



Research Article

ROLE OF VITAMIN D AND CALCIUM SUPPLEMENTATION IN PREGNANCY ALONE OR IN COMBINATION

Dipti Anand^{1*}, Gurjit kaur¹, Alka Sehgal², Shikha Rani², Manju Mathur³

1. Department of Physiology, Government Medical College and Hospital, Chandigarh
2. Department of Obstetrics and Gynecology, Government Medical College and Hospital, Chandigarh
3. Department of Dietetics, Government Medical College and Hospital, Chandigarh

***Corresponding Author: Email shikhataneja2000@yahoo.co.in**

(Received: August 23, 2014; Accepted: October 26, 2014)

ABSTRACT

Fetus is dependent on the mother for its nutritional need. That is why there is increased demand of nutrients in pregnancy. To meet the increased demand of calcium there are various physiological changes in calcium hemostasis. Vitamin D plays an important role in calcium hemostasis. Deficiency of vitamin D leads to various medical disorders in pregnancy and poor neonatal outcome. This study is planned to evaluate whether calcium supplementation along vitamin D has better rise calcium than calcium alone. Fifty pregnant females between 12-14 weeks were enrolled. They were then divided into two groups. In group 1, 25 pregnant women were supplemented with 800mg of calcium and 250 IU of vitamin D for 6 weeks. Group 2, women were supplemented with 800mg of calcium for 6 weeks only. Baseline and 6 weeks after supplementation serum calcium and vitamin D levels were measured in both groups. Baseline values of serum calcium and plasma vitamin D were not significantly different between group 1 and 2. But after 6 weeks, serum calcium and plasma vitamin D levels in group 1 was found to be significantly higher than group 2 ($p < 0.01$). As vitamin D supplementation leads to better rise in calcium, so vitamin D supplementation should be given in pregnancy.

Keywords: Calcium, Vitamin D, Pregnancy.

INTRODUCTION

Pregnancy is a period of stress during which the nutritional needs of developing fetus depends on the mother. There is increased demand of the nutrients and requirement of supplementation of essential nutrients such as iron, calcium, vitamin D and folic acid. During pregnancy approximately 30 grams of calcium is transferred to the fetus. To achieve this, several physiological changes occur in maternal calcium hemostasis like increased intestinal absorption of calcium, increased resorption of bones and decreased urinary calcium excretion. (1) Among these, increased intestinal absorption of calcium due to increased generation of 1,25 (OH)₂D is the main mechanism for calcium conservation. (2) Increased serum vitamin 1,25 (OH)₂D is mainly due to elevated 1-alpha

hydroxylase activity in the maternal kidneys.

(3)

Vitamin D deficiency in pregnancy is associated with increased risk of preeclampsia, gestational diabetes mellitus, preterm birth, small for gestation infants. (4-6) Impaired fetal skeletal formation leads to infant rickets and reduced bone mass. (7, 8)

India is a tropical country with abundant sunshine but hypovitaminosis D is quite common. In a study, prevalence of hypovitaminosis D in pregnant women has been reported as high as 84%. (9) So this study was planned to evaluate whether supplementation of vitamin D in addition to calcium has better effect on serum calcium levels as compared to calcium supplementation alone.

MATERIAL AND METHODS

This study was carried out in out-patient department of Obstetrics & Gynecology from March-April 2008. Study was approved from the institutional ethics committee. After taking consent, 50 pregnant female between 12-14 weeks of pregnancy were enrolled. By computerized generated random number table subjects were divided into two groups. Group 1: In this group, 25 pregnant female were supplemented with 800mg of calcium along with 250IU of vitamin D daily for 6 weeks.

Group 2: In this group, 25 pregnant female were supplemented with 800mg of calcium daily for 6 weeks. Subjects were advised to have sun exposure of 30 minutes three times a week.

Women with mal-absorption syndrome, allergy to any form of calcium and abnormal renal functions were excluded from the study. Serum calcium, vitamin D and renal functions level were measured in both groups at the time of enrollment. Dietician calculated daily dietary calcium and vitamin D intake in both groups with the help of Nutritrust Version Pro (Nutritrust India Private Ltd.). The reference value of vitamin D in different food items were evaluated from 'Clinical Dietetics and nutrition By FP Anita and Philip Abraham

After 6 weeks of pre-planned supplementation, repeat serum calcium and vitamin D was done in respective groups. Serum calcium levels and vitamin D levels were measured spectrophotometrically and high pressure liquid chromatography respectively. Direct sun exposure was calculated by duration of sun exposure, body area exposed and the time at which sun exposure was received.

Total sun exposure = Percentage of body surface area x duration of exposure (minutes)

Percentage of body surface area was calculated by Wallace rule of nine.

Paired t test was used for comparing mean difference within the group. One way ANOVA was applied to compare the mean differences between the two groups. Independent Student's t test was used for the mean parameters for which both groups vary significantly.

RESULTS

This study was carried out in out-patient department of department of Obstetrics & Gynecology from March-April 2008. Fifty pregnant women at 12-14 weeks of gestation

were enrolled in this study. Subjects in group 1 were supplemented with 800mg of calcium along with 250IU vitamin D daily for 6 weeks. In group 2 subjects were given only 800mg of calcium daily for 6 weeks. Mean age of the subjects in both groups was 25 years. In each group one patient had miscarriage and 4 were lost to follow up. Baseline and 6 week after calcium and vitamin D levels were given in table 1.

Baseline values of serum calcium and plasma vitamin D were not significantly different between group 1 and 2. In group 1, both serum calcium and plasma vitamin D levels were increased significantly ($p < 0.01$). In group 2, serum calcium levels were decreased significantly ($p < 0.01$) with no change in plasma vitamin D levels. Also after 6 weeks, serum calcium and plasma vitamin D levels in group 1 was found to be significantly higher than group 2 ($p < 0.01$).

