RESEARCH PAPER

Prevalence of vitamin D deficiency among pregnant women In Basrah city

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Abstract

Background: vitamin D is a fat-soluble vitamin that is crucial for calcium homeostasis and bone metabolism and is obtained through diet and solar exposure. The prevalence of vitamin D deficiency among pregnant women ranges from 4% to 60%. There's an association between vitamin D deficiency and a variety of obstetric complications, such as gestational hypertension and preeclampsia, gestational diabetes, and delivery timing and mode. The study aimed to estimate the prevalence of vitamin D deficiency among pregnant women in Basrah city and detection of the possible aetiologies of vitamin D deficiency.

Subjects and Methods: this is a descriptive cross-sectional study conducted at Al-Basrah Maternity and Child Hospital for the period from January 1st, 2023, to June 30, 2023. 102 pregnant women in the 1st and 2nd trimesters were drawn by systematic random sampling while they were visiting the outpatient department, labour ward, and obstetric ward in Al-Basrah Maternity and Child Hospital.

Results: vitamin D deficiency was prevalent among pregnant women in Basrah (45.1%). There was a significant association between the history of sun exposure, time, and duration of sun exposure and an increasing risk of vitamin D deficiency(the P-value < 0.05). There was a significant association between BMI and vitamin D deficiency (P-value = 0.011), as well as the use of multivitamin supplements and vitamin D supplements (P-value = 0.001), which has a significant association with decreasing the risk of vitamin D deficiency.

Conclusion: vitamin D deficiency is common among pregnant women in Basrah, with many risk factors predisposing to it, such as reduced sun exposure and a high BMI.

Keywords*:* prevalence, vitamin D, pregnancy, Basrah.

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Introduction

Vitamin D is a fat-soluble vitamin that is crucial for calcium homeostasis and bone metabolism. A deficiency in vitamin D can cause osteomalacia and rickets in minors, as well as osteomalacia in adults. The addition of vitamin D to milk in the 1930s was instrumental in eradicating rickets worldwide. However, subclinical vitamin D deficiency is still widespread in both developed and developing nations, with a prevalence of up to one billion worldwide.[1] The major sources of ergocalciferol (D2) and cholecalciferol (D3) are dermal synthesis and dietary intake (fatty fish livers, fortified food), both of which are converted to 25-hydroxy-vitamin D2 (25-OH-D2) and 25-hydroxy-vitamin D3 (25-OH-D3) in the liver by the enzyme hepatic enzyme 25-hydroxylase. In the kidneys, the enzyme 1-alpha-hydroxylase converts both 25-OH-D2 and 25-OH-D3 into the most active form of vitamin D (1,25

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dihydroxyvitamin D).[2] In conjunction with parathyroid hormone, calcium and phosphate homeostasis are the primary functions of circulating 1,25(OH)2D.[3] Vitamin D is essential for sustaining adequate serum calcium and phosphorus concentrations. Only 10 to 15% of dietary calcium and about 60% of phosphorus are assimilated in the absence of vitamin D. Therefore, vitamin D has a significant impact on bone formation and maintenance.[4] However, the effect of pregnancy on 25(OH)D is poorly understood: some studies indicate a decrease during pregnancy[5], whereas others show no significant differences in 25(OH)D pre-pregnancy, within each trimester, or during lactation. As the foetus is completely dependent on the mother for 25(OH)D, maternal 25(OH)D during pregnancy is an essential consideration.[6] The prevalence of vitamin D deficiency among expectant women and neonates ranges from 4% to 60% and from 3% to 86%, respectively.[7,8] Vitamin D deficiency has been linked to limited sun exposure, regular sunscreen use, residing in northern latitudes, dark skin, obesity, extensive clothing coverage, ageing, poor nutritional status, malabsorption syndromes, and medications.[9] Numerous observational studies report associations between serum vitamin D status during pregnancy and a variety of obstetric complications, such as gestational hypertension and pre-eclampsia, gestational diabetes, and delivery timing and mode.[10]

The study aimed to estimate the prevalence of vitamin D deficiency among pregnant women in Basrah city and detection of the possible aetiologies of vitamin D deficiency.

