

# Role of vitamin D supplementation in burka clad pregnant women and its correlation with fetomaternal outcome-----a study in 450 bedded maternity hospital of walled city of Delhi

## Abstract

**Objective:** Estimation of vitamin D level at term pregnancy and role of vitamin D supplementation on fetomaternal outcome in burka clad pregnant women.

**Methods:** 200 burka clad pregnant women of 12-16 weeks gestation attending antenatal clinic in Kasturba Hospital, Delhi, were selected. They were randomly assigned into two groups that is study group and control group. Study group comprised of 100 pregnant burka clad women who received vitamin D supplementation in form of oral cholecalciferol sachet 60,000IU in 5th, 6th and 7th month of gestation along with routine iron, FA and calcium supplementation. Control group comprised of 100 pregnant burka clad women who only received routine iron, FA and calcium supplementation. At term pregnancy vitamin D levels were estimated in both groups by xpress ELISA kit and role of vitamin D supplementation in burka clad pregnant women and fetomaternal outcome of the two groups were compared.

**Results:** Vitamin D supplementation during pregnancy was associated with increased circulating 25(OH) vitamin D levels at term. Vitamin D supplementation reduces the incidence of pre-eclampsia and low birth weight neonates. Incidence of GDM, preterm birth, cesarean section, NICU admission, tetany in newborn was not influenced by vitamin D supplementation.

**Conclusion:** At present, vitamin D supplementation is not a part of antenatal care programs in India. For recommendations concerning routine vitamin D supplementation during pregnancy; further clinical trials are required with larger sample size.

**Keywords:** vitamin D, pre-eclampsia, gestational diabetes mellitus, low birth weight, nicu admission, preterm birth

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Sangita Nangia Ajmani,<sup>1</sup> Manisha Uddey,<sup>2</sup>  
Leela Pant,<sup>3</sup> Poonam Chauhan,<sup>1</sup> Ajmani AK<sup>4</sup>

<sup>1</sup>Obstetrics and Gynecology, Kasturba hospital, India

<sup>2</sup>Postgraduate student, Kasturba hospital, India

<sup>3</sup>Pathology, Kasturba hospital, India

<sup>4</sup>Medicine, Endocrinology, BL Kapur hospital, India

**Correspondence:** Dr. Sangita Nangia Ajmani, Obstetrics and Gynecology, HOD (Obstetrics and Gynecology), Officer Incharge HRRC, Kasturba hospital, India, Tel 9650403404, Email sangitaajmani@gmail.com

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## Introduction

Vitamin D is a fat-soluble vitamin which comes primarily from exposure to sunlight, and is found naturally only in a few foods, such as fish-liver oils, fatty fish, mushrooms, egg yolks, and liver.<sup>1</sup>

Vitamin D status is affected by factors that regulate its production in the skin (i.e. skin pigmentation, latitude, dressing codes, season, aging, sunscreen use, and air pollution) and by factors affecting its absorption or metabolism.<sup>1</sup>

Vitamin D deficiency during pregnancy is associated with impaired maternal musculoskeletal preservation and fetal skeletal formation. Vitamin D deficiency is associated with multiple adverse health outcomes in pregnant female like pre-eclampsia, gestational diabetes mellitus, miscarriage, preterm labor, higher incidence of cesarean section.<sup>2-5</sup> vitamin D deficiency in pregnancy has important consequences in newborn, including small for gestational age infant, neonatal rickets, tetany, infantile rickets.<sup>6-11</sup>

Many studies have investigated vitamin D deficiency in pregnancy in different ethnic groups and the various methods of supplementation. At present, vitamin D supplementation is not a part of antenatal care programs in India. There is paucity of studies on vitamin D supplementation in pregnant women in India, and its effect on fetomaternal outcome.

## Materials and methods

This study was conducted in the Department of Obstetrics and Gynecology at Kasturba Hospital, Delhi during January 2015-December 2015. The study was conducted after ethical clearance from the institutional ethical committee. The study subjects were recruited from patients attending antenatal clinic of Kasturba hospital.

A written informed consent was taken from all the recruited patients. Women with the following criteria were excluded from the study:

- Non burka clad pregnant women,
- Age <18yr and >40yr,
- Gestational age <12weeks,
- Subjects residing in place other than Delhi
- Subjects having liver disease, renal disease, renal calculi, secondary osteoporosis, rheumatoid arthritis, morbid obesity, treatment with antitubercular treatment (ATT) or anti-epileptic in previous 6 months, taking vitamin D or calcium supplementation in previous 1 year.
- With pre-existing calcium and parathyroid condition, required chronic diuretics or cardiac medication, having chronic

hypertension (HTN), active thyroid disease. 200 pregnant burka clad pregnant women of 12-16 weeks gestation were included in the study.

