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Evaluation of the relationship between serum 25-hydroxyvitamin D levels and extended period of leg cramps in pregnant women

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Abstract

Objective: At least one-third of pregnant women suffer from leg cramps. While the cause of these leg cramps is not fully understood, it starts during the third trimester, likely due to pregnancy-related physiological changes. The relation of serum 25-hydroxyvitamin D [25(OH)D] levels and leg cramps has been evaluate in this research.

Methods: The study included 95 pregnant patients who visited our gynecology and obstetrics outpatient clinic in January 2017 during weeks 24–39 of their pregnancies. Demographic characteristics, vitamin supplement use, and other factors that might have affected the 25(OH)D levels of the participating pregnant women were recorded.

Results: A statistically significant difference ($p<0.0001$) was found in the serum 25(OH)D levels between the patients who did and did not use supplemental 25(OH)D. A statistically significant difference was found in the groups of pregnant women regarding 25(OH)D levels and weight 69.60 ± 2.43 ng/dl among the patients who did not use supplemental 25(OH)D compared to 77.69 ± 2.20 ng/dl for those who did; $p < 0.0162$). There was no significant difference between the 25(OH)D serum levels and the number of cramps. A significant difference was found between the intensity and duration of the cramps and the number and duration of the cramps ($p < 0.029$ and $p < 0.0001$, respectively).

Conclusion: The use of supplemental 25(OH)D did not have a statistically significant effect on the occurrence of pregnancy-related leg cramps. The 25(OH)D levels were higher in the that supplemental 25(OH)D used group. A significant difference was found between the pregnant women's weight and the occurrence of leg cramps ($p < 0.0162$). Vitamin D supplements may be used to prevent long period leg cramps for pregnant woman's.

Keywords: leg cramps, vitamin D, pregnancy

Introduction

Muscle cramps are painful involuntary muscle convulsions that are strongly felt. Leg cramps are one of the most common side effects of pregnancy, especially in the third trimester (1, 2, 3). These cramps typically occur at night, usually not more than twice a week, and cease within a few minutes (2, 4). The cramps primarily strike only one side of the body (1, 3). The leg cramps do not originate within the muscle itself but are triggered by a spontaneous convulsion of the muscle's motor nerves (5). There is no standard treatment for leg cramps, but several studies have been conducted on this issue (6), as this side effect is experienced in 30–45% of pregnancies (4).

Leg cramps tend to disrupt sleep quality, and pregnant women with poor sleep quality have been found to have extended labor and increased rates of labor-related operations (7).

It has also been observed that pregnant women have lower serum magnesium levels than nonpregnant women (8), indicating that pregnancy cramps may be related to low magnesium levels. Although the cause of muscle cramps is not fully understood, neuromuscular changes, weight gain, joint looseness, decreased blood flow to the lower extremities, and increased pressure on the leg muscles during the last trimester of pregnancy are all potential contributing factors (3, 9).

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Material and Methods

This study included 95 women who presented to our outpatient gynecology and obstetrics clinic in January 2017 during weeks 24–39 of their pregnancies. The women were surveyed on their experience with leg cramps. Positive responders were asked to specify the duration, frequency, and intensity of their cramps as well as the total number of cramps, whether they occurred during the day or night, and whether they occurred when the subject was moving or resting. Additional patient characteristics were recorded, including: age, weight, height, occupation, use of supplemental 25-hydroxyvitamin D [25(OH)D], use of multi-vitamins, use of anti-anemic treatments, whether the patient was veiled (to evaluate sun exposure), and whether the patient had additional illnesses. Serum 25(OH)D levels were tested in the morning with an empty stomach. The patient's morning hunger. For measurement, the ELISA (Enzyme-linked immunosorbent assay) was used and the results were recorded in ng/dl. Subjects who received oral magnesium to treat pregnancy cramps, those who had not yet reached the 24th week of pregnancy, or those who were beyond the 39th week of pregnancy were not included in the study. Oral and written consent was obtained from each woman who participated in the study. GraphPad Prism version 6.00 (GraphPad Software, La Jolla, California) was used to conduct the statistical analyses. The data was analyzed using definitive statistics, including the one-way analysis of variance test and the t-test. The results were evaluated using 95% reliability; p values < 0.05 were deemed significant.

