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Correlation between vitamin D3 levels and maternal outcomes during pregnancy

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Abstract
Background: Vitamin D3 is an essential entity involved in regulation of various bodily functions. Recent trends have associated deficiency of this vitamin with various disorders. Anecdotal evidence has suggested that hypovitaminosis D during pregnancy is associated with poorer maternal health outcomes. In this study we have evaluated levels of vitamin D3 in pregnancy and maternal health outcomes.
Aim and Objective: To evaluate hypovitaminosis D in pregnancy and correlate it with maternal health outcomes.
Materials and Methods: A total of 150 pregnant ladies were evaluated for levels of vitamin D in third trimester of pregnancy and followed up till delivery.
Results: There is high prevalence of hypovitaminosis D in pregnant ladies evaluated in a tertiary care hospital of Western Maharashtra at 82% (n=123). There was high instance of abnormal/poor maternal health outcomes in patients having hypovitaminosis D.
Conclusion: It is noted that vitamin D 3 deficiency is a commonly prevalent disorder in pregnant women in India. Hypovitaminosis D is associated with several maternal complications during pregnancy. Vitamin D3 levels should be routinely monitored and any deficiency should be adequately treated.

Keywords: vitamin D3, pregnancy, maternal outcome

Introduction
The association between vitamin D deficiency and various adverse pregnancy outcomes has been extensively investigated in the past years. It has been postulated that vitamin D deficiency could be associated with increased risk of preeclampsia, gestational diabetes mellitus, caesarean section and bacterial vaginosis in pregnancy [1]. The concentration of 25(OH)D is relatively constant throughout pregnancy [2]. The mother is the only source of vitamin D for the foetus [3]. Vitamin D has an important role in maintaining an adequate level of minerals through its influence on calcium and phosphate metabolism for bone mineralisation and metabolic functions [4]. The principal source of vitamin D in certain populations is sunlight [5-6]. Factors which negatively influence vitamin D production in the skin are living mostly in an indoor environment, covering the skin with clothes, avoiding sunlight by staying in the shade and using sunscreen, sun exposure through glass, and air pollution with increased ozone concentration which absorbs ultraviolet light [5].
Various studies have highlighted the association of adverse obstetric outcomes and hypovitaminosis D which are discussed subsequently. In the current study we evaluated incidence of hypovitaminosis D and its association with adverse obstetric outcomes.

Materials and Methods
Due ethical clearance was obtained from IEC of Dr.DY Patil Medical College, Pune. Informed consent of the patients was obtained about their participation in the study after explaining them the aims and objective of the study. A total of 150 subjects were recruited in third trimester of pregnancy and followed up till delivery. Vitamin D levels were evaluated and classified as deficient (<12ng/ml), Insufficient (12-30ng/ml) and sufficient (>30ng/ml).

Inclusion criteria
- Subjects above 18 years
- Subjects below 40 years
- Subjects willing to give a written informed consent

Exclusion criteria

- Subjects below 18 years
- Subjects who were alcoholic/ indulged in smoking
- Subjects who were on medications from chronic disorders such as Asthma, SLE, autoimmune disorders

Results

Table 1: Evaluation of age

Age	Values (years)
Mean age	26.7
SD	7.4
Median age	26 years
Min age	19 years
Max age	37 years

Table 2: Vitamin D levels

Vitamin D status	No of subjects	Percentage
Deficiency	99	66%
Insufficient	24	16%
Sufficient	27	18%

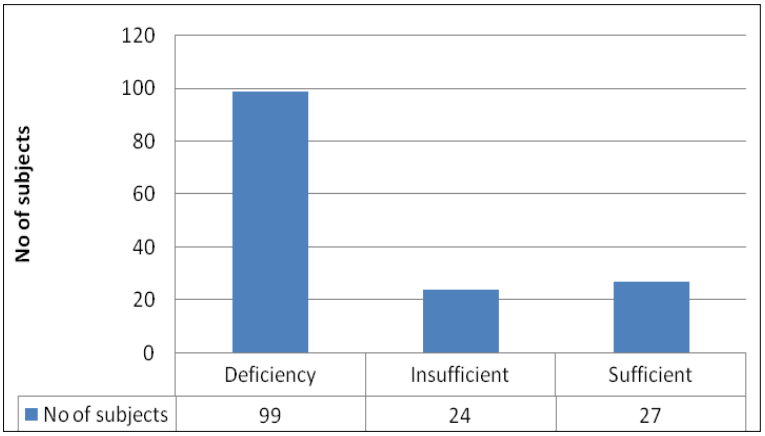

Fig 1: Status of Vitamin D levels

Table 3: Association between Obstetric complication and vitamin D level in study group

