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Original Research Article

Prevalence of vitamin D3 deficiency in antenatal cases in a Tertiary Care Center

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Abstract

Background: Vitamin D is an essential fat soluble vitamin which has been called as a prohormone off lately. Vitamin D during pregnancy has been associated with numerous adverse health outcomes in both mother and offspring with short and long term effects. Despite the above mentioned facts, a search into literature reveals only a few such studies highlighting the currently prevailing spectrum of vitamin D deficiency as a whole.

Method: In this cross sectional study, conducted at Dr. Baba Saheb Ambedkar Memorial Central Railway Hospital, Byculla, Mumbai, 100 antenatal patients admitted to the hospital and attending outpatient department were studied over a period of one year. All antenatal females above 18 years at their first antenatal visit were enrolled in this study after ruling out the exclusion criteria.

Results: Vitamin D deficiency was observed in 90% while insufficiency was present in 6%. Vitamin D deficiency/ Insufficiency wears observed in 98.5% of multi gravid females compared to 90.6% primi females. Complications were observed in about 20% antenatal females. 8.3% cases with vitamin D deficiency/insufficiency had no sun exposure as compared to 59.4% cases which had <30 minutes of sun exposure daily and 32.3% cases which had >30 minutes of sun exposure each day.

Conclusion: A high prevalence of vitamin D deficiency found in this study makes this screening and treatment necessary. Until the adequate treatment of vitamin D deficient pregnant women is established, a safe approach may be to correct vitamin D deficiency by targeting pregnant women at high risk of severe vitamin D deficiency. In settings where facilities for vitamin D testing are not easily available, it is advisable to supplement all pregnant women with vitamin D in 2nd and 3rd trimester with 400IU/day.

Keywords: Antenatal females, Vitamin D, prohormone.

1. Introduction

Vitamin D is an essential fat soluble vitamin. It was classified as a vitamin in the early 20th century and as a prohormone ("conditional" vitamin) in the second half of the 20th century. Vitamin D deficiency is a worldwide problem in adults and children prevailing in epidemic proportions all over the Indian subcontinent with a prevalence of 70-100% in the general population.[1] Vitamin D includes both animal-derived cholecalciferol (vitamin D3) and plant-derived ergocalciferol (vitamin D2) [2]. Also known as sunshine vitamin, its essential role is for mineral homeostasis and skeletal integrity [3]. Vitamin D deficiency prevails in epidemic proportions all over the Indian subcontinent [1], main contributing factors being inadequate exposure to sunlight and poor nutrition. Long indoor working hours may contribute to deficiency in adult populations. Cultural factors and repeated, unplanned and unspaced pregnancies in dietary deficient patients can aggravate Vitamin D deficiency in the mother and the foetus. Vitamin D deficiency during pregnancy has been associated with increased risk for adverse pregnancy outcomes, including preeclampsia, gestational diabetes mellitus, primary caesarean section, bacterial vaginosis, low birth weight, reduced infant size and impaired bone development. [4,5]

The determinants of vitamin D status are skin exposure to sunlight and intake of vitamin D, either from foods or supplements.[6].

Currently there is a lack of validated safe threshold level of sun exposure that allows for maximal vitamin D synthesis without increasing the risk of skin cancer. Food and vitamin D supplements have advantage of avoiding these unwanted effects. Several clinical trials have been conducted indicating that there are mechanisms to reduce vitamin D deficiency in pregnancy by dietary interventions.

2. Method

This cross sectional study was conducted at Dr Baba Saheb Ambedkar Memorial Central Railway Hospital, Byculla, Mumbai. Cases of this study were 100 antenatal patients admitted to the hospital or attending OPD over a period of 1 year (March 2014 to February 2015).

All patients above 18 years of age were included in the study. Exclusion criteria included those suffering from liver or kidney pathology, parathyroid disease, those on vitamin D supplements or anti-tubercular or anti-epileptic medications. After taking informed valid consent from the patient, basic history and information regarding the diet, sun exposure, any co-morbid condition, family history, mobility, intake of any medication, calcium supplements etc. was taken. Further the values of vitamin D3 were noted.

