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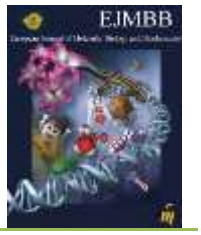

ASSESSMENT OF VITAMIN D DEFICIENCY IN PREGNANT WOMEN: IMPLICATIONS FOR PRENATAL SUPPLEMENTATION STRATEGIES

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ABSTRACT

This study investigates vitamin D deficiency among pregnant women, despite prenatal vitamin usage. While current recommendations suggest 200 to 400 IU of vitamin D daily, scientific evidence supporting these guidelines is limited. The study involved 49 pregnant women across trimesters, supplementing with 50,000 IU of vitamin D weekly. Initial and trimester-specific tests assessed calcium, phosphorus, parathyroid hormone, 25-hydroxyvitamin D, total protein, and albumin levels. Umbilical cord blood tests were conducted at birth. Results showed vitamin D levels of 19.17, 31.10, and 29.3 nanograms per milliliter during the first, second, and third trimesters, respectively, and 24.38 nanograms in newborns. Toxic vitamin D levels were not observed. Multivitamin supplement usage did not significantly impact vitamin D levels between trimesters. These findings contribute valuable insights into addressing vitamin D deficiencies in pregnant women.

INTRODUCTION

The body needs vitamin D to function properly. Multiple physiological processes depend on it, including calcium absorption [1]. Vitamin D plays a key role in controlling immune function, metabolism and cell growth in recent years. A fetus and mother suffer detrimental effects from vitamin D deficiency if their bodies lack vitamin D receptors. Mothers and infants have a correlation between their vitamin D levels [2]. During pregnancy, big amount of vitamin D can harm the fetus. Due to the fact that 25-hydroxyvitamin D crosses the placenta, vitamin D levels in fetal and cord blood are positively correlated [3]. The amount of vitamin D women should consume during pregnancy should not exceed 200-400 IU. The fetus is at risk due to misperceptions about potential harm [4]. According to a recent study, pregnant women who take 4000 IU of vitamin D daily can maintain normal metabolism [5,6].

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The effects of 50,000 IU of vitamin D administered weekly to pregnant women and newborns were examined for vitamin D deficiency.

METHODS

A pregnant woman who was in the first trimester before 14 weeks of gestation was enrolled in the study. She was instructed to continue taking pregnancy supplements per her doctor's orders. The study consisted of supplementing all subjects orally with vitamin D2 tablets of 50,000 IU each week, along with calcium tablets of 1200 mg divided over two doses per day during the study.

Study supplements were administered to subjects twice a week during each trimester of the study. Side effects were recorded at the end of each trimester. Research nurses called and reminded participants of the importance of taking calcium and vitamin D tablets on a regular basis to ensure compliance. Hospital staff supplanted the subject with vitamin D free of charge.

Tests were performed to quantify calcium levels, phosphorus levels, alkaline phosphatase levels, amino

acid levels, 25-hydroxyvitamin D levels, and parathyroid hormone levels. During the second and third trimesters, blood tests were repeated that were conducted at entry in the first trimester [7]. Newborns' 25-hydroxyvitamin D levels were measured using umbilical blood cord samples. Detecting total 25-hydroxyvitamin D levels was carried out using a "DiaSorin Liaison 25OH Vitamin D TOTAL" machine.

For continuous variables, we referred to mean standard deviation and for categorical variables, we referred to frequency distributions with percentages.

RESULTS

This study included 49 pregnant women. Among the participants, there were 22 - 37 years of age. 49 women were included in the study. 4 women dropped out for various reasons, including returning home, and 10 lost their pregnancies. According to international estimates, 15 to 20% of pregnancies end in loss. First-trimester pregnant women represented 49, second-trimester pregnant women represented 39, and third-trimester pregnant women represented 31. It was considered more severe if the level of insufficiency exceeded 30 ng/ml than if it was below 10 ng/ml. Vitamin D levels were lower than 20 ng/ml in 33 patients (33/49) and 10 ng/ml in 16 patients (16/49). Vitamin D levels averaged 17.15 ng/ml during the first trimester, with the lowest level being 3 ng/ml and the highest level 48 ng/ml. A total of four parameters examined, PTH, alkaline phosphatase, calcium, and phosphorus, were within normal ranges. A vitamin D level of 31.10 ng/ml was measured during the second trimester, ranging from 5 ng/ml to 70 ng/ml. Third trimester levels averaged 29.36 ng/ml, with the lowest level being 4 ng/ml and the highest being 59 ng/ml. The mean vitamin D level ranged from 24.38 ng/ml in 31 samples of umbilical cord blood from newborns, with a range from 3 to 59ng/ml. A calcium level of 2.27 mmol/l, 2.21 mmol/l, and 2.24 mmol/l, respectively, was not observed during the first, second, and third trimesters. Tables 1 and 2 show that newborn vitamin D levels are significantly correlated with mothers' levels at the end of the third trimester. A significant difference in vitamin D levels between the groups was not found during the second or third trimesters or in newborns.

