لدعم نمو الجنين. إنها مشكلة صحية عامة كبيرة للنساء الحوامل في ليبيا. هدفت الدراسة الحالية إلى تقييم مستويات فيتامين (د) بين النساء الحوامل في منطقة صرمان في غرب ليبيا. المواد والطرق: أجريت دراسة مراقبة بين 200 شخص (100 امرأة حامل و100 امرأة غير حامل) في منطقة صرمان في غرب ليبيا، على مدى سبعة أشهر من 1 سبتمبر 2024 إلى 31 مارس 2025. تم قياس مستويات 25-هيدروكسي فيتامين (د) في المصل باستخدام طريقة مقايسة المناعة الإنزيمية. تم تقييم ارتباط مستويات فيتامين (د) مع الفئات العمرية وفترات الحمل باستخدام اختبار مربع كاي، واختبار تحليل التباين، واختبار الارتباط باستخدام (SPSS)الإصدار 25. أظهرت النتائج أن مستويات فيتامين (د) في المصل كانت أقل من 10 نانوغرام/مل، و(10–20 نانوغرام/مل)، و(21–29 نانوغرام/مل) لدى 79%، و17%، و4% من النساء الحوامل، على التوالي. انخفض متوسط تركيزات فيتامين (د) في المصل بشكل ملحوظ (*P<0.01*) لدى النساء الحوامل (8.611±0.47 نانوغرام/مل) مقارنةً بالنساء غير الحوامل (18.874±0.90 نانوغرام/مل). وكانت هذه الانخفاضات معنوية (*P<0.05*) في الفترة الثانية من الحمل (7.795±0.54 نانوجرام/مل) مقارنة بالفترة الأولى من الحمل (10.648±1.22 نانوجرام/مل)، وانخفضت معنويا (*P<0.01*)(7.649±0.50 نانوجرام/مل) في الفترة الثالثة من الحمل مقارنة بالفترة الأولى من الحمل (10.648±1.22 نانوجرام/مل). انخفض متوسط تركيزات فيتامين (د) في المصل بشكل ملحوظ (*P<0.01*) ، حيث بلغ 8.293±0.72، و9.22±0.82، و8.614±0.47 نانوغرام/مل في الفئات العمرية (20–29)، و(30–39)، و(>39) سنة لدى النساء الحوامل، مقارنةً بالفئات العمرية نفسها لدى النساء غير الحوامل، وهي 16.05±1.88، و20.13±1.82، و19.09±0.63 نانوغرام/مل، على التوالي. كما

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انخفض متوسط تركيزات فيتامين (د) في المصل بشكل ملحوظ (*P<0.01*) لدى النساء الحوامل اللاتي يعانين من نقص حاد في فيتامين (د) (6.821±0.20 نانوغرام/مل) مقارنةً بنقص فيتامين (د) في نفس المجموعة (15.770±1.34 نانوغرام/مل). انخفض متوسط تركيز فيتامين (د) في المصل لدى النساء الحوامل اللواتي يعانين من نقص فيتامين (د) بشكل ملحوظ (15.770 ± 1.34 نانوغرام/مل) مقارنة بتركيز فيتامين(د) غير الكافي لدى النساء غير الحوامل (19.372 ± 0.69 نانوغرام/مل). لوحظ وجود ارتباط سلبي كبير (r = −0.586) عند (*P <0.01*) بين تركيزات فيتامين د والحمل وارتباط سلبي كبير (r = −0.237) مع فترات الحمل عند (*P<0.05*). أظهرت النتائج أن نقص فيتامين (د) كان شائعًا للغاية بين النساء الحوامل في منطقة صرمان في غرب ليبيا. لوحظ وجود ارتباط سلبي كبير بين تركيزات فيتامين (د) مع الحمل وفترات الحمل. يجب على النساء الحوامل تناول الأطعمة الغنية بفيتامين (د) وتعريض بشرتهن لأشعة الشمس لفترة كافية من الوقت لتعزيز التركيب الطبيعي لجسمهن من فيتامين (د). يمكن استخدام المعلومات لإنشاء برامج تعزيز الصحة التي تزيد من مستويات فيتامين (د) لدى النساء الحوامل. هناك حاجة إلى مزيد من الدراسات لتحديد ما إذا كان نقص فيتامين(د) غير المعالج في المراحل المبكرة من الحمل يؤثر على الأم والجنين، ولمساعدة النساء الليبيات في اختيار العلاج المناسب. تُبرز نتائجنا الحاجة إلى زيادة الوعي والتدخلات المحتملة لمعالجة نقص فيتامين د لدى النساء الحوامل، بما يُحسّن النتائج الصحية للأمهات والأطفال.

