

Vitamin D deficiency in Pregnant Womens and its Maternal and Perinatal Outcomes

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Abstract

Despite its discovery a 100 year ago, vitamin D has emerged as one of the most controversial nutrient and pro-hormone of the 21st century. Its role in calcium metabolism and bone health is undisputed yet has non classical action on glucose metabolism, immune function, bacterial infections etc. During pregnancy Vitamin D deficiency induces maternal and neonatal complications. *Objective:* The aim of our study was to determine the prevalence of Vitamin D deficiency during pregnancy and its consequential effect and complication in mothers and their new-born. *Design:* A sample size of 50 pregnant mothers attending antenatal clinic with suspicion of vitamin D deficiency was picked up for the evaluation that included detailed history, physical examination and Vitamin D level estimation. The extent and severity of Vitamin D deficiency were analysed, maternal and neonatal outcome were recorded. *Result:* Majority of women (60%) had Vitamin D level < 10ng/dl and 28% have insufficiency and 8% had sufficient levels of Vitamin D. Main symptoms were fatigue, bone and muscle pain etc and complications during pregnancy with Vitamin D deficiency were, PIH, oligohydramnios and GDM. There was a six fold increase in the incidence of caesarean section and significant perinatal complications that were highlighted like asphyxia, low birth weight resulting in NICU admission. *Conclusion:* High prevalence of Vitamin D deficiency during pregnancy is increasingly reorganized lead to maternal and perinatal complication. A conscious knowledge about in and its adverse impact on mother and the newborn requires close scrutiny. Universal screening is highly recommended looking to the very high prevalence of Vitamin D deficiency.

Keyword: Vitamin D; PIH; GDM; IUGR; Maternal and Perinatal Outcome.

Introduction

The stark reality of Vitamin D deficiency is now gaining pandemic proportions [1] and its deficit during early pregnancy may result in grievous consequences for both the mother and child [2, 3].

An inbuilt and the largest source of Vitamin D in adult is its synthesis from sunlight, half an hour of sunlight delivers 50000 IU of vitamin D in fair skin human being however dietary intake through natural food is meager, thus makes a small contribution towards over all Vitamin D status of body [4]. Living

in a country like India with predominantly dark skinned melanin rich population another salient point needs mention as the pigment melanin absorbs ultraviolet B from sunlight and decreases cholecalcitol production by 90%, there by causing predisposition to vitamin D deficiency [5].

Overall the spectrum of various factors responsible for vitamin D deficiency include malnutrition, traditional dietary practices, junk food eating, poor socio-economic status, poor exposure to sunshine and multiple pregnancies [6].

The consequences of vitamin D deficiency during pregnancy involves either skeletal (growth restriction)

or non-skeletal complication viz, pre-eclampsia, gestational diabetes, preterm birth etc [7-10]. The new born too bears the brunt of vitamin D deficiency in form of low birth weight, prematurity, tetany, neonatal/ infantile rickets [11-14].

The symptoms are subtle yet, even without symptoms, too little vitamin D can pose health risks. Low blood levels of the vitamin may be associated with symptoms like fatigue, joint pain and muscle pain, Headache, Restlessness, Constipation, Weakness and poor concentration.

Material and Methods

The study was conducted in department of obstetrics and gynaecology at Geetanjali medical college and hospital after approval from ethical committee of the institute. The study was undertaken from July 2016 to June 2017.

The antenatal women attending ANC OPD and showing symptoms of Vitamin D deficiency were included in the study.

A proper history and examination was carried out and recorded in proforma and these women were subjected to Vit-D estimation along with all other routine relevant investigations.

We have categorized serum Vitamin D deficiency as per guidelines give in 93rd annual meeting of the endocrine society [15-17].

| Vitamin- D Status | Sufficient | Insufficient | Deficient |
|-------------------|------------|--------------|-----------|
| Levels | >30 ng/ml | 10-30 ng/ml | <10ng/ml |

Patient with low Vitamin D levels were supplemented with Vit D₃ and were followed till delivery.

