

Prevalence of Vitamin D Deficiency in Burka-clad Pregnant Women in a 450-Bedded Maternity Hospital of Delhi

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Abstract

Aim To assess the prevalence of vitamin D deficiency in burka-clad pregnant women and to study fetomaternal outcome in these women.

Methods 200 pregnant burka-clad women of 18–40-year age group irrespective of the period of gestation were

recruited from the ANC OPD/ward of Kasturba hospital, and their vitamin D levels were estimated. Patients were categorized into vitamin D deficient, vitamin D inadequate, and vitamin D adequate according to The Endocrine Society Guidelines. The association of vitamin D deficiency with dietary/environmental factors was taken note of. Associations with preeclampsia, gestational diabetes mellitus (GDM), low birth weight (LBW), prematurity, APGAR score, and NICU admission were also studied.

Results 78 patients (39.0 %) were vitamin D inadequate; 75 patients (37.5 %) were vitamin D deficient; and 47(23.5 %) were vitamin D adequate. Mean value of vitamin D level was $23.25 \text{ ng/ml} \pm 18.49 \text{ (SD)}$. Fifteen patients (7.5 %) developed preeclampsia, and all 15 were vitamin D deficient; 13 (6.5 %) developed GDM; and only 5 (2.5 %) of them were vitamin D deficient. 19 patients (9.5 %) delivered LBW babies; mothers of 15 (7.5 %) of them were vitamin D deficient. 12 patients (6.0 %)

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delivered premature babies, and mothers of 4 (2 %) were vitamin D deficient; 12 babies had APGAR score <7 at 5 min; mothers of 4 (2.0 %) were vitamin D deficient. Babies of 12 patients (6 %) were admitted in NICU, and of these 12 babies, mothers of 5 (2.5 %) were vitamin D deficient.

Conclusion The prevalence of vitamin D deficiency was high among burka-clad pregnant women, and it is associated with adverse maternal and fetal outcomes. Routine screening of vitamin D levels is recommended in burka-clad women to improve the fetomaternal outcome.

Keywords Vitamin D deficiency · Preeclampsia · Gestational diabetes mellitus · Low-birth weight

Introduction

Vitamin D deficiency is now recognized as a pandemic [1]. Important biological functions involving growth and developmental outcomes have been attributed to vitamin D, and its deficiency during pregnancy may result in important health consequences for both mother and child [2, 3]. Increasing urbanization leading to greater pollution and poor outdoor activities, coupled with dark complexion may predispose to vitamin D deficiency, and the problem is likely to worsen during pregnancy because of active transplacental transport of calcium to the developing fetus [4].

Vitamin D deficiency during pregnancy is associated with impaired maternal musculoskeletal preservation and fetal skeletal formation. Vitamin D deficiency during pregnancy is associated with multiple adverse health outcomes in mothers like gestational diabetes and preeclampsia [5, 6]. Hypovitaminosis D in pregnancy has important consequences for the newborn, including lower birth weight, prematurity, neonatal rickets, tetany, and infantile rickets [7–10].

There is a paucity of studies on the prevalence of vitamin D deficiency in pregnant women in India, and its effect on fetomaternal outcome.

Materials and Methods

The study was conducted in the Department of Obstetrics and Gynecology at Kasturba Hospital, a 450-bedded tertiary care hospital located in the walled city of Delhi during the period January–December 2014. The study was conducted after ethical clearance from the institutional ethical committee. The study subjects were recruited from patients attending antenatal clinic or indoor patients in the antenatal ward of Kasturba Hospital.

A written informed consent was taken from all the recruited patients. Women with the following criteria were excluded from the study: (1) non-burka-clad women, (2) age more than 40 years or less than 18 years, (3) patients having history of liver/renal disease, osteoporosis, and rheumatoid arthritis, (4) history of antitubercular treatment or antiepileptic treatment in the last 6 months, (5) patients taking vitamin D supplementation.

A detailed dietary history was obtained in terms of milk/dairy product/fish intake. History regarding the number of hours of outdoor activities and sun exposure was elicited.

After all routine ANC investigations were done, 25(OH) D levels were estimated by ELISA technique. Diagnosis of Vitamin D deficiency was made on the basis of guidelines given in the 93rd annual meeting of The Endocrine society.

- Vitamin D deficiency is defined as a level of <20 ng/ml.
- Vitamin D inadequacy is defined as a level between 20 and 30 ng/ml.
- Vitamin D levels >30 ng/ml are considered as adequate.