الكلمات المفتاحية: نقص فيتامين د، مستويات فيتامين د، النساء الحوامل، العلاقة مع الحمل وفتراته، منطقة صرمان، غرب ليبيا.

1. Introduction

Humans get cholecalciferol (vitamin D) via their diet, supplements, and exposure to the sun. The synthesis of vitamin D in the skin, which is triggered by ultraviolet B radiation, is the main factor influencing a population's vitamin D status because few foods (liver, fatty fish, eggs, milk and dairy products, soy milk, butter, and margarines) contain or are fortified with vitamin D (Holick, 2007, Vandevijvere *et al.*, 2012). The majority of the body's tissues and cells contain vitamin D receptors (Al Emadi and Hammoudeh, 2013, Abumhdi *et al.*, 2019).

The skin is the primary site of vitamin D synthesis, however, lifestyle and environmental variables may have an impact. The time of day, season, and sun zenith angle all affect how much vitamin D

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is produced by the skin (Wacker and Holick, 2013, Abumhdi *et al.*, 2019).

Following absorption from the gut or skin production, vitamin D undergoes hydroxylation in the liver to create 25-hydroxyvitamin D (25(OH)D), followed by 1,25-dihydroxyvitamin D (1,25(OH)2D) and 24,25-dihydroxyvitamin D (24,25(OH)2D) in the kidney and extra-renal tissues. The active metabolite can then enter cells and help with calcium absorption by attaching to the vitamin D receptor or a responsive gene, like calcium binding protein (Heaney *et al.*, 2003, Edwards *et al.*,2014, Abumhdi *et al.*, 2019). Because it improves intestinal absorption of dietary calcium and stimulates osteoclasts to break down calcium deposited in bone, vitamin D is crucial for maintaining the proper amount of calcium in the body (Holick, 2009, Al-Graiw *et al.*, 2020).

When people don't receive enough sunshine or eat enough foods high in vitamin D, they develop a vitamin D deficiency (Al-Graiw *et al.*, 2020). Vitamin D insufficiency is more frequent in pregnant women than in nonpregnant women; the incidence varies by ethnicity, latitude, environmental variables, and sociocultural practices across the world (Purswani *et al.*, 2017, Reverzani *et al.*, 2025).

The high prevalence of vitamin D deficiency worldwide is a matter for growing concern because of its potential negative consequences on human health, particularly that of pregnant women and their unborn children. In addition to its conventional function of regulating calcium and phosphate metabolism, its deficiency is associated with a host of detrimental health consequences. The conventional consequences of vitamin D deficiency in pregnancy and the fetus include rickets and late-onset hypocalcemia. Furthermore, recent studies have linked vitamin D deficiency to several pregnancy and fertility-related clinical conditions, such as preterm labor, gestational diabetes, preeclampsia, and increased rates of cesarean sections (Mansur *et al.*, 2022, Bochorishvili *et al.*, 2024).

