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A Study of Prevalence of Vitamin D Deficiency in Pregnancy and its Correlation with Obstetric Outcome

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Abstract: ***Introduction: Vitamin D deficiency is the most untreated nutritional deficiency in the world. Its deficiency during pregnancy is associated with complications like preeclampsia, gestational diabetes, preterm birth and increased risk for caesarean section. Vitamin D deficiency is associated with low birth weight and admission to NICU. Aim: To study prevalence of vitamin D deficiency in pregnancy and its correlation with obstetric outcome. Material and Methods: Total 100 patients were studied for vitamin D levels and associated obstetrical complications over a period of one year. Result: 90 pregnant women out of 100 were deficient of Vitamin D. Maximum patients (70%) were less than 30 years of age. Vitamin D deficiency seen more in house wife (85.56%), and multiparous (66.6%) women. Obstetric complications were seen in 33% patients in deficient group. Low birth weight, NICU admission and low APGAR SCORE was not significant in Vitamin D deficient group. Conclusion: Our study show high prevalence of Vitamin D deficiency with less adverse fetomaternal outcome.***

Keywords: Fetal and Maternal outcome, Pregnancy, Vitamin D

1. Introduction

Vitamin D is best known as a vitamin of the calcium and bone metabolism. Indeed, vitamin D receptors are found in most of an organism's cells, including white blood cells, and may play a role in cell proliferation and differentiation and affect the immune system or insulin secretion and sensitivity.[1] Vitamin D deficiency is prevalent (>80%) in India[23], a finding that is unexpected in a tropical country with abundant sunshine. Vitamin D deficiency is recognized as the most untreated nutritional deficiency currently in the world.[2] The prevalence of Vitamin D deficiency has been reported to range from 15%to 80%.[14]

Newly married females are expected to cover themselves even more and are discouraged from outdoor activity. Increasing urbanization that results in poor outdoor activity and greater pollution, coupled with skin pigmentation, may further compound this problem.4 Furthermore, milk, the primary source of calcium, is an expensive food in India. Deficient calcium intake has been shown to be the cause in a large proportion of childhood rickets in India[5] and other tropical countries[6, 7] and to contribute to adolescent osteomalacia.[3, 5]

Furthermore, recent reports indicate an association between low vitamin D levels and an increased risk of pregnancy complications such as pre - eclampsia,, impaired glucose tolerance and gestational diabetes, preterm birth, caesarean section, fetal growth retardation, admission to NICU, low APGAR SCORE and other adverse conditions.[8 - 11]

Several clinical studies suggest the possible association between low Vitamin D levels and potential adverse outcome of pregnancy.1[2, 13] In the last three years, an increasing amount of research suggests that some of the damage done by vitamin D deficiency is done in - utero while the fetus is developing. Much of that damage may be permanent; it cannot be fully reversed by taking Vitamin D after birth. **With this background this study will be done to know the prevalence of vitamin D deficiency in antenatal women and its correlation with adverse pregnancy outcome.**

2. Aim and Objectives

Aim

To study prevalence of vitamin D deficiency in pregnancy and its correlation with obstetric outcome.

Objectives

1) To study the prevalence of vitamin D deficiency among pregnant women.
2) To study the effect of vitamin D deficiency on maternal outcome.
3) To study the effect of vitamin D deficiency on fetal outcome.

3. Materials and Methods

A prospective observational study was conducted over a period of 1 year from December 2020 to November 2021, in the department of Obstetrics and Gynecology at Saraswathi Institute of Medical Sciences, Hapur.

100 pregnant womens were taken randomly from OPD in their third trimester enrolled in the study irrespective of age and parity.

25 (OH) Vitamin D assay was estimated by chemiluminence immunoassay (CLIA) method with chemimmunoassay anayser access2 (Backman Coulter). Maternal and fetal outcomewere studied and compared in the Vitamin D deficienr and sufficient groups.

Inclusion Criteria
All pregnant women with gestational period (28 weeks to 40 weeks) irrespective of age and parity.

Exclusion Criteria
1) Pregnant women with active Thyroid disease like thyroiditis or Grave's disease.
2) Preexisting Calcium or Parathyroid condition or who require diuretic or cardiac medication therapy including Calcium channel blocker.
3) Chronic liver disease, renal disease.
4) Treatment with antitubercular and antiepileptic drugs.

