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Original Article

Assessment of Vitamin D Deficiency in Pregnant Females Attending Antenatal Care Clinic at Tertiary Care Hospital

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Abstract

Introduction: Vitamin D deficiency during pregnancy is associated with increased maternal risks such as pre-eclampsia, gestational diabetes mellitus, and bacterial vaginosis as well as a higher incidence of fetal complications such as low birth weight, neonatal rickets, and osteoporotic fracture in late adulthood.

Objective: To find the prevalence of vitamin D deficiency in pregnant females attending antenatal care clinic in tertiary care hospital and to evaluate other related risk factors associated with vitamin D deficiency.

Materials and Methods: This study was conducted in the Department of Obstetrics and Gynecology, SMIMER, Surat. Total 253 pregnant females were randomly selected who attended antenatal clinic from December 2014 to December 2015. Women with serum 25-hydroxy vitamin D level <20 ng/ml were diagnosed as vitamin D deficient.

Results: In this study, out of 253 cases, 211 cases (83.4%) had vitamin D deficiency (vitamin D <20 ng/ml), 28 cases (11.1%) had insufficiency (vitamin D = 21-29 ng/ml), and only 14 cases (5.53%) had sufficient vitamin D levels (vitamin D ≥30 ng/ml).

Conclusion: This study indicates that vitamin D deficiency is highly prevalent in pregnant females thus implicating the need of a uniform strategy to give vitamin D supplements to all pregnant females.

Key words: Maternal serum 25 hydroxy vitamin D, Vitamin D deficiency, Vitamin D insufficiency, Vitamin D supplementation in pregnancy

INTRODUCTION

Vitamin D deficiency is a preventable health problem. As calcium demands increase during pregnancy, vitamin D status becomes crucial and optimal for maternal and fetal outcome. Vitamin D deficiency during pregnancy may lead to increase the risk of pre-eclampsia,[1] gestational diabetes mellitus (GDM),[2] bacterial vaginosis,[3] and more chances of cesarean section.[4] Low levels of vitamin D are also linked with a number of fetal health problems such as low birth weight, neonatal hypocalcemia[5] and seizures, impaired growth, skeletal problems such as rickets and low bone mineral density[6] and also acute lower respiratory tract infections.[7]

The main action of vitamin D is to maintain the physiological levels of serum calcium and phosphorus. There are two main sources of vitamin D-(1) exogenous source from the diet in the form of vitamins D2 and D3 and (2) endogenous source in the form of vitamin D3 (cholecalciferol) is synthesized in the skin by the action of sunlight. Endogenous vitamin D is the main source in children and adults, thus any factor affecting the transmission of ultraviolet B radiation will determine the reduction of vitamin D-25 hydroxy vitamin D. Excessive use of sunscreens, individuals with darker skin, skin aging, and skin damage secondary to burns are some of the risk factors which may cause decrease in endogenous

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production of vitamin D. Other causes of vitamin D deficiency can be inadequate intake, obesity, severe liver failure,[8] drugs such as anticonvulsants and glucocorticoids.

During pregnancy and lactation, significant changes in calcium and vitamin D metabolism occur to meet the increased demand of calcium needed for fetal bone mineralization. Women of Indian origin especially pregnant women have a high prevalence of vitamin D deficiency. In Indian women, calcium intake is low and demand of calcium is high because of repeated cycles of pregnancy and lactation. Low calcium intake in conjunction with vitamin D deficiency makes the condition worse. Thus, the need for improvement in vitamin D status in pregnant females is both important and urgent.

MATERIALS AND METHODS

This cross-sectional study was conducted in the Surat Municipal Institute of Medical Education and Research in the Department of Obstetrics and Gynecology. Total of 253 participants were randomly selected from pregnant females attending antenatal care clinic from December 2014 to December 2015. Pregnant females who gave voluntary consent were included in the study, irrespective of the period of gestation. Women with renal disease, chronic liver disease, and patient taking antitubercular drugs or antiepileptic drugs were excluded from the study. The study was approved by the Institutional Ethical Committee.

Apart from routine history and examination, patients' blood samples were collected for serum 25-hydroxy vitamin D level estimations, apart from routine investigations.

Women with serum 25-hydroxy vitamin D level <20 ng/ml were diagnosed as vitamin D deficient; levels between 21 and 29 ng/ml were diagnosed as vitamin D insufficient, and levels ≥30 ng/ml were considered sufficient.[9]

RESULTS

In this study, out of 253 cases, 211 cases (83.4%) were diagnosed as vitamin D deficient, 28 cases (11.1%) were diagnosed as vitamin D insufficient, and only 14 cases (5.53%) were found to have sufficient vitamin D levels (Table 1). Thus, the prevalence of vitamin D deficiency and insufficiency in pregnant females in this study was 94.47%.