Results

This study evaluated 95 pregnant women who visited to our outpatient gynecology and obstetrics clinic. Among them, 73 were housewives, 6 were teachers, 5 were healthcare staff, 1 was a tradeswoman, and 8 had other occupations. There was no statistically significant difference between the pregnancy weeks and the heights of the women included in the study.

When the women were divided into groups according to whether they had experienced leg cramps, there was no statistically significant difference between the 25(OH)D levels of the groups; the mean 25(OH)D level in the group without leg cramps was higher than in the group with leg cramps (9.92 ± 1.42 ng/dl - 9,43 ± 0,94 ng /dl). The mean weight of the group without leg cramps was 69.60 ± 2.43 kg, while the mean weight of the group with leg cramps was 77.69 ± 2.20 (Table1). The pregnancy induced cramp was statistically significantly higher among the women with higher weights ($p < 0.0162$). The demographic features of the participating women are shown in Table 3. A statistically significant difference was found between the number of cramps and the duration of the cramps ($p < 0.0001$). No significant difference was found between the number of cramps and 25(OH)D levels. There was no significant difference between the women who were veiled and those who were not, but the 25(OH)D levels were higher in the non-veiled group (veiled, n = 62, 8.50 ± 0.64; non-veiled, n = 33, 11.56 ± 1.8).

A statistically significant difference was found between daily multivitamin usage and vitamin D levels (multivitamin users, n = 73, 10.34 ± 0.98; non-users, n = 22, 6.97 ± 0.75; p = 0.0297*).

A statistically significant difference was found between the women who took daily supplemental 25(OH)D (n = 24, 15.14 ± 2.53) and those who did not (n = 71, 7.67 ± 0.45) (p = 0.0001*).

There was a statistically significant negative correlation between 25(OH)D levels and the intensity of the leg cramps. As the vitamin D levels decreased, the leg cramp intensity increased (p = 0.029).

When comparing the times that cramps occurred, there was no significant difference between when the subject was moving or resting. Additional parameters are provided in the tables (Table 1-12).

Table 1. Comparison of patient characteristics and the occurrence of leg cramps.

	No cramps (n = 25)	Cramps (n = 70)	p
Vitamin D levels	9.92 ± 1.42	9.43 ± 0.94	0.9916
Height (cm)	160.5 ± 1.04	160.4 ± 1.34	0.4951
Weight (kg)	69.60 ± 2.43	77.69 ± 2.20	0.0162*
Week of pregnancy	29.79 ± 1.11	30.65 ± 0.76	0.154

* p values < 0.05 are statistically significant

Table 2. The correlation between Vitamin D insufficiency and the occurrence of leg cramps in pregnant women.

	No cramps		Cramps		χ^2	p
	n	%	n	%		
Not using 25(OH)D	17	69.9	48	73.8	0.0808	0.776235
Using 25(OH)D	7	29.1	17	26.2		
Using multi-vitamins	19	82.6	57	83.8	0.0026	0.959068
Not using multi-vitamins(25(OH)D levels)	4	17.4	11	16.2		
Veiled	18	72	44	62.8	0.6792	0.40985
Not veiled	7	28	26	37.2		

Table 3. Definitive analyses of some demographic parameters

25-OH Vitamin D	9,56 ± 0,78
Age (years)	28,39 ± 0,52
Height (cm)	160,4 ± 1,02
Weight (kg)	75,56 ± 1,78
Week of pregnancy	29,61 ± 0,65

Table 4. The relation between the number of cramps and Vit D levels

No cramps (n=25)	No. of cramps less than 3 (n=52)	No. of cramps 3-5 (n=11)	Number of cramps 5-10 (n=4)	No. of cramps more than 5 (n=2)
9,92 ± 1,42	8,90 ± 0,65	8,1 ± 5,1	8,15 ± 1,77	6,8 ± 4

A statistical meaning could not be found among the groups ($p<0.05$).

Table 5. The relation between the intensity of cramp and Vit D levels

Low (n=50)	Mid (n=22)	Intensive (n=9)	Very intensive (n=3)	P value
8,76 ± 0,65	7,40 ± 2,84	6,29 ± 1,10	5,41 ± 2,32	0,029*

A statistical meaning was found among the groups ($p<0.05$).

Table 6. The relation between the number of cramps and the duration of cramps

No. of cramps	Duration of cramps	P value
2 ± 0,08	1,40 ± 0,08	< 0,0001*

A statistical meaning was found between the number of cramps and the duration of cramps ($p<0.05$).