Method

This is a descriptive cross-sectional study, conducted at Al-Basrah Maternity and Child Hospital to estimate the vitamin D deficiency among pregnant Iraqi women and the risk factors related to this deficiency. Data was collected for the period from the 1st of January 2023 to the 30th of June 2023. One hundred-two pregnant women in the 1st and 2nd trimesters were drawn by systematic random sampling method while they were visiting the outpatient department, labour ward, and obstetric ward in Al-Basrah Maternity and Child Hospital. The enrolled women were entirely oriented to the topic issue and its value, and verbal consent had been obtained from them before participation. Face-to-face interviews were used to collect data by the researcher. The questionnaire included the following aspects:

- Socio-demographic and lifestyle characteristics such as age, residency, educational level, occupation, and family income.
- Maternal characteristics such as parity and inter-pregnancy intervals.
- Physical activity, lifestyle, and sun exposure.
- Medical profile: any history of chronic disease, chronic use of drugs, usage of vitamin D supplement during pregnancy (if the dose is more than 600 IU it is considered adequate).[11]

Participants enrolled in the study underwent an anthropometric measure: The height was measured using a tape measure, and weight was measured using a weight scale, and then BMI was calculated (calculated as weight in kilograms divided by height in meters squared). Participants' BMI was then categorized into underweight (<18.5), normal weight (18.5–24.9), overweight (25–29.9) and obese (> 30).[12] Fasting blood samples were collected from the antecubital vein of all enrolled pregnant women, for serum 25(OH)D concentrations assay. We use ichroma™ Vitamin D is a fluorescence immunoassay (FIA) that measures the total 25(OH)D2/D3 level in human serum or plasma quantitatively.

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The cut-off (reference range(25)OH)D status

- Normal (≥ 30 ng/ml)
- Deficient (< 30 ng/ml).

Data was entered using computerized statistical software; Statistical Package for Social Sciences (SPSS) version 26 was used. Quantitative data were presented as (mean ± standard deviation) and analyzed using a t-test, while qualitative data were presented as frequencies and percentages and analyzed using chi-square. In all statistical analyses, the level of significance (p-value) is set at ≤ 0.05.

Results

The results of 102 pregnant ladies were presented. The women's age ranged from 20-35 years old, with a mean of 25.02 years. 45.1% of them are between 20-24 years old. Regarding their residency, 59.8% of them lived in urban areas and 40.2% lived in rural areas. Regarding their educational level, 75.5% of them had a high school education or less. On the other hand, 24.5% had a college education or more. The employment status shows that 76.5% of them were housewives. The women were asked about their dressing status, most of them 91.2% were fully covered and only nine women were partially covered. These data are presented in (Table-1).

Table 1. Socio-demographic characteristics among participants

Variables		No. (%)
Age	Mean ±SD	25.02 ± 3.6 (20-35 years)
	20-24	46 (45.1)
	25-29	45 (44.1)
	≥ 30	11(10.8)
Residency	Rural	41(40.2)
	Urban	61(59.8)
Educational level	High school education or less	77 (75.5)
	College education or more	25 (24.5)
Employment status	Housewives	78 (76.5)
	Employed	24 (23.5)
Dressing	Fully covered	93(91.2)
	Partially covered	9 (8.8)
Total		102 (100.0)

The prevalence of vitamin D deficiency was shown in Table 2 which ranged from 15- 35 ng/ml. 54.9% of them had a normal vitamin D level on the other hand 45.1% had a vitamin D deficiency.