Reference range taken to classify the patients is as follows:

Deficient	:	serum 25(OH)D < 20ng/ml
Insufficient	:	serum 25(OH)D 21-29 ng/ml
Sufficient	:	serum 25(OH)D >30ng/ml
Hypervitaminosis	:	serum 25(OH)D>150ng/ml

This study has shown the overall prevalence of vitamin d deficiency and various pregnancy related complications which have been associated with vitamin D deficiency are discussed in the study.

LAB method used:

25 hydroxy vitamin D3 tests are done by CMIA (chemiluminescence microparticle immunoassay) method on Abbott architect machine. 2ml serum sample is required.

3. Observation and Results

Most of the subjects were between 21-30 years of age (78%) while only 4% were below 20 years of age. Mean age of study participants was 27.1 years.

Vitamin D deficiency was observed in 90% antenatal females while insufficiency was present in 6%. Sufficient levels of vitamin D (>30ng/ml) were present only in 4% ANC females. The mean vitamin D level was 13.34 ng/ml.

Table 1: Vitamin D status in antenatal females

Vitamin D status	N	%
Deficiency (<20 ng/ml)	90	90.0%
Insufficiency (21-29 ng/ml)	6	6.0%
Sufficiency (>30 ng/ml)	4	4.0%
Total	100	100.0%

4.2% cases age <20 years were deficient/insufficient while 0.0% cases of same age group were sufficient. 31.3% cases of age group 21-25 years were deficient/ insufficient and 50.0% were sufficient.46.9% cases of age group 26-30 years were deficient/ insufficient and 25.0% were sufficient. In age group >30 years, 17.7% cases were deficient/insufficient while 25% were sufficient.

Table 2: Vitamin D status as per diet

Diet	Vitamin D Status		Total
	Def./ Insuff.	Suff.	
Vegetarian	36	0	36
	100.0%	0.0%	100.0%
Mixed diet	60	4	64
	93.8%	6.3%	100.0%
Total	96	4	100
	100.0%	100.0%	100.0%
OR (95% CI); p-value	5.4 (0.28-103.9); 0.31		

About three fourth of the subjects consumed mixed diet while rest were vegetarians. 100% cases which were vegetarian were found deficient/insufficient, whereas 93.8% cases which consumed mixed diet were deficient/sufficient and 6.3% were sufficient.

About 68% of the study subjects were primigravidae while rests were multi-gravidae. Vitamin D deficiency/ Insufficiency were observed in 98.5% of multigravidae females compared to 90.6% primigravidae females.

Table 3: Vitamin D status as per Gravidity

Gravidity	Vitamin D Status		Total
	Def./ Insuff.	Suff.	
Primigravida	29	3	32
	90.6%	9.4%	100.0%
Multigravida	67	1	68
	98.5%	1.5%	100.0%
Total	96	4	100
	96.0%	4.0%	100.0%
OR (95% CI); p- value	0.14 (0.014-1.4); 0.18		

Complications were observed in about 20% antenatal females. Hypertension in Pregnancy was observed in 13% females while 3% females suffered from oligohydramnios. IUGR was noted in 2% pregnancies while 1 case each had PROM and Pre-term delivery.

Table 4: Complications

Complications	N	%
None	80	80.0%
Pregnancy-induced hypertension (PIH)	10	10.0%
Pre-eclampsia	3	3.0%
Oligohydramnios	3	3.0%
Intrauterine Growth Restriction (IUGR)	2	2.0%
Pre-term	1	1.0%
Premature Rupture of Membranes (PROM)	1	1.0%
Total	**100**	**100.0%**

Table 5: Vitamin D Status in Complications

Complications	Vitamin D Status		Total
	Def./ Insuff.	Suff.	
Yes	19	1	20
	19.8%	25.0%	20.0%
No	77	3	80
	80.2%	75.0%	80.0%
Total	96	4	100
	100.0%	100.0%	100.0%
OR (95% CI); p- value	0.74 (0.07-7.5); 0.7		

Table 6: Vitamin D status in presence or absence of hypertension in pregnancy

Vitamin D	HTN in pregnancy		No HTN in pregnancy	
	No.	%	No.	%
Deficiency	12	92.30%	78	89.70%
Insufficiency	0	0.00%	6	6.90%
Sufficient	1	7.70%	3	3.40%
	13	100.00%	87	100.00%

Cross tabulation of vitamin d deficiency versus presence or absence of hypertension in pregnancy depicts 92.3% (n = 12) cases who presented with hypertension in pregnancy were deficient in vitamin D compared to 89.7 % (n = 78) antenatal cases who had no hypertension in pregnancy. 7.7% (n= 1) antenatal cases with hypertension in pregnancy had normal levels of vitamin d compared to 6.9 % (n = 3) antenatal cases with no hypertension in pregnancy were sufficient in vitamin D.

