Section: Obstetrics and Gynaecology

Original Research Article

STUDY ON PERINATAL OUTCOME IN RELATION TO MATERNAL VITAMIN–D DEFICIENCY IN TERTIARY CARE HOSPITAL

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Abstract

Background: Vitamin D deficiency is prevalent in India, 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. Several clinical studies suggest the possible association between low Vitamin D levels and potential adverse outcome of pregnancy. **Materials and Methods:** This was a cross- sectional hospital-based study carried out over 12 months from July 2022 to June 2023, in the department of Obstetrics and Gynaecology NMCH, Sasaram Bihar. 150 pregnant women admitted in third trimester in labour ward were enrolled in the study. Ethics committee approval was obtained for this study. 150 patients were included in the study from 26 weeks to 38 weeks of gestational period. Information on age, education, parity, occupation, income and obstetric history was obtained from the mother using a questionnaire. Statistical Analysis was analyzed by SPSS-18 Version. **Result:** 150 patients 110 of the patients were less than 27 years (73.33%) and remaining were greater than 27 years. Only 20(13.33%) pregnant women were Vitamin D sufficient and Vitamin D deficient and insufficient group 130(86.66) Vitamin D deficient group is 89(90.81%) and 41(78.84%) with complication. **Conclusion:** This study, after summarizing existing data show high prevalence of Vitamin D deficiency in pregnant women and complication of pregnancy. 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).

INTRODUCTION

Vitamin D deficiency is prevalent in India, 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.[1] Several clinical studies suggest the possible association between low Vitamin D levels and potential adverse outcome of pregnancy.[2,3] 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 foetus is developing. Much of that damage may be permanent; it cannot be fully reversed by taking Vitamin D after birth. The prevalence of Vitamin D deficiency has been reported to range from15%to 80% the naturally occurring form of Vitamin D in human is cholecalciferol or Vitamin D.[3-6]

Increased 25 (OH) D is first hydroxylated in the Liver. The second hydroxylation to the active from 1, 25 (OH) D occurs mostly in the Kidney in a process tightly regulated by calcium, Phosphorus and parathyroid hormone levels.[7] Vitamin D itself is devoid of any biological activity, but enzymatic conversion to [1, 25 (OH) 2D] generates the hormonal form with diverse Biological activities. The action of 1,25 (OH)2D are mediated through specific, high affinity binding to the Vitamin D receptor (VDR), which is present in multiple tissue including placenta suggesting a farther-reaching role for VD than bone metabolism alone.[8] During pregnancy, serum level of 1, 25 (OH) D increased up to 2fold starting at 10-12 weeks of gestation and reaching a maximum in the third trimester5 Calcium is transported from the mother to the fetus through the placenta. Approximately 25-30g of calcium are transfer to the fetal Skelton by the end of the pregnancy most of which is transferred during the last trimester. Notably, the 24, 25 (OH) 2D synthesized by the placenta accumulates in bone may be involved in ossification of fetal Skelton.[9] Identifying Vitamin D deficiency by the circulating concentration of 25 (OH) D, the indicator of nutritional Vitamin D status. There is no consensus about the optimal 25 (OH) D level, but many experts accept a range 75 nmol/L (>30ng/ml) as optimal and serum Vitamin D level

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below 50 nmol/L (20ng/ml) represent deficiency.[10] In its 2011 report, the Institute of Medicine (IOM) recommended 600 IU per day of 25 (OH) D for pregnant women specially to support bone metabolism and no more than 4000 IU per day to avoid hypocalcaemia. American College of obstetricians and Gynaecologist (ACOG) endorses these recommendations and propose 1000- 2000 IU per day of 25 (OH) D when deficiency is identified (20ng/ml). Vitamin D deficiency during pregnancy is associated with the non-classical action of this hormone, being linked with preeclampsia, insulin resistance, gestational diabetes mellitus and increased risk for caesarean section delivery. Vitamin D deficiency has been hypothesized to be associated with low birth weight and admission to NICU.