Table 7. The relation between the exposure to the Sun and Vit D level

Veiling (n= 62)	Not Veiling (n=33)	P value
8,50 ± 0,64	11,56 ± 1,8	0,1347

A statistical meaning could not be found between the groups ($p<0.05$).

Table 8. The relation with the Vit D level as per the blood medicine usage

Blood medicine (n= 79)	No blood medicine (n=16)	P value
9,94 ± 0,92	7,66 ± 0,94	0,3417

A statistical meaning could not be found among the groups ($p<0.05$).

Table 9. The relation with the Vit D levels as per the Vit D usage

Using Vit D (n= 24)	Not using Vit D (n=71)	P value
15,14 ± 2,53	7,67 ± 0,45	0,0001*

A statistical meaning was found between the users and non-users of 25-OH Vitamin D ($p<0.05$).

Table 10. The relation with the Vit D level as per the Vitamin usage

Using vitamin (n= 73)	Not using vitamin (n=22)	P value
10,34 ± 0,98	6,97 ± 0,75	0,0297*

A statistical meaning was found between the users and non-users of vitamin ($p<0.05$).

Table 11. The relation between the night cramps and the Vit D level

No (n=50)	1-3 times (n=22)	3-5 times (n=9)	More than 10 times (n=3)	P value
9,12 ± 0,90	8,87 ± 0,73	7,47 ± 11,41	6,80 ± 4,0	0,0308

A statistical meaning was found between the groups ($p<0.05$).

Table 12. The relation with the Vit D level as per when the cramps occur

While moving (n= 38)	While resting (n=57)	P value
9,81 ± 1,63	9,39 ± 0,75	0,5263

A statistical meaning could not be found between the groups ($p<0.05$).

Discussion

Since 25(OH)D plays an active role in many metabolic processes, deficiencies may be related to leg cramps as well as other illnesses like pre-eclampsia. A previous study found that the pre-eclampsia risk was 5.41 times higher among pregnant women with insufficient 25(OH)D levels (10). Another study reported that women with low 25(OH)D levels gave birth to lower weight babies (11). Other reports have indicated that women who took supplemental 25(OH)D during pregnancy had higher calcium levels and less birth pain (12, 13). Therefore, 25(OH)D is an important nutrient, and its deficiency is related to several pathological conditions in addition to leg cramps.

In a randomized, controlled, double blind study conducted on 126 pregnant women who were 18 to 24 years old, the study group was provided supplemental 25(OH)D for six weeks, but no difference in cramp frequency, intensity, and duration was observed compared to the control group (1). We found that many of the pregnant women in our study already had low 25(OH)D levels, suggesting that supplemental 25(OH)D may need to be administered in higher doses during pregnancy or may even need to be started before pregnancy to prevent leg cramps. Within the outpatient clinic control group in our study, a significant difference was found between 25(OH)D levels and cramp intensity among the pregnant women who regularly took supplemental 25(OH)D on the advice of their doctors ($p < 0.029$). In addition, there was a significant difference between the cramp intensity and the number of cramps. Therefore, we conclude that the number of cramps indirectly increases cramp intensity.

Conclusion

We found that supplemental 25(OH)D increased 25(OH)D levels in pregnant women; however, these levels were still within the deficiency range. To fully investigate the effects of 25(OH)D levels on pregnancy-related leg cramps, supplemental 25(OH)D should be provided in higher doses and preferably before the start of pregnancy. More significant findings might have been made in this study if we could have compared pregnant women who had low 25(OH)D levels with women who had normal 25(OH)D levels because they had previously taken supplemental 25(OH)D. This demonstrates a shortfall in our study. Further research is needed employing supplemental 25(OH)D for a longer period and at a higher dose, both during and pre-pregnancy, to provide an effective comparison with patients who have never taken supplemental 25(OH)D.

Conflict of Interest: The authors declare no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Author's Contributions: PK: Research concept and design; patient examination, data collecting, analysis and interpretation of data**.** Preparation of article. All authors approved the final version of the manuscript.

Ethical issues: All Authors declare, Originality and ethical approval of research. Responsibilities of research, responsibilities against local ethics commission are under the Authors responsibilities. The study was conducted under defined rules by the Local Ethics Commission guidelines and audits.

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