Relevant investigations were done, all patients received routine antenatal care and were followed till delivery, fetomaternal outcome was observed. Maternal outcomes in terms of preeclampsia, gestational diabetes mellitus (GDM), bony abnormality, mode of delivery; and fetal outcomes in terms of low birth weight (LBW); APGAR score at 1, 5 min, and prematurity; NICU admission; and duration of NICU stay were observed.

Statistical Evaluation

All the data were entered in Microsoft excel sheet, and various variables were compared by applying χ^2 test and Fisher exact 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

In this study, most of our patients (56.5 %) were in the 20 to 25-year age group with a mean age of 24.76 years, 129 patients (64.5 %) were multigravida, and 71 patients (35.5 %) were primigravidas. Out of 200 patients, 128(64.0 %) belonged to lower socioeconomic class, 37(18.5 %) were from upper lower class, 33(16.5 %) were from lower-middle class, and only 2 patients (1 %) were from upper-middle class. 52 patients (26 %) were illiterate, 75 patients (37.5 %) were educated only till primary level

(class 5), and only 5 patients (2.5 %) were graduates. These findings suggest low level of literacy in the study group. After vitamin D estimation by ELISA technique, it was found that 78 patients (39.0 %) were vitamin D inadequate, 75 patients (37.5 %) were vitamin D deficient, and 47 (23.5 %) were vitamin D adequate (Fig. 1). Mean value of vitamin D level for 200 study patients was 23.25, and the SD was 18.49 (Table 1). In the present study, 88 patients (44 %) were dark in complexion, and 43(21.5 %) of these 88 patients were vitamin D deficient, indicating a significant association between vitamin D deficiency and dark complexion (*p* value 0.001). 145 patients (77.5 %) had limited outdoor activity, and of these 68 (34 %) were vitamin D deficient. The *p* value was 0.001 suggesting a statistically significant correlation between vitamin D deficiency and limited outdoor activities. 174 (87 %) patients did not use sunscreen, and 65 (32.5 %) of these 174 patients were vitamin D deficient. The *p* value was 0.071, making this correlation statistically insignificant. 165 (82.5 %) patients did not consume sufficient milk/dairy products intake, and out of these 165 patients, 65 (32.5 %) were vitamin D deficient, suggesting a significant correlation between vitamin D deficiency and poor milk/dairy product intake (*p* value 0.005). 125 patients (62.5 %) did not consume fish, and of these 125 patients, 57 (28.5 %) were vitamin D deficient. The *p* value was 0.001, making this correlation statistically significant (Table 2). To check for

Table 2 Association of vitamin D deficiency with environmental factors/dietary factors

Environmental/dietary factors	25(OH)D deficiency		
	Absent	Present	Total
Dark complexion	45	43	88
Limited outdoor activities	87	68	155
Use of sunscreen	16	10	26
Inadequate milk/dairy product	100	65	165
Inadequate fish intake	68	57	125

compounding variables, i.e., different patient characteristics (age and parity), a logistic model including all other patient characteristics was created, and it was found that vitamin D reading was the only significant variable with a *p* value of 0.0033 between the level of vitamin D and occurrence of PET. Patient characteristics like age and parity in the presence of vitamin D deficiency had no effect on the relationship between vitamin D level and occurrence of PET. It was also found that with every unit decrease in the vitamin D level reading, the odds of developing PET was increased by a factor of 0.8 (80 %).

Association of Vitamin D Deficiency with Environmental/Dietary Factors

Maternal Outcome

In the present study, 15 patients (7.5 %) developed preeclampsia, and all the 15 patients were vitamin D deficient. The *p* value was 0.001 suggesting a strong correlation between vitamin D deficiency and the development of preeclampsia (Fig. 2). Out of 200 patients, 13 (6.5 %) patients developed GDM, and of these 13 patients, only 5 (2.5 %) were vitamin D deficient suggesting no correlation between vitamin D deficiency and development of GDM (*p* value 0.787) (Fig. 3). Out of 20 patients who delivered by LSCS, 9 were vitamin D deficient. The *p* value was 0.064 making this correlation statistically insignificant. In the present study, only 2 (1 %) patients had bony abnormality. The *p* value was 0.053 making this correlation statistically insignificant (Figs. 1, 2, 3).