Table 2. The prevalence of Vitamin D deficiency

Variable		
Vitamin D level (102)	Mean ± SD (range)	25.4 ± 5.43 (15-35)
	Normal (≥30 ng/ml)	56 (54.9)
	Deficient (<30 ng/ml)	46 (45.1)

The association between sociodemographic and lifestyle characteristics and vitamin D deficiency among participants is presented in (Table-3). There is no significant association between age, residency, Educational level, employment status, and dressing status with the vitamin D level since the P value > 0.05. Regarding lifestyle characteristics, there is a significant association between sun exposure, The time of sun exposure, and Duration of sun exposure with vitamin D level, the P value > 0.05. the highest percentage of women with vitamin D deficiency mentioned they are rarely exposed to the sun 58.7%. fifty percent of women with vitamin D deficiency had less than 15 minutes of daily sun exposure. There is no significant association between the practice of exercise and a vitamin D deficiency p-value = 0.117.

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Table 3. Socio-demographic and lifestyle characteristics and vitamin D deficiency among participants

Variables		Normal	Deficient	Total	p-value
Age	Mean ± SD	24.5 ±3.31	25.41 ±3.75	25.02 ± 3.6 (20-35)	0.432
	20-24	25(54.3)	21(45.7)	46 (100.0)	
	25-29	23(51.1)	22(48.9)	45 (100.0)	
	≥ 30	8(72.7)	3(27.3)	11(100.0)	
Residency	Rural	25(61.0)	16(39.9)	41(100.0)	0.312
	Urban	31(50.7)	30(49.2)	61(100.0)	
Educational level	High school education or less	39(50.6)	38(49.4)	77(100.0)	0.130
	College education or more	17(68.0)	8(32.0)	25(100.0)	
Employment status	Housewives	41)52.6)	37(47.4)	78(100.0)	0.392
	Employed	15(62.5)	9(37.5)	24 (100.0)	
Dressing	Fully covered	50(53.8)	43(46.2)	93(100.0)	0.458
	Partially covered	6(66.7)	3(33.3)	9 (100.0)	
Sun exposure	Rarely	19(41.3)	27(58.7)	46(100.0)	0.005
	Sometimes	18(54.5)	15(45.5)	33(100.0)	
	Frequently	19(82.6)	4(17.4)	23(100.0)	
Daytime sun exposure	Morning	23(43.4)	30(56.6)	53 (100.0)	0.016
	Midday	29(72.5)	11(27.5)	40 (100.0)	
	Evening	4(44.4)	5(55.6)	9 (100.0)	
Daily sun exposure duration	Less than 15 min.	38(49.4)	39(50.6)	77(100.0)	0.048
	15 minutes or more	18(72.0)	7(28.0)	25 (100.0)	
Daily practice of exercise	Rarely	27(46.6)	31 (53.4)	58 (100.0)	0.117
	Sometimes	18(62.1)	11(37.9)	29(100.0)	
	Frequently	11(73.3)	4(26.7)	15 (100.0)	

Table-4, shows the association of maternal characteristics, vitamin D and supplement intake with vitamin D deficiency. The gestational age, parity, interpregnancy interval, and previous method of delivery, all of them had a p-value of more than 0.05. Multivitamin supplements and vitamin D intake both had a significant statistical association with vitamin D deficiency P-value= 0.001. Regarding the daily dose whether adequate or inadequate, there is no significant association with vitamin D deficiency. P value = 0.12. The BMI had a significant association with vitamin D deficiency, P value = 0.011.

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Table 4. Maternal characteristics, vitamin D and dietary supplements intake and vitamin D deficiency among participants