Maternal outcomes were noted in terms of vitamin D deficiency symptoms, antenatal complications like pre-eclampsia, Gestational diabetes mellitus,

oligohydroamnios and normal/caesarean section. Neonatal outcome was noted in terms of intrauterine growth retardation, prematurity, poor apgar scores and NICU admission.

Statistical analysis of the above data was done.

Observations and Statistical Analysis

Detailed observations regarding the age bracket, BMI, vitamin D levels, symptomatology and gravida status, mode of delivery, maternal complications and neonatal complications were carefully tabulated of all 50 symptomatic Vitamin D deficient females.

The data was then subjected to statistical analysis to reach to a judicious conclusion. Statistic was calculated after entering the data in software statistical package for the social sciences (SPSS) version 20.0.

Mean was calculated; chi square test yielded P values and z values and standard deviations too were noted.

A p-value of 0.05 or less was considered statistically significant

Results

Out of total 50 patients majority (60%) of pregnant women had very low level <10 ng/dl, 28% patients were having vitamin D level in range of 10-20 ng/dl and only 8% patients were having vitamin D level >30 ng/dl.

Stratifying the Deficiency of Vitamin D in Pregnant Womens

The mean age, BMI and Vitamin D were 28.56, 24.9 and 10.74 and Standard deviation for age, BMI and Vitamin D were 3.65, 3.96, 8.65 respectively.

In our study 44% patients were multi gravida and 56% patients were primi gravida.

Table 1: Symptomatology of Vitamin D Deficiency

| Symptoms | Present | Absent | Z - test | P value |
|--------------------|----------|----------|----------|---------|
| Fatigue | 44 (88%) | 6 (12%) | 3.745 | <0.001 |
| Joint pain | 28 (56%) | 22 (44%) | 0.558 | 0.577 |
| Muscle pain | 29 (58%) | 21 (42%) | 0.772 | 0.442 |
| Headache | 11 (22%) | 39 (78%) | 3.095 | 0.002 |
| Restless sleep | 15 (30%) | 35 (70%) | 2.313 | 0.021 |
| Constipation | 6 (12%) | 44 (88%) | 3.745 | <0.001 |
| Weakness | 12 (24%) | 38 (76%) | 2.918 | 0.004 |
| Poor concentration | 6 (12%) | 44 (88%) | 3.745 | <0.001 |

The major symptom was fatigue with other symptoms like joint and muscle pain.

Some vague symptoms like headache, restlessness, constipation, weakness and poor concentration were seen with high negative significance of presence.

An alarmingly high number of complications like

PIH, oligohydroamnios and gestational diabetes mellitus were noted in vitamin-D deficiency pregnant mothers (p value significance 0.006)

Out of 46 deficient patient 40 patient had LSCS and only 6 patients had normal delivery with significant p value of 0.003 .

Table 2: Vitamin D deficiency and its Antenatal Complications

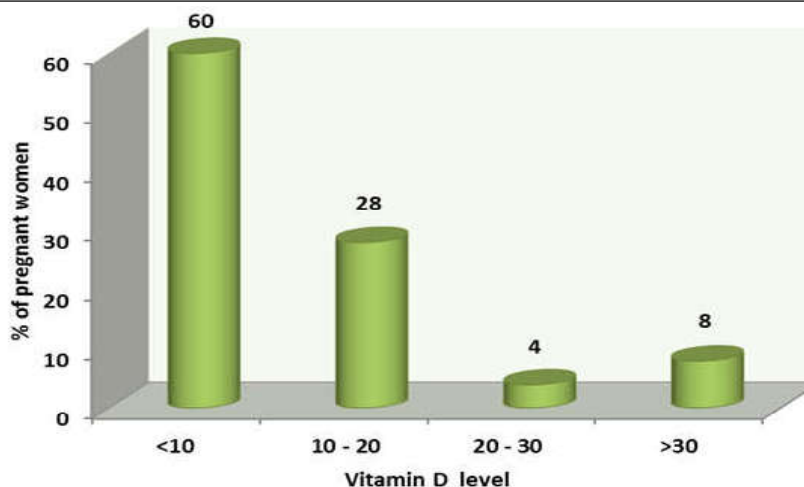
| Vitamin D level | Total Patients | Antenatal Complications | Z - test | P- value | |
|-----------------|----------------|-------------------------|----------|----------|-------|
| <10 | 30 | GDM | 2 | 2.729 | 0.006 |
| | | PIH | 6 | | |
| | | Oligo | 4 | | |
| | | GDM | 0 | | |
| 10-20 | 14 | PIH | 4 | | |
| | | Oligo | 3 | | |
| | | Absent | | | |
| 20-30 | 2 | Absent | | | |
| >30 | 4 | Absent | | | |
| Total | 50 | | 19 | | |