Despite the fact that more than 60% of the pregnant women reported taking vitamin D-containing multivitamins during their pregnancy, nearly 45% of them had vitamin D deficiency (25-(OH)D,20 ng/ml). Multiple negative health consequences for mothers, newborns, and children are linked to vitamin D insufficiency during pregnancy (Vandevijvere *et al.*, 2012). For the growth of the fetus, the health of the newborn, and the long-term well-being of the child, the

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mother need more vitamin D than normal throughout pregnancy (Holick and Chen, 2008, Thorne-Lyman and Fawzi, 2012, Miliku *et al.*, 2016, Zaidi *et al.*, 2023, AbuRedwan *et al.*, 2024).
Pregnant women frequently suffer from severe vitamin D deficiency in Libya and other Arab nations (Markestad *et al.* 1984, Serenius *et al.* 1984, Abumhdi *et al.*, 2019, Zaidi *et al.*, 2023). Studies conducted in a number of nations have found that between 4% and 60% of pregnant women suffer from vitamin D insufficiency (Prentice, 2008, Palacios and Gonzales, 2014). Furthermore, according to AbuRedwan *et al.* (2024), 49% of mothers lacked adequate amounts of vitamin D. All of these findings show that pregnant women and people in Libya continue to suffer from vitamin D deficiency. Pregnant women's vitamin D level is influenced by a variety of factors, such as their diet, usage of dietary supplements, amount of time spent outside, clothing choices, use of sunscreen, weight, skin tone, and health issues (Zaidi *et al.*, 2023).

Objectives

Research on the vitamin D levels of pregnant women in the Surman area in Western Libya is limited. Therefore, the aim of the present study was to assessment the vitamin D status among pregnant women in Sunman region in Western Libya.

Materials and Methods

Over the course of seven months, from September 1, 2024, to March 31, 2025, 200 participants—100 pregnant and 100 non-pregnant—participated in an observational study in the Surman region of Western Libya. An observational study was conducted among 200 subjects (100 pregnant women and 100 none pregnant women) in Surman region in Western Libya, over a period of seven months from 1st September 2024 to 31st March 2025. The use of pharmaceuticals known to impact bone metabolism, such as phenobarbital for seizures, anti-tuberculosis medications, cholesterol-lowering statin medications, thiazide diuretics, anti-retroviral medications, and glucocorticoids, was one of the exclusion criteria. Written informed permission was acquired by each subject.
5 milliliters of venous blood were taken from each participant. The blood samples was then sent to the laboratory for the evaluation of the vitamin status. The enzyme immunoassay technique was used to detect the levels of serum 25-hydroxyvitamin D.

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According to Ginde *et al.* (2009), 25-OHD levels of less than 10 ng/ml were considered severe; 25-OHD values of 10–20 ng/ml were considered moderate; insufficiency was defined as 21–29 ng/ml; and an acceptable serum 25-OHD level was defined as ≥30 ng/ml (Holick *et al.*, 2011).

Statistical Analysis

Data were analyzed using SPSS version 25. The associations of the levels of 25 hydroxyvitamin D with age groups and pregnancy periods were assessed throughout using the Chi-square test, ANOVA test, and Person correlation. A P-value of <0.05 was considered significant for all statistical test.

Results

- **The serum vitamin D levels in pregnant**

The result showed that the serum vitamin D levels were <10 ng/mL, (10-20 ng/mL), and (21-29 ng/mL) in 79%, 17%, 4% of pregnant women, respectively.

- **The mean serum vitamin D concentrations in pregnant and non-pregnant women**

Data in table (1) and figure (1) show the mean serum Vitamin D concentrations in pregnant and non-pregnant women. The mean serum Vitamin D concentration was significantly (P<0.01) decreased in pregnant (8.611±0.47 ng/ml) compared to non-pregnant women (18.874±0.90 ng/ml).

Table. 1: The mean serum vitamin D concentration in pregnant and non-pregnant women

Groups	Non-Pregnant Women (n=100)	Pregnant Women (n=100)	F	P-Value
Parameter	Mean±SE	Mean±SE		
Vitamin D concentration (ng/ml)	18.874±0.90	8.611±0.47**	69.482	0.000

**: Significant at p<0.01 as compared with Non-Pregnant Women

- **The mean serum vitamin D concentrations in the pregnancy periods**

The mean serum Vitamin D concentrations in pregnant women show a significantly (*P<0.05*) decreased in the second period of

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pregnancy (7.795±0.54 ng/ml) compared the first period of pregnancy (10.648±1.22 ng/ml), and the mean serum Vitamin D concentrations in the third period of pregnancy were significantly (*P<0.01*) decreased (7.649±0.50 ng/ml) compared the first period of pregnancy (10.648±1.22 ng/ml) (Table.2 & Figure.2).