MATERIALS AND METHODS

This was cross-sectional study that was carried out at Department of Obstetrics and Gynaecology NMCH, Sasaram, Bihar. This was a cross- sectional hospital-based study carried out over 12 months from July 2022 to June 2023, in the department of Obstetrics and Gynaecology NMCH, Sasaram Bihar. 150 pregnant women admitted in third trimester in labour ward were enrolled in the study. Ethics committee approval was obtained for this study.

All pregnant women were subjected to testing serum Vitamin D at term after counselling and informed consent.

Inclusion Criteria

All pregnant women at term irrespective of age and parity.

Exclusion Criteria

Pregnant women with active Thyroid disease like thyroiditis or Grave's disease, preexisting Calcium or Parathyroid condition or who require diuretic or cardiac medication therapy including Calcium channel blocker.

Data Collection

150 patients were included in the study from 26 weeks to 38 weeks of gestational period. Information on age, education, parity, occupation, income and obstetric history was obtained from the mother using a questionnaire. Gestational age (in weeks) was calculated from the first day of the last menstrual period. History of iron and calcium intake was also taken. Blood investigations like haemoglobin, and serum vitamin D was done. High risk factors like anemia, preeclampsia, diabetes, were identified. Patients were followed-up for delivery events like Normal Vaginal delivery, Caesarean section and birth out comes like birth weight, and Apgar score and neonatal admission to NICU were recorded. Analyses of plasma vitamin D were done. The deficiency value of vitamin D was less than 20ng/ml, insufficiency (20- 30ng/ml), sufficiency (30-100ng/ml).[11,12]

Statistical Analysis

Data was analyzed by SPSS-18 Version. Data was expressed as frequency and percentage (%), association between Vitamin D Category, demographic variable, Mode of Delivery, Maternal outcome and Neonatal outcome was assessed by Chi Square type/fisher exact type.

*(S) =Significant

*(NS) =Not Significant

A P-Value of 0.05 or less was considered statistically significant.

RESULTS

The present study was done on 150 patients admitting in labour ward in department of Obstetrics and Gynaecology, NMCH, Sasaram, Bihar.

Table 1: Demographic factor

Variables	Total (n=150)	Vitamin D deficient (n=130)	Vitamin D sufficient (n=20)	P-value
Age <27 years	110(73.33%)	92(70.76%)	18(90%)	0.705(NS)
Age >27 years	40(26.66%)	38(29.23%)	2(10%)	
Education				0.769(NS)
Primary	70(46.66%)	60(46.15%)	10(50%)	
Secondary	80(53.33%)	70(53.84%)	10(50%)	
House wife	120(80%)	103(85.83%)	17(85%)	0.674(NS)
Working	30(20%)	27(20.76%)	3(15%)	
Income				0.000(S)
Low	24(16%)	12(9.23%)	12(60%)	
Middle	88(58.66%)	84(64.61%)	4(20%)	
High	38(25.33%)	34(26.15%)	4(20%)	
Exposure to sun				0.003(S)
More	88(58.66%)	71(54.61%)	17(85%)	
Less	62(41.33%)	59(45.38%)	3(15%)	
Supplements				0.000(S)
Yes	28(18.66%)	11(8.46%)	17(85%)	
No	122(81.33%)	119(91.53%)	3(15%)	
Number of gravida				0.026(S)
Primiprous	54(36%)	42(32.30%)	12(60%)	
Multiparous	96(64%)	88(67.69%)	8(40%)	
Rural	50(33.33%)	35(26.92%)	15(75%)	0.002(S)
Urban	100(66.66%)	95(73.07%)	5(25%)	

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Table 2: Vitamin D status

Vitamin D status	Number	Percentage
<30ng/ml	130	86.66%
>30ng/ml	20	13.33%
Total	150	100%

Table 3: Mode of delivery

Delivery type	Vitamin D deficient (n=130)	Vitamin D sufficient (n=20)	Total	P-value
Vaginal delivery	71(54.61%)	16(80%)	87(58%)	0.213(NS)
Cesarean delivery	59(45.38%)	4(20%)	63(42%)	0.116(NS)
Total	130(100%)	20(100%)	150(100%)	--