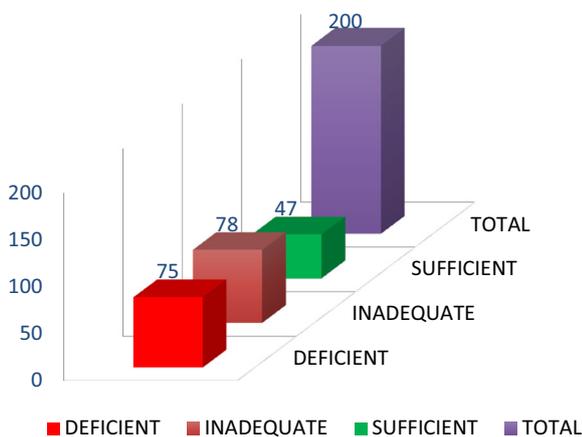


Fig. 1 Vitamin D status of pregnant burka-clad women

Table 1 Vitamin D status of pregnant burka-clad women

Vitamin D status	Number	Percentage	Mean	Median	SD
Adequate (>30 ng/ml)	47	23.5	48.53	47.57	11.74
Inadequate (20–30 ng/ml)	78	39.0	24.08	23.46	2.59
Deficient (<20 ng/ml)	75	37.5	3.53	1.61	4.74
Total	200	100	23.25	22.45	18.49

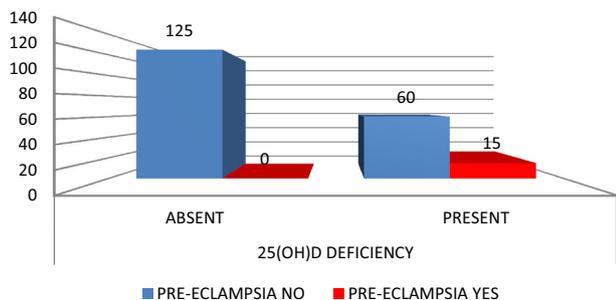


Fig. 2 Association of vitamin D deficiency and preeclampsia

Fetal Outcome

Nineteen patients (9.5 %) delivered LBW babies, and out of these 19 babies, mothers of 15 (7.5 %) were vitamin D deficient indicating a strong correlation between vitamin D deficiency and LBW neonates (*p* value 0.001). Twelve patients (6.0 %) delivered premature babies, mothers of only 4 (2 %) were vitamin D deficient. The *p* value was 0.901 making this correlation statistically insignificant. Twenty patients (10 %) delivered babies with abnormal APGAR score (<7) at 1 min, and mothers of 10 (5 %) were vitamin D deficient indicating no correlation (*p* value 0.138). Twelve patients (6 %) delivered babies with abnormal APGAR score (<7) at 5 min, and out of these 12 babies, mothers of 4 (2.0 %) were vitamin D deficient suggesting no association between vitamin D deficiency and neonatal hypoxia (*p* value 0.214). Babies of 12 patients (6 %) were admitted in NICU, and out of these 12 babies, mothers of 5 (2.5 %) were vitamin D deficient suggesting no correlation between vitamin D deficiency and neonatal morbidity (*p* value 0.412) (Table 3).

Table 3 Association of vitamin D deficiency with fetal outcome

Fetal outcomes	25(OH)D deficiency		Total
	Absent	Present	
LBW	4	15	19
Prematurity	8	4	12
APGAR < 7 at 1 min	10	10	20
APGAR < 7 at 5 min	5	4	9
NICU admission	7	5	12

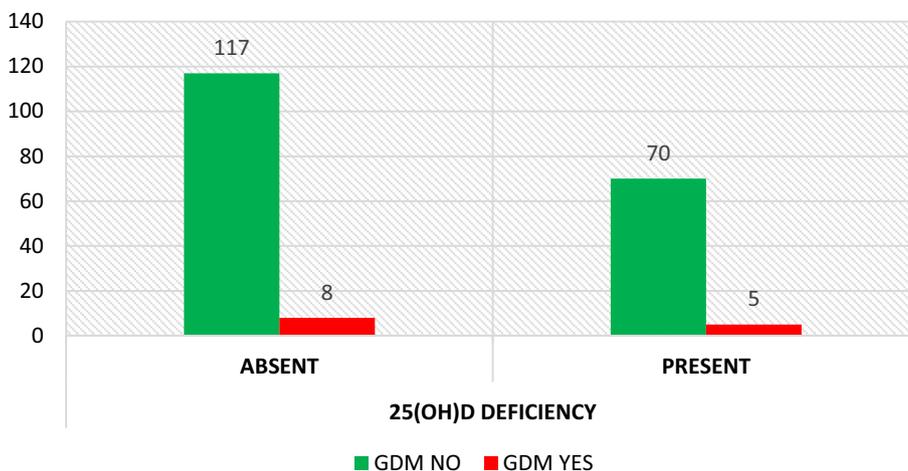
Discussion

This study revealed that there is a high prevalence of vitamin D deficiency in burka-clad pregnant women, and hence, vitamin D estimation should be recommended as a part of antenatal work-up of pregnant burka-clad women.

