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Original Research Article

Correlation of Vitamin D levels with feto-maternal outcome

Nidhi Chauhan[1]*, Nikita Pahuja[1], Vinita Kalra[2]

[1]Department of Obstetrics and Gynecology, Himalayan Institute of Medical Sciences, SRHU, Dehradun, Uttarakhand, India
[2]Department of Biochemistry, Himalayan Institute of Medical Sciences, SRHU, Dehradun, Uttarakhand, India

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***Correspondence:**
Dr. Nidhi Chauhan,
E-mail: manumanan@rediffmail.com

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ABSTRACT

Background: Vitamin D deficiency in adult females may increase risk of pre-eclampsia, gestational diabetes, bacterial vaginosis. Various malpresentation, cephalo-pelvic disproportion and difficult deliveries increases the risk of caesarean section. It may also increase the risk of fetal hypovitaminosis D, neonatal rickets and tetany, lower respiratory tract infections, low birth weight, the largest cause of infant mortality in India. This study was under taken to study the impact of vitamin D deficiency on feto-maternal outcome.
Methods: The study was conducted in the Department of Obstetrics and Gynaecology, Himalayan Institute of Medical Sciences (HIMS), Swami Ram Nagar, Dehradun, over a period of 12 months. Sample size was 100 pregnant females attending antenatal clinic.
Results: Out of 100 subjects, pre-eclampsia was seen in 15, among which 5 (23.80%) had deficient, 9 (13.04%) had insufficient and 1 (10%) had sufficient vitamin D levels. Eclampsia was seen in 3 subjects, out of which 1 (4.76%) had deficient, 2 (2.89%) had insufficient vitamin D status. IUGR was seen in 8 subjects, out of which 4 (19.04%) had deficient vitamin D levels, 4 (5.79%) had insufficient vitamin D status. Neither of the two had sufficient vitamin D status. Deficient vitamin D status with birth weight ≤2.5 kg was seen in 9 (42.85%) subjects and 12 (57.14%) subjects with >2.5 kg Insufficient Vitamin D status was seen in 22 (31.88%) subjects with birth weight ≤2.5 kg and 48 (69.56%) with birth weight >2.5 kg.
Conclusions: Prevalence of vitamin D deficiency and insufficiency was noted in this region and its association with pre-eclampsia (23.80%, 13.04% and 10% in deficient, insufficient and sufficient group respectively) was seen. Higher incidence of LSCS was also present among the deficient and the insufficient group.

Keywords: Correlation, Feto-maternal outcome

INTRODUCTION

Vitamin D deficiency in adult females may increase risk of pre-eclampsia, gestational diabetes, bacterial vaginosis.[1] Various malpresentation, cephalo-pelvic disproportion and difficult deliveries increases the risk of caesarean section. It may also increase the risk of fetal hypovitaminosis D, neonatal rickets and tetany, lower respiratory tract infections, low birth weight, the largest cause of infant mortality in India.[2]

Though reported incidence of vitamin D deficiency in India is very high but certain subsets of pregnant women are at higher risk i.e. obesity, darker pigmentation or expected date of delivery (EDD) in winter/spring which may even require higher-dose supplementation.[3]

In a population that already has a high prevalence of vitamin D deficiency and poor dietary calcium intake, the problem is likely to worsen during pregnancy because of the active transplacental transport of calcium to developing foetus. In the light of existing evidence, public health intervention to reduce the prevalence of hypovitaminosis D in pregnant women is imminently desirable. Therefore, present study was undertaken to study the impact of Vitamin D deficiency on feto-maternal outcome.

METHODS

The study was conducted in the Department of Obstetrics and Gynaecology, Himalayan Institute of Medical Sciences (HIMS), Swami Ram Nagar, Dehradun, over a period of 12 months after obtaining written informed consent and ethical clearance certificate from the institute.

It was an observational, cross sectional study. Considering the prevalence of vitamin D deficiency among women in India to be 80% (57) with an allowable error of 10% sample size calculated was 100 (100% enumeration during the study period) convenient sampling. Sample size was 100 pregnant females attending antenatal clinic.

Study was carried out on all pregnant subjects presenting to the Obstetrics and Gynaecology department. Subjects were selected from antenatal clinic OPD, HIMS, Dehradun.

Inclusion criteria

- All pregnant women between 12 weeks to 24 weeks
- Less than 30 years of age.

Exclusion criteria

- All high-risk pregnancies including pre-eclampsia, diabetes mellitus, anemia, twin pregnancy, HIV positive, HBsAg positive, jaundice, heart disease, history of seizures
- Gravida 5 or more
- On category C, D and X drugs
- Bad obstetric history.