Table 4: Complication during pregnancy

Vitamin D status	Pregnancy without complication (n=98)	Pregnancy with complication (52)	Total	P-value
Vitamin D deficient (n=130)	89(90.81%)	41(78.84%)	130(86.66%)	0.529(NS)
Vitamin D sufficient (n=20)	9(9.18%)	11(21.15%)	20(13.33%)	
Total	98(100%)	52 (100%)	150(100%)	

Table 5: Maternal outcome [Pregnancy with complication (n=52)]

Vitamin D status	Preterm Labour	PROM	Infection	Gestational Diabetes	Pre ec-clampsia	Preexisting hypertension	Total
Vitamin D deficient (n=41)	13(31.70%)	7(17.07)%)	9(21.95%)	6(14.63%)	4(9.75%)	2(4.87%)	41(78.84%)
Vitamin D sufficient (n=11)	Nil	Nil	8(72.72%)	Nil	Nil	3(27.27%)	11(21.15%)
Total (n=52)	--	--	--	--	--	--	52(100%)

Total 6: Live birth

Vitamin D status	Live birth	IUD	Total	P-value
Vitamin D deficient (n=130)	124(95.38%)	6(4.61%)	130(86.66%)	0.529(NS)
Vitamin D sufficient (n=20)	18(90%)	2(10%)	20(13.33%)	
Total	142(94.66%)	8(5.33%)	150(100%)	

Table 7: Neonatal outcome

	Vitamin D sufficient (n=18)	Vitamin D deficient (n=124)	P-value
Birth weigh <2.5kg (n=128) >2.5kg (n=14)	 16(88.88%) 2(11.11%)	 112(90.32%) 12(9.67%)	1.000(NS)
APGAR <7(n=16) >7(n=126)	 3(16.66%) 15(83.3%)	 13(10.48%) 111(89.51%)	0.638(NS)
NICU Admitted (n=22) Not admitted (n=120)	 4(22.22%) 14(77.77%)	 18(14.51%) 106(85.48%)	1.000(NS)

[Table 1] shows the socio demographic profile of patients according to Vitamin D. Out of 150 patients 110 of the patients were less than 27 years (73.33%) and remaining were greater than 27 years 40(26.66%), primary educated 70(46.66%) and Secondary educated 80(53.33%), House wife 120(80%) and working 30(20%), low income 24(16%), middle income group 88 (58.66%) and high income 38(25.33%), more exposure to sun 88(58.36%) less exposure to sun 62(41.33%), supplemented with vitamin D 28(18.66%) and not supplemented with Vitamin D 122(81.33%), multigravida 96(64%), rural 50(33.33%) and urban 100(66.66%). [Table 2] shows only 20(13.33%) pregnant women were Vitamin D sufficient and Vitamin D deficient and insufficient group 130(86.66%). [Table 3] total vaginal deliveries 87(58%) and total Caesarean section 63(42%). [Table 4] summarizes the Pregnancy without complication seen in Vitamin D deficient group is 89(90.81%) and 41(78.84%) with complication. [Table 5] shows pregnancy with complication in deficient group include Preterm labour 13(31.70%), PROM 7(17.0%), infection 9(21.95%), GDM 6(14.63%), Preeclampsia 4(9.75%) and pre-existing hypertension 2(4.87%). [Table 6] show Live birth 124(95.38%) in Vitamin D deficient group and 18(90%) in sufficient group. IUD in sufficient group is 2 (10%) and in Vitamin D deficient group is 6(4.61%). [Table 7] shows live birth in Vitamin D deficient group in term of weight baby <2.5 kg is 112(90.32%) and >2.5kg is 12(9.67%). Apgar score >7 is 111 (89.51%) and <7 is 13(10.48%). NICU admission in Vitamin D deficient group is 18 (14.51%) and in Vitamin D sufficient is 4 (22.22%).

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DISCUSSION

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

[Table 1] shows the socio demographic profile of patients according to Vitamin D. Out of 150 patients 110 of the patients were less than 27 years (73.33%) and remaining were greater than 27 years 40(26.66%), primary educated 70(46.66%) and Secondary educated 80(53.33%), House wife 120(80%) and working 30(20%), low income 24(16%), middle income group 88(58.66%) and high income 38(25.33%), more exposure to sun 88(58.36%) less exposure to sun 62(41.33%), supplemented with vitamin D 28(18.66%) and not supplemented with Vitamin D 122(81.33%), multigravida 96(64%) ,rural 50(33.33%) and urban 100(66.66%) .