DISCUSSION

In our study we found that the supplementation of vitamin D along with calcium during pregnancy increases serum calcium and vitamin D levels much more than only calcium. It suggests that vitamin D supplementation facilitates the calcium absorption. Delvin et al in their study reported that increase in Vitamin D level is significantly higher ($p < 0.0005$) if calcium is supplemented with vitamin D than alone. However, they did not find any change in calcium levels with or without supplementation of calcium. (10)

Congdon et al measured cord vitamin D and calcium concentrations among 45 women who received no vitamin D supplements and 19 women who received 1000 IU per day vitamin D during the last trimester. They reported higher serum 25(OH)D and calcium concentrations and similar alkaline phosphatase concentrations among infants of mothers who received vitamin D, compared with those who did not. (11) Cockburn et al recruited 1139 women in their quasi-randomized trial. 506 women received vitamin D from 12 weeks onwards and 663 women were in placebo group. They reported higher vitamin D, calcium and phosphorus concentrations in vitamin D supplemented arm. Calcium concentrations also were higher on day 6 among the infants whose mothers received vitamin D, compared with those whose mothers did not. (12)

Plasma vitamin D levels did not differ significantly in subjects who were given calcium along with sun exposure (group 2).

Table 1: Baseline and 6 week after calcium and vitamin D levels and sun exposure score in both groups.

	Group 1 (n=20)	Group 2(n=20)
Baseline		
Serum Calcium(mg/dl) ^a	8.27 ± 0.7	8.0 ± 0.97
Plasma vitamin D (ng/ml) ^a	10.30 ± 3.5	8.88 ± 0.88
After 6 weeks		
Serum Calcium(mg/dl)	8.806 ± 0.92	7.52 ± 1.08
Plasma vitamin D (ng/ml)	15.45 ± 3.79	8.98 ± 4.74
Sun exposure score	6.92	14.3

This may be because only 11% of body surface area has been exposed whereas the ideal requirement is 30% of body surface area to be exposed to sun for half an hour thrice a week. But as the sun exposure was not under our direct observation so its reliability is not so robust. Ideally, bone densitometry is to be done to compare the bone sparing effect.

Inadequate sun exposure or inadequate intake of vitamin D could be the possible cause of our findings. Further the recommended dose by endocrine society for vitamin D supplementation is 1500-2000 IU.(13) Since, the increase in calcium levels is significantly more in vitamin D supplemented group thus vitamin D supplementation should be given along with calcium in pregnant female.

REFERENCES:

- Pitkin RM. Calcium metabolism in pregnancy and the perinatal period: a review. *Am J Obstet Gynecol.* 1985;151(1):99-109. Epub 1985/01/01.
- Kovacs CS, Fuleihan Gel H. Calcium and bone disorders during pregnancy and lactation. *Endocrinology and metabolism clinics of North America.* 2006;35(1):21-51, v. Epub 2005/11/29.
- Turner M, Barre PE, Benjamin A, Goltzman D, Gascon-Barre M. Does the maternal kidney contribute to the increased circulating 1,25-dihydroxyvitamin D concentrations during pregnancy? *Mineral and electrolyte metabolism.* 1988;14(4):246-52. Epub 1988/01/01.
- Wei SQ, Audibert F, Hidiroglou N, Sarafin K, Julien P, Wu Y, et al. Longitudinal vitamin D status in pregnancy and the risk of pre-eclampsia. *BJOG.* 2012;119(7):832-9. Epub 2012/04/03.
- Zhang C, Qiu C, Hu FB, David RM, van Dam RM, Bralley A, et al. Maternal plasma 25-hydroxyvitamin D concentrations and the risk for gestational diabetes mellitus. *PLoS One.* 2008;3(11):e3753. Epub 2008/11/19.
- Leffelaar ER, Vrijkotte TG, van Eijnden M. Maternal early pregnancy vitamin D status in relation to fetal and neonatal growth: results of the multi-ethnic Amsterdam Born Children and their Development cohort. *The British journal of nutrition.* 2010;104(1):108-17. Epub 2010/03/03.
- Javaid MK, Crozier SR, Harvey NC, Gale CR, Dennison EM, Boucher BJ, et al. Maternal vitamin D status during pregnancy and childhood bone mass at age 9 years: a longitudinal study. *Lancet.* 2006;367(9504):36-43. Epub 2006/01/10.
- Sharma R. K., Gulati A., "Effect of vitamin c and vitamin E on Malathion induced stress on testicular tissue in vitro", *Int. J. Res. Dev. Pharm. L. Sci.,* 2014, 3(6), pp. 1316-1322.
- Goswami R, Gupta N, Goswami D, Marwaha RK, Tandon N, Kochupillai N. Prevalence and significance of low 25-hydroxyvitamin D concentrations in healthy subjects in Delhi. *The American journal of clinical nutrition.* 2000;72(2):472-5. Epub 2000/08/02.
- Delvin EE, Salle BL, Glorieux FH, Adeleine P, David LS. Vitamin D supplementation during pregnancy: effect on neonatal calcium homeostasis. *The Journal of pediatrics.* 1986;109(2):328-34. Epub 1986/08/01.
- Congdon P, Horsman A, Kirby PA, Dibble J, Bashir T. Mineral content of the forearms of babies born to Asian and white mothers. *Br Med J (Clin Res Ed).* 1983;286(6373):1233-5. Epub 1983/04/16.

How to cite your article:

Anand D., Kaur G., Sehgal A., Rani S., Mathur M., "Role of vitamin d and calcium supplementation in pregnancy alone or in combination", *Int. J. Res. Dev. Pharm. L. Sci.,* 2015, 4(1), pp. 1341-1343.