Complication	Deficient/insufficiency (123)	Percentage	Sufficient (27)	Percentage	P value
Anemia	34	27.64%	3	11.11%	<0.05
GDM	10	8.13%	1	3.70%	>0.05
PIH	12	9.75%	1	3.70%	>0.05
Bacterial vaginosis	10	8.13%	1	3.70%	>0.05
PROM	2	1.62%	0	0%	>0.05
Preterm births	12	9.75%	1	3.7%	>0.05
IUGR	1	0.81%	0	0%	>0.05
IUD	1	0.81%	0	0%	>0.05
Bad obstetrics history	1	0.81%	0	0%	>0.05
PPH	9	7.30%	1	3.70%	>0.05

Discussion

A high instance of hypovitaminosis D was noted in our study (82%) with majority of the patients having levels below 12ng/ml. The mean age of participants in our study was 26.7% with age range of 19 years to 37 years. High number of participants were having anemia in the study (37/150 patients) and of these 34 patients were deficient in Vitamin D. Similarly 10 patients each with Gestational Diabetes Mellitus (8.13%) and bacterial vaginosis, 12 (9.75%) each with Pregnancy induced Hypertension and preterm delivery, 9 (7.3%) with Post partum hemorrhage had hypovitaminosis D. Patients with anemia significantly had higher instance of hypovitaminosis D. It can be suggested that this could be due to diets that are nutritionally poorer leading to multiple deficiencies.

Several meta-analyses of observational studies have been performed on association of gestational diabetes and these all reported lower vitamin D concentrations in women with gestational diabetes [7-9]. Vitamin D could influence the pathophysiology of preterm labour as it affects the processes of inflammation and immunomodulation [10]. However, in a study by Baker *et al.* compared vitamin D levels in 120 American mixed ethnicity women who delivered at term and 40 women who delivered between the 23rd and the 35th week of pregnancy [11]. No differences in vitamin D levels between the groups were observed [11]. Hensel *et al.* reported that vitamin D deficiency was associated with bacterial vaginosis only in pregnant and not in nonpregnant women [12]. Wei *et al.* analysed 24 observational studies and also found an increased risk of preeclampsia in women with vitamin D concentrations below 50 nmol/L [13].

Considering high amount of literature showing association of Vitamin D levels with multiple adverse maternal outcomes it is prudent to conduct further research in such patients. Analysis of Vitamin D levels at the time of first visit to hospital after delivery would be a better assessor of hypovitaminosis D and its association with adverse outcomes. Considering the structure of the society in India and its cultural practices such as women staying indoors, purdah system, malnutrition it would be worthwhile to supplement vitamin D in all pregnant ladies unless otherwise contraindicated.

Limitations

1. A small sample size that cannot be extrapolated to regional trends.
2. Vitamin D levels were not evaluated in 1st and 2nd trimester of pregnancy.
3. Effect of correcting Vitamin D levels was not studied.
4. Risk factors for hypovitaminosis D and dietary patterns were not evaluated.
5. The sample size for those with sufficient with vitamin D was less that can lead to bias during statistical analysis.

Conclusion

It is noted that vitamin D 3 deficiency is a commonly prevalent disorder in pregnant women in India. Hypovitaminosis D is associated with several maternal complications during pregnancy. Vitamin D3 levels should be routinely monitored and any deficiency should be adequately treated right from the time of conception. We propose to conduct similar studies with a higher patient sample size and evaluation from time of first visit to hospital for further conclusive evidence of hypovitaminosis D and obstetric complications along with effect of correcting vitamin D levels in such patients. We also suggest that pregnant women should be supplemented with vitamin D.

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