Table.2: The mean serum vitamin D concentrations in the pregnancy periods

Pregnancy Periods	First Period (n=31)	Second Period (n=30)	Third Period (n=39)	F	P-Value
Parameter	**Mean±SE**	**Mean±SE**	**Mean±SE**		
Vitamin D concentration (ng/ml)	10.648±1.22	7.795±0.54*	7.649±0.50**	4.488	0.014

*: Significant at p<0.05 as compared with the first period of pregnancy. **: Significant at p<0.01 as compared with the first period of pregnancy.

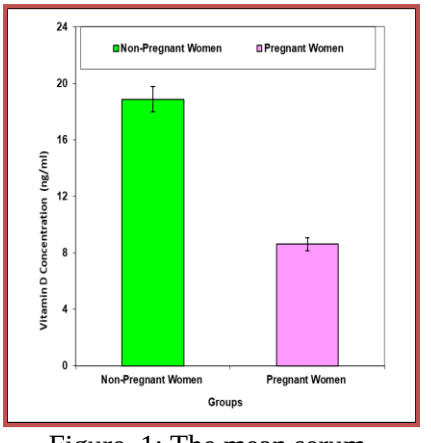

Figure. 1: The mean serum vitamin D concentrations in pregnant and non-pregnant women

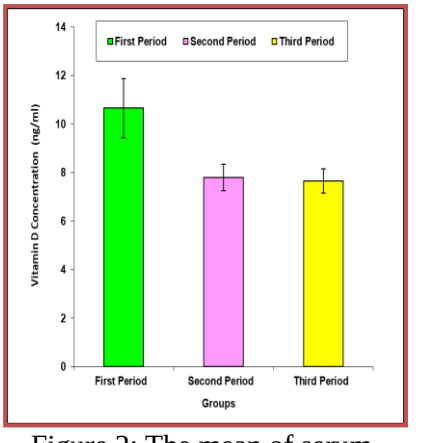

Figure.2: The mean of serum vitamin D concentrations in the pregnancy periods

- **The mean serum vitamin D concentrations in different age groups in pregnant and non-pregnant women**

The mean serum vitamin D concentrations in different age groups in pregnant and non-pregnant women are shown in Table (3) and Figure (3). According to age groups, the mean serum vitamin D concentrations were significantly (*P<0.01*) decreased, 8.293±0.72, 9.22±0.82, and 8.614±0.47 ng/ml in age groups, (20-29), (30-39), and (>39) years in pregnant women compared with the same age

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groups in non-pregnant women, 16.05±1.88, 20.13±1.82, and 19.09±0.63 ng/ml, respectively.

Table. 3: The mean serum vitamin D concentrations in different age groups in pregnant and non-pregnant women

Groups	Vitamin D concentration Non-Pregnant Women (n=100)	Vitamin D concentration Pregnant Women (n=100)	F	P-Value
Age Groups	**Mean±SE**	**Mean±SE**		
20-29	16.05±1.88	8.293±0.72**	19.873	0.000
30-39	20.13±1.82	9.22±0.82**		
>39	19.09±0.63	8.614±0.47**		

n= 38 in age group (20-29). n= 40 in age group (30-39). n= 22 in age group (>39). **: Significant at p<0.01 as compared with Non-Pregnant Women

- **The mean serum vitamin D concentrations in insufficient vitamin D and Severe deficiency vitamin D in pregnant women**

The mean serum vitamin D concentrations were significantly (*P<0.01*) decreased in severe deficiency vitamin D pregnant women (6.821±0.20 ng/ml) compared to insufficient vitamin D in the same group (15.770±1.34 ng/ml) (Table.4 & Figure.4).