All pregnant women in their third trimester were enrolled in the study. A detailed history and examination were done. History of iron and calcium intake will also be taken. All pregnant women were subjected to testing serum Vitamin D level after counseling and informed consent. Blood investigations like haemoglobin, blood sugar and serum vitamin D level were done. The deficiency value of vitamin D less than 20ng/ml, insufficiency (20 - 30ng/ml), sufficiency (30 - 100ng/ml).[15, 16]

Patients were follow - up for impaired glucose tolerance test, pre - eclampsia, and caesarean section rate and neonatal outcome like, APGAR score, low birth weight, neonatal hypocalcaemic seizure, and impaired skeletal development and neonatal admission to NICU will be recorded.

Statistical Analysis
The data were entered in IBM - SPSS VERSION 25.0 and analysis were done after data collection. The Statistical analysis were carried out through statistical tools, techniques and tests such as chi - square test, graphical representation of data, frequency distribution table etc.
(S) = Significant
(NS) = Not Significant
A P - value of less than 0.05 will be considered as statistically significant

4. Results

The present study were done on 100 patients admitting in department of Obstetrics and Gynaecology, SIMS, Hapur, U. P.

Table 1: The sociodemographic profile of patients according to Vitamin D

Variable	Total (n=100)	Vitamin D deficient (n=90)	Vitamin D sufficient (n=10)	P - Value
Age<30yrs Age>30yrs	70% 30%	61 (67.78%) 29 (32.22%)	8 (80%) 2 (20%)	0.427 (NS)
Housewife Working	85% 15%	77 (85.56%) 13 (14.44%)	8 (80%) 2 (20%)	0.641 (NS)
More Exposure to sun Less Exposure to sun	43% 57%	33 (36.67%) 57 (63.33%)	7 (70%) 3 (30%)	0.041 (S)
Supplements of vit. D No supplements of vit. D	16% 84%	9 (10%) 81 (90%)	8 (80%) 2 (20%)	<0.001 (S)
Primigravida Multigravida	35% 65%	30 (33.4%) 60 (66.6%)	7 (70%) 3 (30%)	0.022 (S)
Rural Urban	32% 68%	25 (27.78%) 65 (72.72%)	8 (80%) 2 (20%)	0.0008 (S)

Table 2: Shows Vitamin D Status

Vitamin D status	Number	Percentage
<30ng/ml	90	90%
>30ng/ml	10	10%

Table 3: Mode of delivery

Total deliveries (N=100)	Vitamin D deficient (N=90)	Vitamin D sufficient (N=10)	P - Value
V. D. – 40	34 (34%)	6 (6%)	<0.001 (S)
C. S. – 60	56 (56%)	4 (4%)	<0.001 (S)

V. D. - Vaginal delivery
C. S. - Cesarean delivery

Table 4: Maternal outcome

Vitamin D status	Pregnancy without complications (65)	Pregnancy with complications (35)	P – value
Vit D sufficient (N=10)	8 (8%)	2 (2%)	0.29 (NS)
Vit D deficient (N=90)	57 (57%)	33 (33%)	

Table 5: Neonatal outcome

Vitamin D status	Live birth	IUD	P - value
Vitamin D sufficient (N=10)	9 (90%)	1 (10%)	0.57 (NS)
Vitamin D deficient (N=90)	85 (94.45%)	5 (5.55%)	

Live birth (n=94)	Vit. D sufficient (n=9)	Vit. D deficient (n=85)	P - value
Birth weight <2.5kg (n=14) Birth weight >2.5kg (n=80)	1 (11.11%) 8 (88.89%)	13 (15.30%) 72 (84.70%)	0.73 (NS)
APGAR SCORE <7 (N=15) APGAR SCORE < 7 (N=79)	1 (11.11%) 8 (88.8%)	14 (16.47%) 71 (83.52%)	0.76% (NS)
Admitted in NICU (n=20) Not admitted in NICU (n=74)	2 (22.23%) 7 (77.77%)	18 (21.17%) 67 (78.88%)	0.941 (NS)

5. Discussion

Demoghraphic status:
Mother dressing habit, low dietary Vitamin D intake, no vitamin supplementation during pregnancy, spending most of the day time at home contribute to Vitamin D deficiency.

Table 1. shows, Vitamin D deficiency was more common in age<30 years (67.78%, P= 0.427), House wife (85.56%, P=0.641), Less exposure to sunlight (63.3%, P =0.041), No supplementation of Vitamin D (90. %, P <0.001), Urban group (72.72%, P =0.0008) and Vitamin D deficiency in multiparous (66.6%, P =0.022). Our study shows statistically significant association with Vitamin D in less exposure to sun light, no supplementation with Vitamin D, Urban

populations and in multiparous patients.

