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Original Research Article

A study on prevalence of vitamin D Deficiency among pregnant women attending a tertiary health centre in Rajasthan, India

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ABSTRACT

Background: Objective of the study was to study the prevalence of vitamin D deficiency among antenatal women and in relation to parity, BMI, diet and working status.
Methods: Prospective study conducted at NIMS Medical College, Jaipur from Dec 2019-July 2021, in the Department of Gynaecology and Obstetrics. It was a hospital based observational study 160 pregnant women were included in the study after obtaining written informed consent. Blood was collected at their first visit itself and 25 (OH) D3 level was tested by Chemiluminescent Immunoassay (CLIA) in hospital lab. And results were analysed.
Results: Out of 160 antenatal women, only 12 (07.50%) had sufficient vitamin D levels of 30-100 ng/ml. Mean (SD) vitamin D level in this group was 41.1±10.8. 41 (25.625%) participants had vitamin D insufficiency (20-29 ng/ml) with a mean (SD) of 22.6±2.3 and 107 (68.875%) participants had vitamin D deficiency with serum level <20 ng/ml with a mean (SD) value of 13.8±3.9. Vitamin D deficiency and insufficiency together (vitamin D <30 ng/ml) constituted 92.50% and the mean (SD) was 16.2±5.6. Among vitamin D deficient group, 26 (16.25%) were having vitamin D level <10 ng/ml with a mean of 8.1±1.3.
Conclusions: There is high prevalence of vitamin D insufficiency and deficiency among antenatal women attending the OPD in NIMS Medical College and Hospitals in Rajasthan region. Since vitamin D has crucial role in maternal and foetal health outcomes, it is of utmost importance to correct this deficiency in pregnancy.

Keywords: Antenatal women, BMI, Parity, Rajasthan, Serum level, Vitamin D

INTRODUCTION

Vitamin D is a fat-soluble vitamin, which functions as an important biological regulator of calcium homeostasis in human body. Vitamin D plays vital role in promoting insulin action and secretion, immune modulation, regulation of hematopoietic system, cognitive functions and lung development.[1-3] Vitamin D is transferred from pregnant mothers to their foetus and thus it has the potential to influence development of the foetus.[1] The requirement of vitamin D is more during pregnancy and lactation. Placenta can synthesize only 24, 25(OH)2 vitamin D3 and is involved in the ossification of foetal bone. Vitamin D deficiency has increased incidence of pre-eclampsia, intrauterine growth restriction and increased risk of gestational diabetes mellitus, bacterial vaginitis and chorioamnionitis.[4-9] Babies of vitamin D deficient mothers were reported to have increased risk of low birth weight, respiratory infections, neonatal sepsis, neonatal seizures.[10-12] Recent researches suggest that some of the problems associated with vitamin D deficiency to the babies which are happening in-utero, cannot be fully reversed by giving vitamin D supplements at birth. In pigmented skin, melanin absorbs ultraviolet B from sunlight and thereby diminishes vitamin D3 production. Vitamin D can be obtained from natural sources like fish,

egg, fish liver oil, beef, and from man-made fortified food sources. Among low socioeconomic status people like muslim community in our area, even adequate access to sources of vitamin D is compromised. Vitamin D deficiency is a worldwide nutritional deficiency which is often underdiagnosed and undertreated. This unrecognized epidemic is common among children, adults and pregnant women throughout the world.[13] Aim of this study was to study the prevalence of vitamin D deficiency among antenatal women in NIMS Medical College and hospitals, Jaipur Rajasthan.

METHODS

After getting clearance from the Ethics Committee, the present study was carried out in Department of Obstetrics and Gynaecology at NIMS Medical College, Jaipur from Dec 2019 - July 2021. It was a hospital based observational study 160 pregnant women were included in the study after obtaining written informed consent. Information on age, occupation, diet (vegetarian or non-vegetarian), gestational age, parity, comorbidities and intake of vitamin supplements were obtained using a questionnaire. Height and weight were measured in the OPD and BMI was calculated. Blood was collected at their first visit itself and 25(OH)D3 level was tested by Chemiluminescent Immunoassay (CLIA) in hospital lab.

Inclusion criteria

Antenatal patients with singleton pregnancy, who were in the early trimesters before starting calcium supplements and were willing to get the blood test were included.

Exclusion criteria

Those pregnant women with current or past medical illness or on drugs which can affect the calcium or vitamin D metabolism were excluded.

Serum vitamin D level ≥30 ng/ml considered as sufficient, insufficient as 20-29.9 ng/ml, and deficient as <20 ng/ml.

Statistical analysis

Data were entered in Microsoft excel sheet and analysed statistically. A p value of <0.05 was considered as significant.