Variables		Normal	Deficient	Total	p-value
Gestational age	Mean ±SD	19.89 ± 2.67	20.64 ±2.66	20.30 ± 2.68	0.980
Parity	0	4(50.0)	4(50.0)	8 (100.0)	0.189
	1-2	32(66.7)	16(33.3)	48(100.0)	
	≥ 3	20(43.5)	26(56.5)	46(100.0)	
Inter-pregnancy intervals (n=94)	2 years or less	35(51.5)	33(48.5)	68 (100.0)	0.225
	More than 2 years	17(65.4)	9(34.6)	26(100.0)	
The previous method of delivery (n=94)	Normal vaginal delivery	32(50.0)	32(50.0)	64(100.0)	0.130
	Caesarean birth	20(66.7)	10(33.3)	30(100.0)	
Multivitamin supplement	Yes	28(75.7)	9(24.3)	37 (100.0)	0.001
	No	28(43.1)	37(56.9)	65 (100.0)	
Vitamin D intake	Yes	34(81.0)	8(19.0)	42(100.0)	0.001
	No	22(19.0)	38(63.3)	60(100.0)	
Daily dose (N=42)	Adequate	12(92.3)	1(7.7)	13 (100.0)	0.12
	Inadequate	20(68.9)	9(31.1)	29 (100.0)	
BMI	18.5- 24.9	16(84.2)	3(15.8)	19 (100.0)	0.011
	25- 29.9	36(46.8)	41(53.2)	77(100.0)	
	≥ 30	4(66.7)	2(33.3)	6 (100.0)	

Discussion

As a consequence of the numerous studies that have elucidated Vitamin D's function in various physiological mechanisms, Vitamin D is currently the focus of a great deal of research. The current study reported a mean vitamin D level of 25.4 ± 5.43 ng/ml, which is already below the normal range of 30 ng/ml. However, less than half of the cases (45.1%) reported low vitamin D status. Our prevalence is lower than the percentage rates of Vitamin D deficiency among pregnant women who were included in a recent study from Sulaymaniyah City, northern Iraq, by Sofihussein et al. (2023), which was equal to 71.3%.[13] The current study's findings are in line with a local study from Duhok, northern Iraq, by Al-Tamimi et al. (2013), which showed a prevalence rate of 43.3% of Vitamin D deficiency among pregnant ladies.[14] Regarding a local study from Basrah, we did an extensive review of the available published literature, but there was no study regarding Vitamin D and pregnancy. The only available study was done by Al-Assadi et al. (2018), but their sample included infertile women; however, they demonstrated that 76.4% of those women had Vitamin D deficiency.[15] Saudi Arabian researcher Al-Faris (2016) discovered a high prevalence of vitamin D deficiency and insufficiency among expectant Saudi women. Over 90 percent of expectant women in their study were either deficient in vitamin D or had insufficient levels.[16] There are a few theories as to why Iraqi pregnant women have such a high prevalence of vitamin D insufficiency and a low overall mean serum 25(OH)D. Even though it is a nation that gets sunshine all year, Iraqi women wear traditional heavy clothes, such as the headscarf (Hijab) and Islamic costume (Abaya), which might prevent their skin from being exposed to UV rays. In the current study, 91.2% of the participants are fully covered, but there is no significant association (P = 0.458) between vitamin D level and the level of coverage. This is because the current study did not involve uncovered ladies, as even 8.8% are partially covered rather than uncovered. Furthermore, Iraqi ladies are worried about sun exposure, thus many try to avoid it or take preventative measures against sunburn, such as applying sunscreen. The current study found that only 22.5% of the ladies are frequently exposed