Table 3: Mode of Delivery

| Vitamin D level | Mode of Delivery | | Chi square value | P value |
|-----------------|------------------|-----------|------------------|---------|
| | LSCS | Normal | | |
| <10 | 28 (66.67%) | 2 (25%) | 14.271 | 0.003 |
| 10-20 | 11 (26.19%) | 3 (37.5%) | | |
| 20-30 | 1 (2.38%) | 1 (12.5%) | | |
| >30 | 2 (4.76%) | 2 (25%) | | |
| Total | 42(100%) | 8 (100%) | | |

Table 4: Perinatal Complications related to Vitamin d Deficiency

| Vitamin D level | Perinatal Complication | | Chi square value | P value | |
|-----------------|------------------------|----------|------------------|---------|-------|
| | None | Present | | | |
| <10 | 24 (60%) | Asphyxia | 2(20%) | 10.352 | 0.020 |
| | | LBW | 2(20%) | | |
| | | NICU | 2(20%) | | |
| | | Asphyxia | 2(20%) | | |
| 10-20 | 10 (25%) | LBW | 2(20%) | | |
| | | NICU | 0 | | |
| | | | | | |
| 20-30 | 2 (5%) | 0 | | | |
| >30 | 4 (10%) | 0 | | | |
| Total | 40 (100%) | 10(100%) | | | |



Graph 1: Stratifying the deficiency of Vitamin D in pregnant womens

Out of total 50 newborn, 10 had some or other perinatal complications. 60% of these complications were noted with patients having Vitamin D level <10ng/dl and 40% perinatal complications were noted with patients having Vitamin D level 10-20. No perinatal complication were noted with vitamin D level >20ng/dl (p- Value significance 0.020).

Discussion

The high prevalence of vitamin D insufficiency during pregnancy is increasingly recognized, among growing evidence that the intrauterine environment can have both immediate and long-lasting effects on the health of the offspring.

In most countries, the universal screening of Vitamin D Levels is not practised. A 2009 review has recommended that women with one or more risk factors for low serum 25(OH)D should be monitored at the beginning of gestation and in mid pregnancy [15].

A whole gamut of issues that are closely affiliated with the "vitamin D deficiency" required detailed observation with the references to its prevalence, critical serum levels, symptomatology along with association of complications in pregnant mothers and their new borns. Our study aims to address each one of these issue in details.

The study reveals an alarming high proportion of Vitamin D Deficiency (10.74 mean Vit-D levels) in pregnant females with suggestive symptomatology of vit-D deficiency. The interesting observation was that this extended well into young and healthy females too with an average age bracket of 28 year and BMI of 24.9.

Similar observations were made in the study of Mangilal ppuri et al. [18] 2015 and Sachan A. et al [19]. The universality of vit- D deficiency was an interesting observation in the study western black and white population in northern USA by Bodhhar by L.M. et al. [20] Identical observations were made in another Pennsylvania study by Mere wood et.al. in 2009 [21].

Cutting across the gravida status primi or multi, the deficiency of vit D was found in nearly equal proportions 56% and 46% respectively [22,23].