Table.4: The mean serum vitamin D concentrations in insufficient vitamin D and Severe deficiency vitamin D in pregnant women

Vitamin D levels	Insufficient vitamin D (n=79)	Severe Deficiency vitamin D (n=21)	F	P-Value
Parameter	**Mean±SE**	**Mean±SE**		
Vitamin D concentration (ng/ml)	15.770±1.34	6.821±0.20**	135.603	0.000

**: Significant at p<0.01 as compared with insufficient vitamin D

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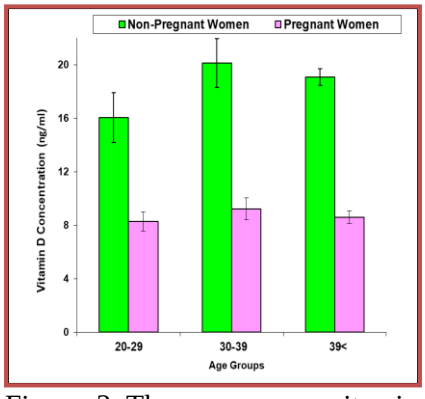

Figure. 3: The mean serum vitamin D concentrations in different age groups in pregnant and non-pregnant women

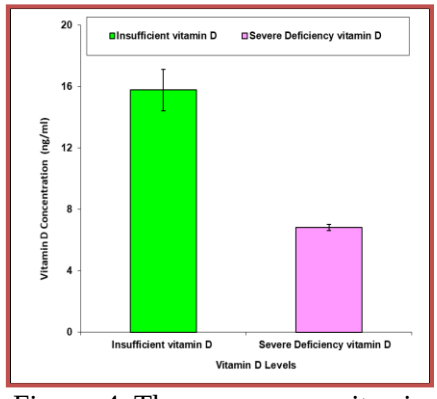

Figure. 4: The mean serum vitamin D concentrations in insufficient vitamin D and Severe deficiency vitamin D in pregnant women

- **The mean serum vitamin D concentrations in pregnant and pregnant non-Women according to Vitamin D Levels**

Table (5) and figure (5) demonstrate the mean serum vitamin D concentrations in pregnant and non- pregnant Women according to Vitamin D Levels. The mean serum vitamin D concentration in insufficient vitamin D in pregnant Women significantly decrease (15.770±1.34 ng/ml) compared with that in insufficient vitamin D in non- pregnant Women (19.372±0.69 ng/ml). The mean serum vitamin D concentration in sufficient vitamin D in non- pregnant Women was 36.940±0.95 ng/ml. The mean serum vitamin D concentration in severe vitamin D deficiency in pregnant Women was showed a non-significantly decrease (6.821±0.20 ng/ml) compared to the same level in non- pregnant Women (7.411±0.23 ng/ml).

Table. 5: The mean serum vitamin D concentrations in pregnant and non- pregnant Women according to Vitamin D Levels

Groups	Non-Pregnant Women Vitamin D concentration (n=100)	Pregnant Women Vitamin D concentration (n=100)	F	P-Value
Vitamin D Levels	**Mean±SE**	**Mean±SE**		
Sufficient vitamin D	36.940±0.95	-	210.15	0.000
Insufficient vitamin D	19.372±0.69	15.770±1.34**		
Severe Deficiency	7.411±0.23	6.821±0.20		

**: Significant at p<0.01 as compared with Non-Pregnant Women

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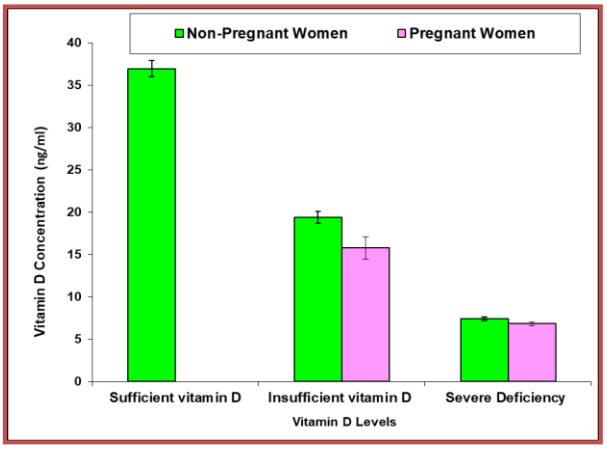

