

The Prevalence of Vitamin D Deficiency During Pregnancy and Its Maternal and Fetal Complications

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انتشار نقص فيتامين د أثناء الحمل والمضاعفات المترتبة عليه لدى الأمهات والأجنة

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Abstract:

Background: An insufficiency of vitamin D during pregnancy is linked to a higher chance of unfavorable pregnancy outcomes, particularly those involving placental malfunction. Generally, pregnant women are liable to have insufficiency in the level of vitamins and minerals. The objective of this study is to investigate the prevalence of vitamin D deficiency during pregnancy and maternal complications as well as fetal and early neonatal complications.

Keywords: Vitamin D Deficiency, Pregnancy, Maternal complications, neonatal and Fetal Complications.

المخلص

الخلفية: يرتبط نقص مستويات فيتامين د أثناء الحمل بزيادة احتمالية حدوث نتائج حمل سلبية، ولا سيما تلك المرتبطة باضطراب وظيفة المشيمة. وبوجه عام، تكون النساء الحوامل أكثر عرضة للإصابة بنقص الفيتامينات والمعادن نتيجة زيادة الاحتياجات الغذائية والفسيولوجية خلال فترة الحمل. تهدف هذه الدراسة إلى تحديد مدى انتشار نقص فيتامين د أثناء الحمل، وتقييم المضاعفات التي قد تحدث لدى الأمهات، بالإضافة إلى المضاعفات الجنينية والمضاعفات التي تحدث خلال فترة حديثي الولادة المبكرة.

الكلمات المفتاحية: نقص فيتامين د، الحمل، مضاعفات التي تصيب الأمهات، مضاعفات التي تصيب الاجنة وحديثي الولادة.

Introduction

During pregnancy, the daily food must include an adequate supply of energy, protein, vitamins, and minerals in order to fulfill the increased needs of both the mother and the fetus. All of the body's cells require vitamin D which is a fat-soluble vitamin, to functioning normally and to maintain normal blood levels of calcium and phosphate. The primary source of vitamin D for infants during the first few months of life, especially those who are breastfed, is the vitamin D that fetuses obtain from their mothers [1].

Basically, when the skin is exposed to Ultra Violet-B, the vitamin D and the micronutrients will be created endogenously. Earlier, vitamin D was first found to be involved in calcium metabolism and bone disorders. However, it is discovered that after it converted to 1,25-dihydroxyvitamin D3 (1,25(OH)D), it takes part in a process of gene regulation (the high affinity ligand of the nuclear transcription factor vitamin D receptor (VDR)). Ligand-activated VDR modifies the transcription of its target genes by binding to accessible genomic regions nearby, so that is potentially affecting many organs [2]. The Endocrine Society Clinical Practice

Guideline defines vitamin D deficiency as a level 25(OH)D concentration of less than 20 ng/mL (50 nmol/L) and vitamin D insufficiency as a 25(OH)D concentration of 21–29 ng/mL (525–725 nmol/L) [1,2]. The serum circulating 25(OH)D level, which are determined by a trustworthy assay, are used to evaluate vitamin D status. During pregnancy, the levels of 1,25(OH)D in the placenta and the mother's systemic circulation rise. Its role is crucial in a process of controlling the expression of important genes that linked to the placental development [3]. In human cells, the quality of UVB photons that reach the epidermis is most significant element that influencing the effectiveness of vitamin D production. Sun exposure and vitamin D production have decreased as a result of increased indoor time and widespread sunscreen use [4]. The amount and quality of UVB rays are also influenced by attitude and time of year. The effectiveness of sunlight conversion of pro-vitamin D is diminished by other factors such as aging and increased melanin in dark skinned individuals which lowers the synthesis of vitamin D. Therefore, vitamin D intake is mostly derived from food additives or supplements and can be determine its level by measure the plasma 25(OH)D level [5]. The normal range of 1,25(OH)2D will increase the availability of calcium and phosphorus in the blood by inducing intestinal calcium and phosphorus absorption and so stimulating osteoclast activity [6]. On the other hand, intestinal calcium and phosphorus absorption declines as well as parathyroid hormone (PTH) synthesis is enhanced when a person suffers from vitamin D deficient. The deficiency of vitamin D will be covered by boosting renal synthesis of 1,25(OH)2D as well as increasing in bone turnover will speeding the bone loss and encouraging tubular calcium reabsorption and phosphate excretion [7].