Study tool

Structured study instruments (questionnaires/formats/subject proformas and investigations) were developed used to generate data for the study.

Study protocol

All the women included in the study were followed up by regular antenatal check-up. High vaginal swab was collected at initially and repeated as applicable to rule out bacterial vaginosis. Any abnormalities in the mother or fetus were recorded. All women were delivered in the hospital. Intranatal complications, route of delivery and fetal outcome were recorded. Neonate were followed for 7 days for any complications.

Data management and statistical analysis

Interpretation and analysis of obtained results were carried out by using SPSS (Statistical package for Social Sciences) version 17 and statistical analysis of the qualitative data was done using the chi square test for intergroup comparisons.

RESULTS

Out of 100 subjects, pre-eclampsia was seen in 15, among which 5 (23.80%) had deficient, 9 (13.04%) had insufficient and 1 (10%) had sufficient vitamin D levels. Eclampsia was seen in 3 subjects, out of which 1 (4.76%) had deficient, 2 (2.89%) had insufficient vitamin D status. IUGR was seen in 8 subjects, out of which 4 (19.04%) had deficient vitamin D levels, 4 (5.79%) had insufficient vitamin D status. Neither of the two had sufficient vitamin D status. Bacterial vaginosis was seen in 7 subjects, out of which 3 (14.28%) had deficient, 3 (4.34%) had insufficient and 1 (10%) had sufficient vitamin D status. Gestational diabetes was seen in 5 subjects, of which 2 (9.52%) had deficient, 2 (2.89%) had insufficient and 1 (10%) had sufficient vitamin D status. PROM was seen in 4 (19.04%) subjects who had deficient vitamin D status. None of the subjects had Insufficient and sufficient vitamin D status (Table 1).

Table 1: Distribution of subjects according to Vitamin D status and its association with various complications.

Complications	Deficiency (n=21)	Insufficiency (n=69)	Sufficiency (n=10)
Pre-eclampsia	5 (23.80%)	9 (13.04%)	1 (10%)
Eclampsia	1 (4.76)	2 (2.89%)	0
IUGR	4 (19.04%)	4 (5.79%)	0
Bacterial vaginosis	3 (14.28%)	3 (4.34%)	1 (10%)
Gestational diabetes	2 (9.52%)	2 (2.89%)	1 (10%)
PROM	4 (19.04%)	0	0

Out of 100 subjects, deficient vitamin D status was seen in 5 (23.80%) subjects who delivered pre-term and 16 (76.19) subjects who delivered at term. Insufficient vitamin D status was seen in 6 (8.69%) subjects who delivered preterm and 63 (91.30%) subjects who delivered at term. Sufficient vitamin D status was seen in 2 (20%) subjects who delivered pre-term and 8 (80%) subjects who delivered at term. P value was 0.154(.0.05) which was statistically not significant (Table 2). 12 (57.14%) subjects had vaginal and 2 (9.52%) had

instrumental delivery with deficient vitamin D status. LSCS was done in 7 (33.33%) subjects with deficient status. Vaginal delivery was seen in 52 (75.36%), instrumental delivery was seen in 3 (4.34%) and 14 (20.28%) subjects had LSCS with insufficient vitamin D status.4 (40%) had vaginal delivery, instrumental delivery was seen in 1 (10%) subjects and 5 (50%) subjects had LSCS with sufficient vitamin D status (Table 3).

Table 2: Distribution of subjects according to vitamin D status and gestational age.

Gestational age	Deficiency (n=21)	Insufficiency (n=69)	Sufficiency (n=10)
Preterm	5 (23.80%)	6 (8.69%)	2 (20%)
Term	16 (76.19%)	63 (91.30%)	8 (80%)

Table 3: Distribution of subjects according to vitamin D status and mode of delivery.

Mode of delivery	Deficiency (n=21)	Insufficiency (n=69)	Sufficiency (n=10)
Vaginal delivery	12 (57.14%)	52 (75.36%)	4 (40%)
Instrumental	3 (9.52%)	5 (4.34%)	1 (10%)
LSCS	7 (33.33%)	14 (20.28%)	5 (50%)

Live birth was seen in 21 (100%) deficient subjects and none had still birth/ IUD. Live birth was seen in 67 (97.10%) subjects who had insufficient vitamin D status and 2 (2.89%) subjects had IUD. 10 (100%) live birth with sufficient vitamin D status (Table 4).

Table 4: Distribution of subjects according to vitamin D status and fetal outcome.