Table 7: Vitamin D Status in Sun exposure (min)

Sun exposure (min)	Vitamin D Status		Total
	Def./ Insuff.	Suff.	
None	8	0	8
	8.3%	0.0%	8.0%
</= 30	57	2	59
	59.4%	50.0%	59.0%
> 30	31	2	33
	32.3%	50.0%	33.0%
Total	96	4	100
	100.0%	100.0%	100.0%
p- value	**0.68**		

8.3% cases which were vitamin D deficient/insufficient had no sun exposure at all each day.59.4% had a sun exposure of <30 minutes and 32.3% had >30 minutes of sun exposure daily. Whereas out of those cases which were sufficient in vitamin D levels, 50% had an exposure of <30 minutes and 50% had it for > 30 minutes.

Table 8: Vitamin D Status in Mean Sun exposure

Vitamin D Status	Sun exposure		t-value	p-value
	Mean	SD		
Def./ Insuff. (n-96)	27.29	16.25	-1.9	**0.27**
Suff. (n-4)	36.25	10.30		

Mean sun exposure was 27.29 minutes for cases which were deficient / sufficient whereas it was 36.25 minutes for the cases which had sufficient levels of vitamin D.

4. Discussion

In present study vitamin D deficiency was observed in 90% antenatal females while insufficiency was present in 6%. Only 4% of cases were found to have sufficient vitamin D levels. The mean vitamin D level in the present study was 13.34 ngm/ ml. In a study, conducted by Sachan *et al*, the mean maternal serum 25(OH)D was 14 ± 9.3 ng/ mL and prevalence of vitamin D deficiency was 84%.[7]

Sahu *et al* found 74% prevalence of vitamin D deficiency in pregnant women.[8] Similarly, a high prevalence of vitamin D deficiency in pregnant women has been reported from various other countries.[7,9-11] Thus vitamin D deficiency during pregnancy is becoming a worldwide epidemic. Our study confirms and extends the research work done in context of prevalence of vitamin D deficiency in pregnancy.

In present study, 13% cases were detected to have pregnancy induced hypertension. Out of these, 92.3% were vitamin D deficient and 7.7% were sufficient. A case control study by Bodnar *et al* showed a significant association between vitamin D levels in early pregnancy and subsequent preeclampsia. [12] Baker *et al* concluded in their study that midgestation maternal vitamin D concentration was lower in women who subsequently developed severe preeclampsia compared with controls[13].

In present study on a whole, complications were compared but individually as the numbers of cases with complications were limited, further statistical significance could not be assessed. This needs to be further evaluated.

5. Conclusion

In the present study, the aim of the study was to assess the overall prevalence of vitamin D deficiency. Since high prevalence of vitamin D deficiency was observed among pregnant women (90%).

We recommend the screening of all pregnant women for vitamin D deficiency. The high prevalence found in this study makes this screening and treatment necessary. Until the adequate treatment of vitamin D deficient pregnant women is established, a safe approach may be to correct vitamin D deficiency by targeting pregnant women at high risk of severe vitamin D deficiency. An intake of 400 iu is recommended in accord with the national guidelines.[14] For the cases which are found deficient or insufficient, the treatment recommendations are 20000 iu of cholecalciferol weekly for 6 weeks.[15,16]

As the safety of vitamin D is not yet established, and also, as the requirement of vitamin D is more in second and third trimester (as maximum calcium deposition in fetus occurs towards second and third trimester)[17,18], it is recommended to supplement or treat the deficient/insufficient cases after first trimester.

In settings where facilities for vitamin D testing are not easily available, it is advisable to supplement all pregnant females with vitamin D in second and third trimester.

Due to small sample size and lack of follow up, the complications which have long been associated with vitamin D deficiency, could not be well assessed. Due to lack of follow up of the patients until through delivery, the effects of vitamin D deficiency on the neonate remain un-illustrated. While several observational studies point to correlations between vitamin D insufficiency and maternal and neonatal ill health, experimental evidence from supplementation clinical trials is needed to inform health policy.

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