They were randomly assigned into two groups that is study group and control group. Study group comprised of 100 pregnant burka clad women of 12-16 weeks gestation who received vitamin D supplementation in the form of oral cholecalciferol sachet 60,000IU in 5th, 6th and 7th month of gestation along with routine iron, folic acid and calcium supplementation. Control group comprised of 100 pregnant burka clad women of 12-16 weeks who received only routine iron, folic acid and calcium supplementation. At first antenatal visit a detailed history was obtained and thorough examination and routine antenatal investigations of all the subjects was done. At term pregnancy vitamin D level was estimated in both groups and patients were then grouped in three categories: – vitamin D deficient <20ng/ml, vitamin D insufficient 20-30ng/ml, vitamin D sufficient >30ng/ml Role of vitamin D supplementation and maternal outcome in terms of preeclampsia, gestational diabetes mellitus (GDM), preterm labour, mode of delivery and fetal outcome in terms of low birth weight(LBW),neonatal intensive care unit(NICU) admission, tetany of the two groups was compared.

### Statistical evaluation

All the data was entered in Microsoft excel sheet and various variables were compared by applying chi-square test as a test of significance for nominal and numerical variables with the help of computer using Statistical Package of Social Sciences and Problem Solutions (SPSS)-16.0 software. Statistical significance was considered if p value was <0.05.

### Results

The mean age in this study was 24.6years.Out of 200 patients, 67(33.5%) patients were primigravida and 133 (66.5%) patients were multigravida. Most of the patients (66.5%) belonged to lower socioeconomic class. According to our study vitamin D deficiency was more common in lower socioeconomic status and lower educated. In our study there was no correlation between fish intake and milk, dairy product intake and skin colour with vitamin D deficiency. In our study there is a statistically significant correlation established between vitamin D deficiency and limited outdoor activity and use of sunscreen lotion. Vitamin D supplementation during pregnancy was associated with increased circulating 25(OH) vitamin D levels at term. Vitamin D supplementation reduces the incidence of pre-eclampsia and low birth weight neonates. Incidence of gestational diabetes mellitus (GDM), preterm birth, cesarean section, neonatal intensive care unit (NICU) admission, tetany in newborn was not influenced by vitamin D supplementation.

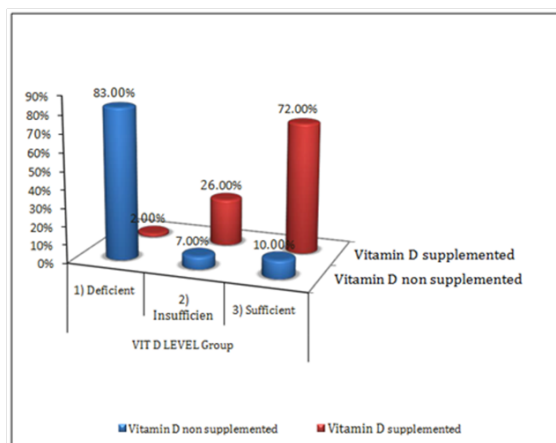
### Discussion

#### Vitamin D level in vitamin d supplemented and non supplemented group

CKH Yu conducted a prospective randomised study to determine vitamin D status in pregnancy and to evaluate the effects of vitamin D supplementation. A total of 180 women were recruited and randomised into three groups, a single dose of 200,000IU vitamin D, a daily supplement of 800IU vitamin D from 27weeks until delivery and a no treatment group. The final maternal vitamin D levels were significantly higher in supplemented group. The result of our study is shown in Table 1 which are similar to above mentioned study (Figure 1).