Recent data suggest an association between vitamin D deficiency and caesarean section, our study shows a 6 folds increase in caesarean section rate in vitamin D deficient patients, similarly a study done by Merewood A, Mehta SD, Chen TC, Bauchner H, Holick MF. Association between vitamin D

deficiency and primary cesarean section found women with 25(OH)D less than 37.5 nmol/liter were almost 4 times as likely to have a cesarean than women with 25(OH)D 37.5 nmol/liter or greater (P = 0.012) [24].

High prevalence of vitamin D deficiency in the general population and in women of child-bearing age, worldwide, is known to be associated with an increased prevalence of preeclampsia. Small for gestational age and Low birth weight babies are the associated with low maternal vitamin D levels [25]. The data in the study done by Abdulbari Bener et al. showing the mean serum levels of vitamin D in pregnant women were 17.78±7.7, 17.65±7.8 and 18.01±8.6 in gestational diabetes mellitus, anemia and preeclampsia respectively. It was reported that vitamin D status in women with risk factors of maternal complications like GDM and preeclampsia was significantly lower. Even multivariate logistic regression analysis supported this finding that vitamin D deficiency was a significant contributor for GDM (OR 1.387, P=0.019) and pre-eclampsia (OR 1.87, P<0.001) [26].

In a case control study carried out by Taru Gupta ESICPGIMSR, New Delhi, India from August 2012–April 2014. A total of 100 patients were divided into two equal groups (control and study groups of 50 each). They found more incidence of severe vitamin D deficiency (90%) in preeclamptic patients as compared to normotensive patients (62%). Also preeclamptic group had lower median vitamin D levels (3.9 ng/ml) when compared to normotensive group (9 ng/ml). Concluding preeclampsia is indeed associated with lower vitamin D levels, and its pathophysiology involves vitamin D and calcium metabolism [27] suggesting a strong association between the PIH and hypovitaminosis.

Madhu Jain et al. in 2015 in Banaras, India did a study and found a high incidence of vitamin D deficiency (72.8%) in pregnancy in a tropical country like India in spite of abundant sunlight for most of the year. They studied a total of 550 antenatal cases and to find serum 25(OH) D concentrations significantly lower (46% less) in women who subsequently developed GDM compared with controls [mean: 11.93±3.42 ng/ml, 95% CI: 10.7-13.17 ng/ml]. Concluding maternal vitamin D deficiency is highly prevalent in early pregnancy and is an independent risk factor for GDM in North India [28].

Similarly in our study 43% (p = 0.006) of Vitamin D deficient patients (i.e Vitamin D <20mg/dl) were having antenatal complications (PIH, GDM and oligohydroamnios) and 29% (p value = 0.020) of perinatal complications (asphyxia, low birth weight

and NICU admissions) and no complications were seen in patients having sufficient Vitamin D levels.

Conclusion

Despite ample available sunshine throughout the year, Vitamin D hypovitaminosis is quite prevalent in our country. Majority of antenatal women have Vitamin D insufficiency or deficiency. There is an extreme lack of awareness regarding the importance of Vitamin D and its sources.

Vitamin D hypovitaminosis increases the incidence of pregnancy related complications like GDM, PIH, anaemia, Preterm delivery and IUGR. Patients who were deficient were advised 60,000 IU of Vitamin D supplements to be consumed orally, once a week for eight weeks. Our study shows an alarmingly high prevalence of insufficiency and deficiency of Vitamin D compelling a need to study the causal relation between low 25-OHD levels and adverse maternal and perinatal outcomes.

Bruce W Hollis concluded that Vitamin D supplementation of 4,000 IU/day for pregnant women was safe and most effective in achieving sufficiency. The current available amount of Vitamin D in supplements is comparatively ineffective to achieve adequate circulating 25(OH) D levels [29].

In view of high prevalence of Vitamin D deficiency in our study, universal screening and supplementation of all antenatal women is highly recommended.

Limitation

Limitation of our study was small sample size and lack of universal screening because of financial constrains. We intent to continue the study in oerder to enhance its obsevational spectrum and to extrapolate conclusion.

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