Figure. 5: The mean serum vitamin D concentrations in pregnant and non- pregnant Women according to Vitamin D Levels

- **The correlation between vitamin D concentrations with age groups, pregnancy, and pregnancy periods**

A significant negative correlation (r = -0.586) at (*P<0.01*) was observed between vitamin D concentrations with Pregnancy, and a significant negative correlation (r = -0.237) at (*P<0.05*) was recorded between vitamin D concentrations and the periods of pregnancy. On the other hand, a non-significant negative correlation (r = **-0.079**) was observed between vitamin D concentrations and age groups [Table.6, Figures (6-8)].

Table. 6: The correlation between vitamin D concentrations with age groups, pregnancy, and pregnancy periods

Parameter	Correlation Coefficient	P-Value
Age Groups	-0.079	0.423
Pregnancy	-0.586 **	0.000
Period of Pregnancy	-0.237 *	0.015

*: Significant at p<0.01; **: Significant at p<0.01

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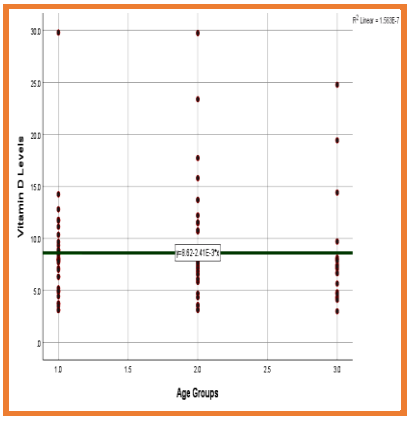

Figure. 6: The correlation between vitamin D levels and age groups.

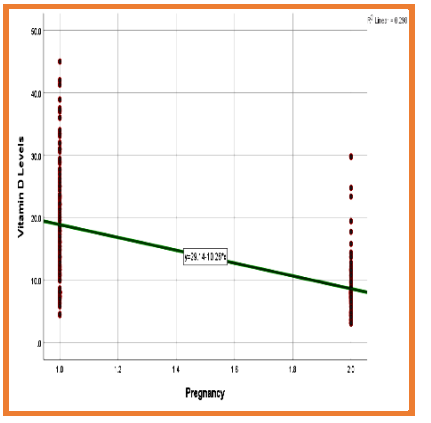

Figure. 7: The correlation between vitamin D concentrations and pregnancy.

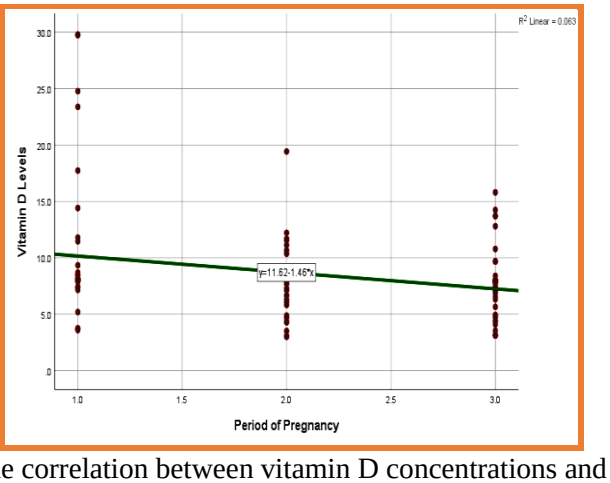

Figure. 8: The correlation between vitamin D concentrations and pregnancy periods

The mean serum vitamin D concentrations were significantly (*P<0.01*) decreased in severe deficiency vitamin D pregnant women (6.821±0.20 ng/ml) compared to insufficient vitamin D in the same group (15.770±1.34 ng/ml). The mean serum vitamin D concentration in insufficient vitamin D in pregnant women significantly decreased (15.770±1.34 ng/ml) compared with that in insufficient vitamin D in non-pregnant Women (19.372±0.69 ng/ml). A significant negative correlation (r = -0.586) at (*P<0.01*) was observed between vitamin D concentrations with Pregnancy and a significant negative correlation (r = -0.237) with the periods of pregnancy at (*P<0.05*).