**Table 1** Vitamin D level in vitamin d supplemented and non supplemented group

Vitamin D level at term	Group				Total	P value
	Vitamin D non supplemented		Vitamin D supplemented			
	NO.	%	NO.	%	NO.	%
1.Deficient	83	83%	2	2%	85	42.50%
2.Insufficient	7	7%	26	26%	33	16.50%
3.Sufficient	10	10%	72	72%	82	41%
Total	100	100%	100	100%	200	100%



**Figure 1** Vitamin D level in vitamin d supplemented and non supplemented group.

#### Maternal outcome in vitamin d supplemented and non supplemented group

**Pre-eclampsia:** In our study 6% patients developed pre-eclampsia and out of these 5% belonged to vitamin D non-supplemented group and 1% belonged to vitamin D supplemented making this correlation statistically significant (p-value=0.033). These findings suggest that incidence of pre-eclampsia was less in vitamin D supplemented group. Similarly, Bodnar et al.<sup>10</sup> conducted a case control study of pregnant women in which they found that serum 25-hydroxy vitamin D concentration in early pregnancy were lower in women who subsequently developed preeclampsia compared with controls. Baker also concluded in their study that maternal mid gestation vitamin D deficiency was associated with increased risk of severe preeclampsia and vitamin D may be a modifiable risk factor for severe preeclampsia. Both of these studies show similar results to our study.

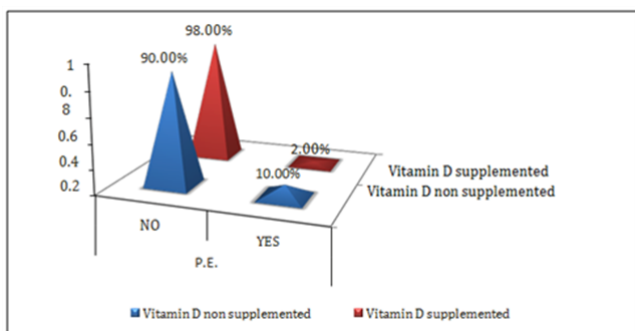
- **Gestational diabetes mellitus:** In present study 8.5% patients developed gestational diabetes mellitus. Out of these 5% belonged to vitamin D non-supplemented group and 3.5% belonged to vitamin D supplemented group. The p-value was 0.447 making this correlation statistically insignificant. Similar results were found by Faustino who conducted a systematic review and meta-analyses of randomised controlled trials to assess the effects of vitamin D supplementation on obstetric outcomes and birth variables and they found that incidence of gestational diabetes mellitus was not influenced by vitamin D supplementation.
- **Preterm labour:** In our study 7.5% patients had preterm labour and out of these 4.5% belonged to vitamin D supplemented group and 3% belonged to vitamin D non supplemented group. The p-value was 0.421 making this correlation statistically insignificant. Similar results were found in studies conducted by

Faustino RP and Bodnar LM in both of these studies incidence of preterm birth was not influenced by vitamin D supplementation.

**Mode of delivery:** In our study 85% patients delivered by vaginal route and 15% patients delivered by LSCS. Out of 15% patients who delivered by LSCS, 8% belonged to vitamin D non supplemented group and 7% belonged to vitamin D supplemented group suggesting no correlation between vitamin D supplementation and mode of delivery (p-value 0.692). Similar result was found by Skowronska-jozwaik who recruited 102 pregnant women to study vitamin D3 concentration and its influence on pregnancy course, health of pregnant women and their offspring and found no relation between vitamin D status and incidence of gestational diabetes, mode of delivery and size of newborns (Table 2) (Figure 2).

**Table 2** Maternal outcome in vitamin d supplemented and non supplemented group

Maternal outcome	Group				Total		p value
	Vitamin D non supplemented		Vitamin D supplemented				
	NO.	%	NO.	%	NO.	%	
Pre-Eclampsia	10	10%	2	2%	12	6%	0.033
Gestational Diabetes Mellitus	10	10%	7	7%	17	8.50%	0.447
Preterm Labour	6	6%	9	9%	15	7.50%	0.421
Mode of Delivery (LSCS)	16	16%	14	14%	30	15%	0.692