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to the sun, and even among those exposed to the sun, most (75.5%) were exposed for less than 15 minutes. We also found a significant association between vitamin D deficiency and sun exposure (P = 0.005), daytime sun exposure (P = 0.016), and duration of sun exposure (P = 0.048); hence, those ladies who expose themselves to the sun mainly in the midday and for more than 15 minutes are less liable for vitamin D deficiency. Meanwhile, according to a recent systematic review by Octavius et al. (2023), some research shows that the length of sun exposure has a substantial effect on blood 25(OH)D levels, while others do not. Individual sensitivities to sunshine and Fitzpatrick skin types might explain these contradictory findings.[17] Also, expectant Iraqi women do not regularly take vitamin D supplements because the Ministry of Health does not provide them for free. In our study, only 36% of the ladies took multivitamin supplements, and only 41% of them received vitamin D; furthermore, the majority (69%) took an inadequate dose, which further intensified the problem of vitamin D deficiency. We found a highly significant association between supplement intake and an improvement in the level of vitamin D (P = 0.001). Our finding is consistent with the findings of Al-Faris (2016), who reported that expectant Saudi women have inadequate vitamin D supplementation practises and typically ingest only vitamins that are essential for maternal and newborn health, such as folic acid and iron.[16] Regarding certain demographic factors, the current study found no significant association between the age of pregnant women and their vitamin D status (P = 0.432). According to Kanan et al. (2013), women under the age of 30 are more vitamin D deficient than those over the age of Thirty.[18] This might be attributed to older women using more vitamin supplements and younger women having an unfavourable eating pattern represented by increased fast-food intake. This is also in line with our findings, but it is statistically not significant. The present research demonstrated a link between BMI and vitamin D insufficiency. The majority of published research reveals that overweight and obese women are more likely to be vitamin D deficient[16,19,20] High amounts of vitamin D are thought to enhance lipogenesis and impede lipolysis in cultured human adipocytes, causing fat to accumulate. In addition, vitamin D inhibits the formation of adipocyte uncoupling protein 2 (UCP2), which lowers adipocyte metabolism.[16] Our research had several limitations, which may include There was a limited sample size. Variations in vitamin D status during pregnancy trimesters and various seasons of the year were not detected, as our study focused on the first and second trimesters of pregnancy, And We were unable to fully evaluate underlying factors such as pigmentation, levels of physical activity, dietary figures, and sunlight protection methods.

In conclusion, vitamin D deficiency is common among pregnant women in Basrah, with many risk factors predisposing to it, such as reduced sun exposure and a high BMI.

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انتشار نقص فيتامين (د) بين النساء الحوامل في مدينة البصرة

الخلفية: فيتامين (د) هو فيتامين قابل للذوبان في الدهون وهو أمر ضروري لتوازن الكالسيوم واستقلاب العظام ويتم الحصول عليه من خلال النظام الغذائي والتعرض لأشعة الشمس. يتراوح انتشار نقص فيتامين (د) بين النساء الحوامل من ٤٪ إلى ٦٠٪. هناك ارتباط بين نقص فيتامين (د) ومجموعة متنوعة من مضاعفات الولادة ، مثل ارتفاع ضغط الدم الحملي وتسمم الحمل وسكري الحمل وتوقيت الولادة ووضعها. هدفت الدراسة إلى تقدير مدى انتشار نقص فيتامين (د) بين النساء الحوامل في مدينة البصرة والكشف عن المسببات المحتملة لنقص فيتامين (د).

الموضوعات والأساليب: هذه دراسة وصفية مقطعية أجريت في مستشفى البصرة للولادة والأطفال للفترة من ١ كانون الثاني ٢٠٢٣ إلى ٣٠ حزيران ٢٠٢٣. تم سحب ١٠٢ امرأة حامل في الثلث الأول والثاني من الحمل عن طريق أخذ عينات عشوائية منهجية أثناء زيارتهن لقسم العيادات الخارجية وجناح الولادة وجناح التوليد في مستشفى البصرة للولادة والطفل.

النتائج: كان نقص فيتامين (د) سائدا بين النساء الحوامل في البصرة (٤٥,١٪). كان هناك ارتباط كبير بين تاريخ التعرض لأشعة الشمس ووقت ومدة التعرض لأشعة الشمس وزيادة خطر نقص فيتامين (د)) القيمة .($P < 0.05$) كان هناك ارتباط كبير بين مؤشر كتلة الجسم ونقص فيتامين (د)) القيمة ($P = 0.011$)، وكذلك استخدام مكملات الفيتامينات المتعددة ومكملات فيتامين (د)) القيمة = P (0.001)، والتي لها ارتباط كبير مع تقليل خطر نقص فيتامين (د).

الخلاصة: نقص فيتامين (د) شائع بين النساء الحوامل في البصرة ، مع وجود العديد من عوامل الخطر المؤهبة له ، مثل انخفاض التعرض لأشعة الشمس وارتفاع مؤشر كتلة الجسم.

الكلمات المفتاحية: انتشار، فيتامين د، الحمل، البصرة

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