During pregnancy and lactation, a significant change in maternal vitamin D and calcium metabolism undergoes major alterations in order to supply the calcium required for fetal bone mineral accretion. The fetus accumulates 2-3 mg/d in skeleton during first trimester and this rate is doubled reaching its maximum absorption in the last trimester [8]. Depending on the nation, the prevalence ranges from 5% to 90% [9]. Numerous negative effects for mothers and fetuses have been connected to vitamin D insufficiency. For instance, low birth weight, preterm birth, gestational diabetes mellitus and hypertensive problems during pregnancy [10].

Material and methods

This prospective study was conducted during the period from January 2024 to March 2025, It included 420 pregnancies who labored in El-Sbetar Hospital, Tabark Hospital and Al-Saed Hospital. Verbal informed consent was obtained from the patients at the clinics, as the all data were anonymous. The data were collected by using medical questionnaire-checklist. It comprised of two (2) parts. Part I was related to the personal and obstetrical histories of the patients. Part II included information on outcomes to mothers, fetus and new born. The eligibility criteria for being selected in this study included all pregnant women (vitamin D deficiency) with or without any maternal, neonatal and fetal obstetric complications.

Ethical approval

The study protocol was approved by the scientific ethical committee research department of Gynecology and Obstetrics. Participants were briefed about the study purpose, objectives, and voluntary decision to decide their participation, and a verbal informative consent was obtained. Privacy and confidentiality of the individuals were strictly ensured throughout the study.

Statistical Analyses

The SPSS 23.0 was used for data processing and analysis. Measurement and enumeration data were expressed as percentages. The Chi-square test was used for the analysis of variables. $P < 0.05$ is the standard for a significant difference.

Results

This prospective study was conducted during the period from January 2024 to March 2025. It included in total 420 pregnancies who labored in El-Sbetar Hospital, Tabark Hospital and Al-Saed Hospital admitted in labor ward in the obstetrics department. Those patients were subjected to assess serum vitamin D levels. As in table 1 showed only 195 pregnant women were vitamin D sufficient during pregnancy, and 225 were with vitamin D deficient. So, the prevalence of vitamin D deficiency during pregnancy in this study revealed 53.6%.

Table 1 Distribution according to vitamin D level.

variable	NO.	%
Vitamin D sufficient	195	46.4%
Vitamin D deficient	225	53.6%

With regarding to the socio-demographic characteristics of patients according to vitamin D status. In vitamin D deficient group, majority of patients were in age group less than 30 years old (87%), multigravida (57%), come from rural areas (44%), and housewife (55%). whereas, the patients with age more than 30years (52%), primigravida (83%), living in urban area (80%) and working women (74%) all have vitamin D sufficient level. With regarding to the mode of delivery, in vitamin D deficient group (41%) of patients had vaginal delivery. In vitamin D sufficient group (76%) of patients underwent C-section as shown in table 2.

Table2 Distribution according to demographic data

Variable	VIT D Sufficient (195)		VIT D Deficit (225)	
≤30	93	48%	195	87%
>30	102	52%	30	13%
PG	161	83%	97	43%
Multipara	34	17%	128	57%
Rural	39	20%	99	44%
Urban	156	80%	126	56%
House Wife	51	26%	123	55%
Working staff	144	74%	102	45%
Normal Vaginal Delivery	47	24%	92	41%
C-section	148	76%	133	59%

Regarding to the complications for mothers as well as fetal and neonatal summarizes in Table 3, vitamin D deficient group (32%) of women had not developed any complications, while in vitamin D sufficient group (63%) of them had no complications. Whereas, the fetal and neonatal complications, vitamin D deficient group (61.3%) of women who were their babies had not developed any complications, while in vitamin D sufficient group (88.7%) of them had no complications.