Study conducted by Andiran et al,[13] found Vitamin D deficiency in low socioeconomic group where as Atiq et al found lower level serum level of Vitamin D in mother and in their infants from upper socio-economic group, who mostly preferred to live in indoor and reduced exposure to direct sun light.[14] In our study we found no correlation between the number of pregnancies and Vitamin D deficiency. 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 the distribution of vitamin D, Vitamin D status basically. Out of 150 patients 130 (86.66%) were vitamin D deficient i.e vitamin D is <30ng/ml and 20(13.33%) were vitamin D sufficient i.e >30ng/ml. Shows Vitamin D deficiency was even more marked in our study, with third trimester level lower than <30ng/ml in 130 (86.66%) of the patients. The finding was similar to the study conducted by I.Pehlivan, S.hatun et al in 2000.[15] In August 1998, in a study performed in Istanbul, Alagol et al, reported low serum25 -hydroxyvitamin in 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 Table 4 shows caesarean section rate is 4(20%, P = 0.2) were less than rate of Normal Vaginal Delivery 16 (80 %, P = 0.213) in vitamin D sufficient group. In our study cesarean section rate is 59 (45.38%, P = 0.2) were less than rate of Normal Vaginal Delivery 71 (%, P = 0.213) 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. 23.5% women delivering by cesarean had vitamin D deficiency but this association is not statistically correlated. Segregating the vitamin D deficiency with the indications of cesarean section will be more important to understand the role of vitamin D in initiation of labor or association with the calcium metabolism. Vitamin D deficiency (< 37.5 nmol/l) has been associated with a four-fold increased risk of primary caesarean section, although this has not been demonstrated in all studies. 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.

[Table 4] shows the complication during pregnancy. Summarizes the Pregnancy without complication seen in Vitamin D deficient group is 89(90.81%) and 41(78.84%) with complication.

[Table 5] summerizes the maternal outcome seen in Vitamin D deficient group (55.0%, P=0.529) without complication and this association is not statistically correlated. Pregnancy with complication in deficient group include Preterm labour is 13(31.70%), PROM is 7 (7.31%), infection 9(21.95%), GDM 6(14.63%), Preeclampsia 4(9.75%), and preexisting hypertension 2(4.87%).

Pre-eclampsia In our study, reported number of Pre-eclampsia (6.06%) and Hypertensive disorder (9.09%) with pregnancy patient were less but Serum level of Vitamin D level of all these patient was <20ng/dl. So further large studies in this perspective would be needed. Parul Singla et al,[19] studied in 100 pregnant women who received 60,000 IU every fort nightly from 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 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] In our study, reported numbers of gestational diabetes were less (12.12%) and all had vitamin D deficiency. This is a very small sample size to comment on the association of glucose tolerance and vitamin D deficiency.

Neonatal out come in our study maternal Vitamin D levels had no Statistical correlation with birth weight (P=1.000), Apgar score (P=0.683) and NICU admission (P=1.000). 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

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groups.[21] In contrast, 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]

CONCLUSION

In our study, we found that women from all ages, socioeconomic, 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 labour and rate of Caesarean section, Gestational hypertension, preeclampsia and Diabetes were not prominently seen with pregnancy in Vitamin D deficiency and fails to show a direct relation between low vitamin D level and adverse neonatal outcome in our study. On the contrary many scholars and researchers have now started questioning the association of vitamin D deficiency with every medical disorder possible. For that matter associations have been reported regarding pregnancy related complications. It is now thought to raise the normal level criteria for vitamin D. Vitamin D deficiency and associated complications are seen very rarely in the individuals unless the deficiency is very severe. Hence to conclude our study fails to show a relation of vitamin D deficiency with other high risk factors of pregnancy and adverse foetal outcome. But supplementation of Vitamin is simple and cost effective with a low likelihood of toxicity. We recommended increase supplementation or exposure to sun light in all pregnant women to keep serum level of 25 (OH) D in the normal range for adult (>30ng/ml).

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