A significant association was found between vitamin D deficiency and maternal and fetal morbidity. Use of burka, limited outdoor activities, dark skin color, and poor dietary intake of milk/dairy product/fish were major contributing factors for vitamin D deficiency. The present study showed a significant association between vitamin D deficiency and development of preeclampsia in mothers. Vitamin D deficiency in mothers was also found to be associated with low birth weight among neonates. However, no association was found between vitamin D deficiency and GDM, mode of delivery, and bony abnormality in mothers; and prematurity, APGAR score, and NICU admission in neonates.

At present, The American College of Obstetricians and Gynecologists does not recommend screening all pregnant women for vitamin D deficiency. However, given that severe vitamin D deficiency has been associated with

Fig. 3 Association of vitamin D deficiency with GDM



congenital rickets and fractures of newborn, it has been suggested that some high-risk groups such as vegetarians, women with limited sun exposure, and ethnic groups with increased melanin may benefit from vitamin D determination.

There is paucity of studies on vitamin D deficiency in pregnant women in India and its effect on feto-maternal outcome. There is no consensus on specific value of vitamin D level to define vitamin D deficiency, and no clear guidelines are established yet regarding vitamin D supplementation. Thus, further research into vitamin D status of pregnant women and supplementation of vitamin D during pregnancy is needed. At present, vitamin D supplementation is not a part of routine antenatal care and national programs in India. The estimation of vitamin D levels is an expensive test. So, before we recommend routine screening of all antenatal women for vitamin D deficiency, further prospective studies are required to establish the association of vitamin D deficiency with feto-maternal outcome, the cost effectiveness, and possible benefits of supplementation of vitamin D in improving feto-maternal outcome.

Compliance with Ethical Standards

Conflict of interest None.

Ethical approval This study was approved by institutional ethical committee.

References

1. Holick MF, Chen TC. Vitamin D deficiency: a worldwide problem with health consequences. *Am J Clin Nutr.* 2008;87:1080S–6S.
2. Wagner CL, Taylor SN, Dawodu A, et al. Vitamin D and its role in pregnancy in attaining optimal health of mother and fetus. *Nutrients.* 2012;4:208–30.
3. Leffelaar ER, Vrijkotte TGM, Eijdsden MV. 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. *Br J Nutr.* 2010;104:108–17.
4. Marwaha RK, Tandon N, Chopra S, et al. Vitamin D status in pregnant Indian women across trimesters and different seasons and its correlation with neonatal serum 25-hydroxyvitamin D levels. *Br J Nutr.* 2011;106:1383–9.
5. Aghajafari F, Nagulesapillai T, Ronksley PE, et al. Association between maternal serum 25-hydroxyvitamin D level and pregnancy and neonatal outcomes: systematic review and meta-analysis of observational studies. *Br Med J.* 2013;346:f1169.
6. Baker AM, Haeri S, Camargo CA, et al. A nested case control study of midgestation vitamin D deficiency and risk of severe preeclampsia. *J Clin Endocrinol Metab.* 2010;95(11):5105–9.
7. Mannion CA, Donald KG, Koski KG. Association of low intake of milk and vitamin D during pregnancy with decreased birth weight. *Can Med Assoc J.* 2006;174(9):1273–7.
8. Dror DK, Allen LH. Vitamin D inadequacy in pregnancy: biology, outcomes, and interventions. *Nutr Rev.* 2010;68(8):465–77.
9. Bodnar LM, Catov JM, Simhan HN, et al. Maternal vitamin D deficiency increases the risk of preeclampsia. *J Clin Endocrinol Metab.* 2007;92(9):3517–22.
10. Zhu T, Liu TG, Ge X, et al. High prevalence of maternal vitamin D deficiency in preterm births in northeast china, Shenyang. *Int J Clin Exp Pathol.* 2015;8(2):1459–65.