Vitamin D deficiency and insufficiency were prevalent in almost all age groups studied. Out of 97 primigravida, 78 cases (80.41%) were vitamin D deficient, and out of 156 multigravida, 133 cases (85.26%) had vitamin D deficiency. So, there was a high distribution of vitamin D deficiency in both primi- and multi-gravida. In our study, the prevalence rate of vitamin D deficiency was much higher in lower socio-economic class (64 cases [94.12%] out of 68) as compared to upper socio-economic class (1 case [25%] out of 4). We also observed that vitamin D deficiency was equally prevalent in all trimester of pregnancy. Out of 13 cases of first trimester, 11 subjects (84.62%) were deficient and 2 subjects (15.38%) were insufficient. Out of 49 cases of second trimester, 41 cases (83.67%) were deficient and 6 cases (12.4%) were insufficient for vitamin D. Similarly, from 191 cases of third trimester, 159 cases (83.25%) were vitamin D deficient, and 20 cases (10.47%) were vitamin D insufficient.

As shown in Table 2, a strong correlation was seen between increasing body mass index (BMI) and vitamin D deficiency and insufficiency. All obese females, i.e., BMI ≥30 were found to have vitamin D deficiency (100% prevalence).

In this study of 253 cases, 86 cases had anemia, in which 74 cases (86.1%) had vitamin D deficiency, and 9 cases (10.47%) had vitamin D insufficiency. Total 14 cases of pregnancy-induced hypertension were diagnosed, of which 13 cases (92.86%) had vitamin D deficiency and 1 case (7.41%) had vitamin D insufficiency. GDM was found in 6 cases, of which 5 cases (83.33%) were deficient for vitamin D (Table 3).

DISCUSSION

In our study, a very high prevalence of vitamin D deficiency (83.4%) and insufficiency (11.1%) was found

Table 1: Prevalence rate of vitamin D deficiency

Vitamin D status	Number of cases	Percentage
Vitamin D sufficiency	14	5.53
Vitamin D insufficiency	28	11.1
Vitamin D deficiency	211	83.4
Total	253	

Table 2: Vitamin D deficiency status according to BMI

BMI	Cases	Sufficiency (%)	Insufficiency (%)	Deficiency (%)
<20	10	1 (10)	1 (10)	8 (80)
20-24.9	152	12 (7.89)	16 (10.53)	124 (81.58)
25-29.9	78	1 (1.28)	11 (14.1)	66 (84.62)
≥30	13	0 (0)	0 (0)	13 (100)
Total	253	14	28	211

BMI: Body mass index

Table 3: Vitamin D statuses with other risk factors

Other risk factors	Cases	Percentage
Anemia	86	34
PIH	14	5.5
GDM	6	2.4

PIH: Pregnancy-induced hypertension, GDM: Gestational diabetes mellitus

Table 4: Comparisons of vitamin D status in present study with other related studies

Various studies	Sufficiency (%)	Insufficiency (%)	Deficiency (%)
Present study	5.53	11.1	82.4
Ravinder *et al*. (2015), South India	3	30	67
Bartoszewicz *et al*. (2013) Warsaw	30	38.7	31.3
Vandevijvere *et al*. (2012) Belgium	25.9	29.5	44.6
Sharma *et al*. (2015) North India			93

among pregnant females. This may be due to higher skin pigmentation, vegetarian diet, and inadequate intake. Our results are comparable to the study conducted by Sharma *et al*.,[10] who found that the prevalence of vitamin D deficiency in pregnant females in North Indian population was 93%. The prevalence of vitamin D deficiency was comparatively lesser in studies conducted by Ravinder *et al*.,[11] Vandevijvere *et al*.,[12] and Bartoszewicz *et al*.[13] (Table 4). Vitamin D deficiency and insufficiency were found to be higher in multigravida as compared to primigravida. This could be due to repeated cycles of pregnancy and lactation in multigravida. Choi *et al*.[14] observed that in primigravida, severe vitamin D deficiency was present in 75.4% cases, and in multigravida, vitamin D deficiency was present in 80.8% cases.

As far as the trimester of pregnancy was concerned, vitamin D deficiency was prevalent in all trimester. In this study, the prevalence rate of vitamin D deficiency was much higher in lower socio-economic class as compared to upper socio-economic class. This could be because of poor dietary intake in lower economic strata.

A very important correlation was found between vitamin D deficiency and increasing BMI in our study. This can be possibly due to the sequestration of vitamin D in adipose tissue and its lower dietary intake. Bodnar *et al*.[15] (2007) concluded in his study that 61% of women who were obese (BMI >30) before pregnancy were found to be vitamin D deficient as compared to 36% of women with pre-pregnancy BMI of <25.

CONCLUSION

As calcium demand increases during pregnancy, vitamin D status becomes crucial for optimal maternal and fetal outcome. The high prevalence of vitamin D deficiency in pregnancy calls for unanimous approach to tackle this grave situation by implementing a national strategy for screening, prevention, and treatment of this deficiency. Programs need to be developed to increase the awareness of this problem among people and to provide adequate doses of vitamin D supplements to pregnant females to avoid maternal and fetal complications which may occur due to vitamin D deficiency.

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