Fetal outcome	Deficiency (n=21)	Insufficiency (n=69)	Sufficiency (n=10)
Live	21 (100%)	67 (97.10%)	10 (100%)
Still birth/IUD	0	2 (2.89%)	0

Deficient vitamin D status with birth weight ≤2.5 kg was seen in 9 (42.85%) subjects and 12 (57.14%) subjects with >2.5 kg Insufficient Vitamin D status was seen in 22 (31.88%) subjects with birth weight ≤2.5 kg and 48 (69.56%) with birth weight > 2.5 kg.

Sufficient vitamin D status was seen in 3 (30%) subjects with birth weight ≤2.5 kg and 7 (70%) subjects with birth weight >2.5 kg. P value was 0.603 (>0.05) which was statistically not significant (Table 5).

Table 5: Distribution of subjects according to vitamin D status and birth weight.

Birth weight	Deficiency (n=21)	Insufficiency (n=69)	Sufficiency (n=10)
≤2.5 gm	9 (42.85%)	22 (31.88%)	3 (30%)
>2.5 gm	12 (57.14%)	29 (69.56%)	7 (70%)

DISCUSSION

In the current study, Vitamin D deficiency was seen in 23.80%, insufficiency in 13.04% and even 10% subjects with sufficient vitamin D status developed pre-eclampsia.

Similar to the present study, Wei SQ et al found association of vitamin D deficiency and insufficiency with higher incidence of pre-eclampsia.[4] Bodnar LM et al also found vitamin D deficiency as an independent predictor of preeclampsia and low vitamin D status in the neonate.[5] While Powe et al found no association between maternal 25(OH)D deficiency and the risk of pre-eclampsia.[6] However more studies are required for correlation.

IUGR was seen in 19.04% who had deficient and 5.79% with insufficient vitamin D status. None of the subjects had sufficient vitamin D levels.

According to the present study Booke et al, who studied British mothers of Asian descent, found a greater incidence of small-for-gestational-age infants born to mothers who received placebo than in mothers who received vitamin D supplements during pregnancy.[7]

Bacterial vaginosis was present in 14.28% having deficient and 4.34% having insufficient vitamin D status.

In contrast, Barclay L in a study determined the prevalence of bacterial vaginosis which was approximately 57% in women with deficient serum 25(OH)D concentration, and it was 23% in women with sufficient serum 25(OH)D concentration.[8]

In the present study, gestational diabetes mellitus was present in 9.52% having deficient and 2.89% having insufficient vitamin D status.

Similarly, in accordance to our study Makgoba M et al and Baker et al stated there were no statistically significant differences in maternal mean 25(OH)D levels between those who subsequently developed GDM.[9,10] While Zhang et al found plasma 25(OH)D at 16 weeks gestation to be significantly lower in women who subsequently developed GDM.[11]

In the current study, deficient vitamin D status was seen in 23.80% subjects who delivered preterm and 76.19% subjects who delivered at term. Insufficient vitamin D status was seen in 8.69% subjects who delivered preterm and 91.30% subjects who delivered at term. p value was 0.154 (>0.05) which was statistically not significant.

While Shibata M et al and Hollis et al in comparison with term controls, women with a high risk of preterm labor displayed significantly lower serum 25(OH)D levels.[12,13]

In the current study, 57.14% subjects had vaginal and 9.52% had instrumental delivery with deficient vitamin D

status and LSCS was done in 33.33% subjects. Vaginal delivery was seen in 75.36%, instrumental delivery in 4.34% and 20.28% subjects had LSCS with insufficient vitamin D status.

Merewood A et al and Papandreou et al also reported higher cesarean delivery rates for women with serum 25(OH)D levels.[14,15] Live birth was 100% in deficient subjects and 97.10% subjects who had insufficient vitamin D status. 2.89% subjects had IUD with insufficient vitamin D status. No correlation exists.

In the present study, there was no significant difference in the birth weight of the new-born of subjects with deficient and insufficient vitamin D status. p value was 0.603(>0.05) which not statistically significant.

Similarly, Ana M et al found no correlation between 25(OH)D levels and neonatal gestational age or weight.[16]

In contrast to the present study, Bodnar et al reported that the relationship among Caucasian women between maternal serum 25(OH)D levels before the 22nd week of pregnancy and the risk of an SGA birth between 24 and 32 ng/mL 25(OH)D levels.[17]

CONCLUSION

Prevalence of vitamin D deficiency and insufficiency was noted in this region and its association with pre-eclampsia (23.80%, 13.04% and 10% in deficient, insufficient and sufficient group respectively) was seen.

Higher incidence of LSCS was also present among the deficient and the insufficient group. So, more studies are required, however prophylactic administration of vitamin D along with calcium as is the practice mandatory is recommended.

We do not recommend more supplement over and above it even though encouragement of outdoor activities, and exposure to adequate sun light is recommended and highly desirable.

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