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Discussion

The present study was carried out an observational study on 200 participants—100 pregnant and 100 non-pregnant women in the Surman region to assess the vitamin D status among pregnant women in Sunman region in Western Libya. Despite Libya's year-round abundance of sunshine, this suggests that other causes may be causing the population's low vitamin D levels (Zaidi *et al.*, 2023).

The present study showed that the serum vitamin D levels were <10 ng/mL, (10-20 ng/mL), and (21-29 ng/mL) in 79%, 17%, 4% of pregnant women, respectively. A significant negative correlation (r = -0.586) at (*P<0.01*) was observed between vitamin D concentrations with Pregnancy and a significant negative correlation (r = -0.237) with the periods of pregnancy at (*P<0.05*). Similarly, the Reverzani *et al.*, 2025 research found that pregnant women in Uganda had a high burden of vitamin D inadequacy at birth; the prevalence of 25(OH)D insufficiency, at 71.8%, is much higher than the worldwide average of 54% in pregnant women, as calculated by Saraf *et al.*, 2016. According to AbuRedwan *et al.* (2024), vitamin D levels in 85.6% of pregnant women in Libya were less than 20 ng/mL. In an Egyptian study, El Koumi *et al.* (2013) found that only 35.8% of pregnant women had blood vitamin D levels higher than 20 ng/mL. An Indian study found that 84% of pregnant women had vitamin D levels below 22.5 ng/mL (Sachan *et al.*, 2005). According to a countrywide survey in Belgium, 74.1% of persons had an insufficiency (<30 ng/mL) and 44.6% had a vitamin D deficiency (<20 ng/mL) (Vandevijvere *et al.*, 2012). Vitamin D deficiency is common among pregnant women, according to earlier research conducted in Turkey. According to Alagol e*t al.* (2000), in 1998, 66.6% of women in Istanbul who were of reproductive age had inadequate vitamin D levels. In 2003, Pehlivan *et al.* found that 94.8% of mothers and 24.6% of newborns had levels < 16 ng/mL. In a subsequent study by Ergur *et al.* (2009), only 18.6% of mothers and 2.9% of neonates had normal vitamin D levels. In 2008, Halicioglu *et al.* (2012) found that 50.4% of pregnant women in Turkey had blood vitamin D levels below 10 ng/mL. A 2010 study in Turkey found that vitamin D deficiency (≤20 ng/mL) affected 62.6% of pregnant women and 58.6% of neonates (Gur *et al.*, 2014). Furthermore, the prevalence of 25(OH) D insufficiency in the overall African population is 40.2%, which is greater than the 34% reported in the literature (Mogire *et al.*, 2020). In 2025, Reverzani *et al.*, discovered that pregnant women giving

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birth at St. Francis Hospital in Nsambya had a significant rate of vitamin D insufficiency (40.2%). According to Zaidi *et al.* (2023), 34% of pregnant women in a developed region of Libya had vitamin D insufficiency (25(OH)D < 20 ng/mL), with 43.8% of them being classed as seriously deficient (25(OH)D < 10 ng/mL). Tunisia (Fenina *et al.*, 2016), Morocco (Bour and Nejjar, 2017), and Egypt (Botros *et al.*,2015, Osman *et al.*,2020) have all shown significant rates of vitamin D insufficiency in women. According to Gharib *et al.* (2023), hypovitaminosis D is quite prevalent among pregnant women in Ismailia City. 34.8% of the pregnant women in this research had abnormal vitamin D levels. 15.4% of pregnant women had vitamin D insufficiency, and 19.4% had vitamin D deficiency, among pregnant women with abnormal vitamin D levels. With rates ranging from 30 to 90%, hypovitaminosis D is prevalent, with a desired serum 25 hydroxy-vitamin D [25(OH)D] of 20 ng/ml. Adult hypovitaminosis D is known to be predicted by a number of factors, including age, female gender, multiparity, clothing style, season, socioeconomic level, and urban life. The established risk factors for rickets and hypovitaminosis D in children include low dietary calcium intake and prolonged nursing without vitamin D supplementation (Bassil *et al.*, 2013, Abumhdi *et al.*, 2019).