TABLE 1: Tests for alkaline, vitamin D, albumin, calcium, phosphatase, total protein and PTH are performed, and levels of vitamin D for babies are recorded as well

	N	MINIMUM	MAXIMUM	MEAN	STD. DEVIATION
1st trimester results					
Total protein g/l	94	32	93	76.59	7.546
Alkaline phosphatase u/l	90	34	167	61.26	18.384
Albumin g/l	95	33	60	43.67	3.746
Calcium mmol/l	94	2.04	2.57	2.2775	.10,144
Phosphorus mmol/l	93	.83	73.00	1.9597	7.31,986
Vitamin D ng/ml	97	5	50	19.17	10.997
PTH ng/ml	88	5	193	39.92	27.728
2nd Trimester					
Albumin g/l	79	33	44	38.59	2.076
Calcium mmol/l	79	1.97	2.45	2.2179	.09207
Phosphorus mmol/l	78	.88	1.65	1.2218	.19,085
Vitamin D ng/ml	80	7	72	31.10	14.897
PTH ng/ml	78	7.00	154.00	35.2765	24.47,506
3rd trimester					
Total protein g/l	56	55	88	72.13	6.623
Alkaline phosphatase u/l	58	60	587	126.34	78.828
Albumin g/l	59	30	52	39.25	5.253
Calcium mmol/l	59	1.87	2.55	2.2447	.12,896
Phosphorus mmol/l	56	.89	1.76	1.2537	.16,763
Vitamin D ng/ml	63	6	64	29.36	12.413

Table 2. Pregnant women taking vitamin D before pregnancy compared to those not taking it (0 means not taking vitamin D, 1 means taking it).

Vitamin D		Number	Mean	Std. deviation	P value
1st trimester	0	19	8.73	4.097	,0.001
	1	23	24.66	8.877	
2nd trimester	0	18	23.88	12.547	,0.01
	1	19	33.56	16.016	

3rd trimester	0 1	15 15	26.33 28.39	12.347 12.842	0.52 NS

DISCUSSION

The percentage of women who suffer from a vitamin D deficiency during pregnancy varies between countries and clothing customs, ranging from 18 to 84% [8]. The study reported 86% of pregnant women have low Vitamin D levels in winter, 46% of mothers have low Vitamin D levels in summer, and 35% of newborns have low Vitamin D levels during winter. It was found that newborns' levels of 25-hydroxyvitamin D correlated positively with those of their mothers ($p<0.001$).

Infants and fetuses need vitamin D to develop their skeletons. Infants' size is correlated with their vitamin D status [9]. The maternal 25-hydroxyvitamin D level at 9 years is associated with the lower lumbar spine and whole-body mineral content [10]. In pregnancy and perinatal life, low vitamin D concentrations are hypothesized to affect body tissues' functional characteristics, increasing a person's likelihood of developing cancer, insulin-dependent diabetes, multiple sclerosis and schizophrenia [11]. To determine baseline status, vitamin D levels achieved with supplementation during pregnancy and the newborn period, as well as the optimal level without complications or toxicity during pregnancy and newborn periods [12,13], we conduct RCTs of vitamin D supplementation with 25-hydroxy vitamin D measurement.

CONCLUSION

Supplementation with 50,000 IU of vitamin D has proven effective in maintaining optimal levels of this essential nutrient in pregnant mothers throughout their pregnancy. Additionally, this supplementation regimen can be extended to newborns as needed, ensuring the sustained well-being of both mothers and infants. By incorporating a strategic approach of administering 50,000 IU vitamin D supplements, it becomes feasible to uphold the normal vitamin D levels in expectant mothers. Moreover, this practice can be seamlessly extended to newborns, safeguarding their health by addressing any potential deficiencies. The proactive use of vitamin D supplements, tailored to the specific requirements of mothers and infants, emerges as a viable and beneficial strategy to support maternal and neonatal health throughout the crucial phases of pregnancy and infancy.

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