**Figure 2** Cases of pre-eclampsia in vitamin d supplemented and non supplemented group.

**Fetal outcome in vitamin d supplemented and non supplemented group**

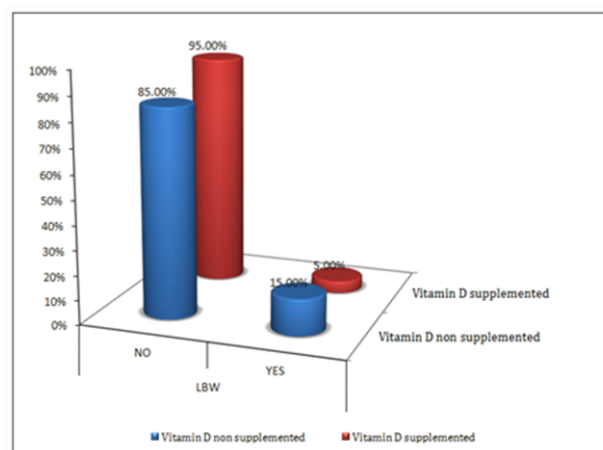
- **Low birth weight:** In our study, 10% patients gave birth to LBW neonates (<2.5kg). Out of these 7.5% belonged to vitamin D non supplemented group and 2.5% belonged to vitamin D supplemented group. The p-value was 0.017 making this correlation statistically significant. Out of 20 patients who gave birth to LBW, 17% were vitamin D deficient and 2% had vitamin D level insufficient and 1% patient had sufficient level of vitamin D. The p-value was 0.009 making this correlation statistically significant. This implied that vitamin D supplementation could reduce the risk of low birth weight. Similar results were found by Bowyer, De Regil LM.
- **Neonatal intensive care unit admission:** In our study neonates of 7.5% patients were admitted in NICU and out of these 5% mothers belonged to vitamin D non-supplemented group and 2.5% patients belonged to vitamin D supplemented group. The p-value was 0.179 making this correlation statistically insignificant. Out of 15 neonates, mothers of 5% were vitamin

D deficient and 1% mothers had insufficient level of vitamin D and 1.5% mothers had sufficient level of vitamin D. The p-value was 0.131 making this correlation statistically insignificant. Hollis studied that there was no significant differences based on supplemented dose in the neonatal intensive care unit admission rate. Although neonatal intensive care unit admission is not a complete assessment measure for neonatal outcome, these findings provide evidence that different levels of vitamin D supplementation had no significant positive or negative effect on the need for advanced neonatal care. The result of this study is comparable with our study.

**Neonatal tetany:** In our study neonates of 4 patients developed tetany and out of 4 neonates, mothers of 3 belonged to vitamin D non-supplemented group and 1 patient belonged to vitamin D supplemented group. The p-value was 0.621 making this correlation statistically insignificant. Similarly Cockburn found out that tetanic convulsions occurred in 8 of the 1139 infants (0.7%), and there was no difference in the occurrence of convulsions among infants of mothers who received vitamin D, compared to those who did not (Table 3) (Figure 3).

**Table 3** Fetal outcome in vitamin d supplemented and non supplemented group

Fetal outcome	Group				Total		p value
	Vitamin D non supplemented		Vitamin D Supplemented				
	NO.	Percentage	NO.	Percentage	NO.	Percentage	
Low Birth Weight	15	15%	5	5%	20	10%	0.017
Neonatal Intensive Care Unit Admission	10	10%	5	5%	15	7.50%	0.179
Tetany	3	3%	1	1%	4	2%	0.621



**Figure 3** Cases of low birth weight in vitamin d supplemented and non supplemented group.

**Conclusion**

Vitamin D deficiency and insufficiency are common in burka clad pregnant women of Delhi. In the present study a significant association was found between vitamin D deficiency and lower socioeconomic status, lower education, limited outdoor activity and with sunscreen lotion use. Vitamin D supplementation during pregnancy was

associated with increased circulating 25 hydroxy vitamin D levels at term. Vitamin D supplementation reduces the incidence of pre-eclampsia and low birth weight neonates, hence emphasizing the role of vitamin D supplementation in improving fetomaternal outcome. Incidence of gestational diabetes mellitus, preterm birth, cesarean section, neonatal intensive care unit admission, tetany in newborn was not influenced by vitamin D supplementation in our study.

At present, vitamin D supplementation is not a part of antenatal care programs in India. The US National Academy of Sciences mentions 400IU/day as the reference dietary intake during pregnancy but several investigators worldwide are arguing for revised guidelines for higher vitamin D allowance during pregnancy. This may call for vitamin D supplementation to mothers. Low vitamin D concentrations have been associated with a wide range of adverse maternal and offspring health outcomes. At this time there is insufficient evidence to support a recommendation for screening all pregnant women for vitamin D deficiency. While there is some evidence that vitamin D supplementation could reduce the risk of pre-eclampsia and low birth weight neonates. For pregnant women thought to be at increased risk of vitamin D deficiency, maternal serum 25-hydroxy vitamin D levels can be considered and should be interpreted in the context of the individual clinical circumstance. For recommendations concerning routine vitamin D supplementation during pregnancy, further clinical trials are required with larger sample size.

### Acknowledgements

An informed consent was taken from all the patients recruited in this study.

### Conflicts of interest

There was no conflict of interest among the authors of this study.

### Ethics approval and consent to participate

This study was approved by the institutional ethical committee..

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