The current study revealed that the mean serum vitamin D concentrations were significantly ($P<0.01$) decreased in pregnant (8.611±0.47 ng/ml) compared to non-pregnant women (18.874±0.90 ng/ml). These decreases were significant ($P<0.05$) in the second period of pregnancy (7.795±0.54 ng/ml) compared to the first period of pregnancy (10.648±1.22 ng/ml), and significantly ($P<0.01$) decreased (7.649±0.50 ng/ml) in the third period of pregnancy compared to the first period of pregnancy (10.648±1.22 ng/ml). Similarly, the mean vitamin D level of pregnant Libyan women was 15.72±10.5 ng/mL, according to AbuRedwan *et al.*, 2024. Ninety percent of pregnant women in the first trimester had vitamin D insufficiency, according to the previous study (Vandevijvere *et al.*, 2012, Bukhary *et al.*, 2016). This suggests that a sizable fraction of expectant mothers may not be getting enough vitamin D in the early stages of their pregnancy. On the other hand, the third trimester had a greater frequency of vitamin D insufficiency than previous trimesters, according to a 2019 study by Singh *et al.* in India. This raises the possibility of a vitamin D shortage in later stages of pregnancy and points to a potential reduction in vitamin D status as pregnancy goes on.

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Deficit was found in all trimesters when vitamin D level was analyzed by trimester (Zaidi *et al.*, 2023). Regardless of the trimester, this implies that vitamin D deficiency is a common problem throughout pregnancy (Regan and Rai, 2000, Zaidi *et al.*, 2023).

The results of the present study showed that the mean serum vitamin D concentrations were significantly ($P<0.01$) decreased, 8.293±0.72, 9.22±0.82, and 8.614±0.47 ng/ml in age groups, (20-29), (30-39), and (>39) years in pregnant women compared with the same age groups in non-pregnant women, 16.05±1.88, 20.13±1.82, and 19.09±0.63 ng/ml, respectively. These findings are consistent with some other research that found that older adults were more likely to be vitamin D deficient (Omar *et al.*, 2017, Zaidi *et al.*, 2023). However, according to other research, vitamin D insufficiency was more common in younger women than in older women (Al-Faris, 2016, El-Khateeb *et al.*, 2019, Zaidi *et al.*, 2023). This age-related variation in vitamin D insufficiency may be caused by a number of factors. One explanation is that older women are more likely to take regular vitamin D supplements and may eat healthier due to their increased health consciousness. Furthermore, older women may have a greater internal pool of vitamin D, mostly in the form of adipose reserves of 25(OH)D, which may explain their comparatively higher levels.

Conclusion

The results showed that vitamin D deficiency was extremely common among pregnant women in the Surman region of Western Libya. A significant negative correlation was observed between vitamin D concentrations with Pregnancy and the periods of pregnancy. Pregnant women should consume foods high in vitamin D and expose their skin to sunlight for a sufficient amount of time to boost their body's natural synthesis of vitamin D. The information might be used to create health promotion programs that maximize pregnant women's vitamin D levels. Pregnant women should consume foods enriched with vitamin D and take vitamin D supplements to reduce this public health hazard. More study is needed to determine if untreated vitamin D deficiency in the early stages of pregnancy has an impact on the mother and the unborn child and to assist Libyan women in selecting suitable therapy. Our findings highlight the need for increased awareness and potential

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interventions to address vitamin D inadequacy in pregnant women in order to enhance outcomes for both mothers and babies.

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