Table3 Distribution according to Maternal, Fetal and Neonatal Complications.

		Normal Vitamin D Level (195)		Vitamin D Deficiency (225)		P- Value
Maternal Complications	Free Of Complications	122	63%	71	32%	< 0.001
	With Complications	73	37%	154	68%	
Fetal And Neonatal Complications	Free Of Complications	173	88.7%	138	61.3%	< 0.001
	With Complications	22	11.3%	87	38.7%	

Table 4 shows pregnancy with complication in vitamin D deficient include GDM (7%), pre-eclampsia (14%), eclampsia (1), PROM (25%), abruption (12), obstructed labor (24), post-partum hemorrhage (PPH) (17%). The neonatal complications are summarizes as following, in vitamin D deficient group 20% had IUGR, Preterm baby 24% and 6% were IUFD.

Table4 Distribution according to Maternal as well as Fetal and Neonatal complications.

Variable	VIT D Sufficient (195)		VIT D Deficit (225)	
MATERAL COMPLICATIONS				
Abruptio placenta	9	12%	19	12%
Eclampsia	0	0	1	1%
GDM	0	0	11	7%
PET	9	12%	21	14%
Obstructed labor	21	29%	37	24%
PPH	13	18%	26	17%
PROM	21	29%	39	25%
FETAL AND NEONATAL COMPLICATIONS				
Pre-term	4	18%	21	24%
Fetal distress	2	9%	13	15%
IUFD	1	5%	5	6%
IUGR	3	14%	17	20%

Study shows 225 pregnant women out of 420 were deficient in vitamin D, so, it is as common as 53.6%. The women who have sufficient level of vitamin D are significantly will have less pregnancy complication rate for herself as well as her fetal and neonatal life.

Discussion

The study was presented as prospective cohort study. Four hundred and twenty patients were enrolled in the final analysis for pregnancy outcomes. Quite a high prevalence of low vitamin D level among pregnant women at term was seen in this study. The complications in this study for mothers are significantly higher among group with vitamin D deficiency and these complications are involved maternal and both fetal and neonatal outcomes. Previous research has different opinion about the association between vitamin D level and clinical pregnancy rate. Garabedian et. al. (2014), found that the prevalence of vitamin D deficiency (< 25 nmol/L), and insufficiency (25–74 nmol/L) in population was 1.2%, 53.8% respectively and revealed that women with sufficient levels of vitamin D are significantly more likely to achieve good pregnancy outcome [11, 12]. deficient vitamin D was associated with a decreased chance of live birth, while had similar probability in clinical pregnancy and ongoing pregnancy with women with sufficient vitamin D. The conclusion was agreement with the systematic reviews by Valeria et al. and Lv et al. but it included additional several publications and evaluated not only clinical pregnancy but also live birth [13, 14, 15]. However, other studies found that vitamin D deficiency did not play a critical role in the outcome of pregnancy and meta-analysis suggests that vitamin D status assessment and supplementation prior to conception is currently not recommended. [16, 17, 18]. These discrepancies may be attributed to differences in patients' mean age, ethnicity, race, BMI, countries, social economic status, the season, exposure categorization, analysis methods, and study design [19,20,21].

The interpretation is still limited by the sample size. A larger sample size could have perhaps a more generalized result. As this study focused on serum vitamin D levels during third trimester only. Future research should clarify the influence of timing of vitamin D supplementation, including in the preconception period, and so the mechanisms by which vitamin D could contribute to fetal growth and gestational duration.

Conclusion

The finding of this study has concluded that vitamin D level has a positive predictive value for pregnancy outcome. The women who have low level of vitamin D are significantly will have a positive pregnancy complication for mother than patients with normal vitamin D serum level. From a cost-effective point view, it's recommended that vitamin D supplementation is important among pregnant patients in order to reduce the maternal complications. Also, it is valuable to make vitamin D status as a routine investigation workup for every patient before implementing to be pregnant.

Compliance with ethical standards

Disclosure of conflict of interest

The authors declare that they have no conflict of interest.

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