Atiq et al found lower level serum level of Vitamin D in mother and in their infants who mostly preferred to live in indoor and reduced exposure to direct sun light[14]. Although more Vitamin consumption is expected in frequent pregnancies. If exposure to sunlight is not optimal, the Vitamin D content of diet must be 400IU/day.

Table 2 shows Vitamin D deficiency was even more marked in our study, with third trimester level lower than<30 ng/ml in 90% of the patients.

In August 1998, in a study performed in Istanbul, Alagol et al, reported low serum25 - hydroxyvitamin D3 in 66% of women of reproductive age[16]. The study done by Dava A et al (2017) revealed that Vitamin D deficiency prevalence was 48.2% among pregnant women[17].

Table 3 shows the mode of deliveries in study subject. In our study cesarean section rate (56%, P < 0.001) were more than Normal Vaginal Delivery (34%, P < 0.001) in Vitamin D deficient group. Our study was similar to study conducted by Dave et al (2017), shows an association of vitamin D deficiency and cesarean deliveries.

Merewood et al measured vitamin D concentrations of 253 mothers after delivery[18]. They reported that the risk for primary cesarean section in women with Vitamin D concentrations < 37.5 nmol/l were almost four times higher than women with higher vitamin D concentrations. They proposed maternal vitamin D status may be associated with risk for primary cesarean section through calcium‟s role in the initiation of labor, or by increasing preeclampsia risk. Studies revealed a significant increase in maternal serum calcium concentration.

Table 4 Summerizes the maternal outcome seen in Vitamin D deficient group (57.0%, P=0.29) without complication and this association is not statistically correlated. Pregnancy with complication in deficient group include Preterm labour (42.42%), PROM (15.15%), infection (15.15%), GDM (15.15%), Preeclampsia ((6.06%) and preexisting hypertension (6.06%).

Pre - eclampsia

In our study, reported number of preeclampsia (6.06%) and hypertensive disorder (6.06%) with pregnancy patient were less but Serum level of Vitamin D level of all these patient was<20ng/dl. Parul Singla et al[19] studied in 100 pregnant women who received 60, 000 IU every forth nightly from 28week till 36 week of gestation. Vitamin D supplementation during third trimester of pregnancy was found to be efficacious in reducing the risk of Pre - eclampsia by increasing therapeutic effectiveness of Calcium supplementation in pregnant women.

Impaired glucose tolerance

In our study, reported number of gestational diabetes were less (15.15%) and all had vitamin D deficiency. The risk of glucose tolerance depends on the variations of ethnicity. In a majority non - Hispanic white population, 25 (OH) D concentrations at 16 weeks of gestation were significantly lower in GDM subjects than in controls, whereas no association was found in Indian mothers where 25 (OH) D concentrations were measured at 30 weeks of gestation[20.]

Neonatal out come

In our study maternal Vitamin D levels had no Statistical correlation with birth weight (P=0.73), APGAR Score (P=0.67) and NICU admission (P=0.941). However, multiple confounding factors could be implicated for the Vitamin D effects on gestational baby size (such as ethnicity, nutritional status, sunlight exposure) milk or calcium intake.

A randomized trial was conducted in France in 3 groups of pregnant women in the third trimester: 1 group received200, 000 IU of Vitamin D in a single dose, 1 group received 1000 IU of Vitamin D daily and 1 group served as the control. No differences in birth weight were found among groups[21]. In contrast, a pregnant women with Vitamin D intakes< 200IU/d had infants with birth weighs that were 60 g below women with Vitamin D intakes at or above 200IU/ d[22].

6. Conclusion

In our study, we found that women from all ages, irrespective of parity, and educational levels had inadequate dietary Vitamin D intake. This study, after summarizing existing data show high prevalence of Vitamin D deficiency in pregnant women and complication of pregnancy like PROM, Preterm labor and rate of Caesarean section, Gestational hypertension, preeclampsia and Diabetes and neonatal outcome like low birth weight, APGAR SCORE<7, NICU admission were not prominently seen with pregnancy in Vitamin D deficiency. We recommended increase supplementation or exposure to sun light in all pregnant women to keep serum level of25 (OH) D in the normal range for adult (>30ng/ml).

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