RESULTS

Mean (±SD) age of the study population was 28 (±3.8). Of the total 160 participants, 90 were ≤30 years of age, and 70 were >30 years of age. With respect to number of pregnancies, 97 were with first pregnancy (primigravida), while 63 were with second or third pregnancies (multigravida). 62 participants were with normal BMI (18-24.9), 61 were overweight (BMI-25-29.9), 27 were obese (BMI≥30) and 10 were underweight (BMI<18). 113 women were non-working (housewives: 108 and students: 5), 47 were working women in these categories: bank officer (4), medical professional (19), software engineer (15) and teacher (9). 150 participants were non-vegetarians (as majority of population is of muslim community) and 10 were vegetarians (Table 1).

Table 1: Characteristics of the study population.

Characteristics	Categories	Frequency	%
Age group (years)	≤30	90	56.25
	>30	70	43.75
Parity	Primigravida	97	60.625
	Multigravida	63	39.375
BMI (kg/m^2)	<18	10	06.25
	18-24.9	62	38.75
	25-29.9	61	38.125
	≥30	27	16.875
Work status	Working	47	29.375
	Not working	113	70.625
Diet	Vegetarian	10	06.25
	Non-vegetarian	150	93.75

Table 2: Vitamin D levels in the study population.

Serum Vitamin D level in ng/ml	Frequency	%	Mean Vitamin D level
Vitamin D sufficient ≥30	12	07.50	41.1±10.8
Vitamin D insufficient 20 -29	41	25.625	22.6±23
Vitamin D deficient <20	107	68.875	13.8±3.9
Vitamin D <30 (insufficient and deficient group)	148	92.50	16.2±5.6
Vitamin D severe deficient <10	26	16.25	8.1±1.3

Out of 160 antenatal women, only 12 (07.50%) had sufficient vitamin D levels of 30-100 ng/ml. Mean (SD) vitamin D level in this group was 41.1±10.8. 41 (25.625%) participants had vitamin D insufficiency (20-29 ng/ml) with a mean (SD) of 22.6±2.3 and 107 (68.875%) participants had vitamin D deficiency with serum level <20 ng/ml with a mean (SD) value of 13.8±3.9. Vitamin D deficiency and insufficiency together (vitamin D <30 ng/ml) constituted 92.50% and the mean (SD) was 16.2±5.6. Among vitamin D deficient group, 26 (16.25%)

were having vitamin D level <10 ng/ml with a mean of 8.1±1.3 (Table 2).

The deficiency was more common in older age groups. 78% of >30 years of age and 58% of ≤30 years of age had vitamin D deficiency (<20 ng/ml). 73% of primigravida were deficient in vitamin D and 57% were deficient among multigravida. Vitamin D deficiency among obese, overweight, normal BMI and underweight were 74%, 59%, 69% and 80% respectively. 45% of working women were affected with vitamin D deficiency. 50% of vegetarians and 68% of non-vegetarians were vitamin D deficient (Table 3).

Table 3: Distribution of vitamin D sufficiency, insufficiency and deficiency in each category.

Characteristics	Categories	Frequency	Vitamin D sufficient (≥30 ng/ml)	Vitamin D insufficiency (20-29 ng/ml)	Vitamin D deficient: (<20 ng/ml)
Age (years)	≤30	90	10 (11)	28 (31)	52 (58)
	>30	70	2 (3)	13 (19)	55 (78)
Parity	Primigravida	97	6 (6)	20 (21)	71 (73)
	Multigravida	63	6 (10)	21 (33)	36 (57)
BMI (Kg/m^2)	<18	10	0 (0)	2 (20)	8 (80)
	18-24.9	62	3 (5)	16 (26)	43 (69)
	25-29.9	61	8 (13)	17 (28)	36 (59)
	≥30	27	1 (4)	6 (22)	20 (74)
Work status	Working	47	8 (17)	18 (38)	21 (45)
	Not working	113	4 (4)	23 (20)	86 (76)
Diet	Vegetarian	10	2 (20)	3 (30)	5 (50)
	Non-vegetarian	150	10 (7)	38 (25)	102 (68)

DISCUSSION

A significant public health issue that can be prevented is vitamin D insufficiency. Although India is a tropical country with year-round sunshine, the prevalence of vitamin D deficiency ranges between 40–99%, and the majority of research indicate that the prevalence is between 80-90%.[19] In North India, among 521 pregnant women, vitamin D deficiency was reported as 96.3%.[19] Studies among prenatal patients in Tamil Nadu and Mysore, South India, showed an incidence of 61.5% and 66.5%, respectively.[19,20] Despite good environmental conditions, vitamin D deficiency is highly prevalent in India. This may be attributed to factors such as increasing skin melanin pigment, wearing more covered clothing, consuming inadequate vitamin D through diet, overcooking food, and poor vitamin D fortification of food.

Additionally, our results are in line with earlier research. About 68.9% of people and 25.6% of people, respectively, had vitamin D deficiencies. Together, vitamin D deficiency and insufficiency made up 92.5%. This high incidence in this study might be a result of urban dwellers spending more time indoors and participating in less outside activities due to air pollution, which also reduces exposure to sunshine.[21] For women of childbearing age, two to three sessions of roughly 10-15 minutes of sun exposure each week are strongly advised to absorb an adequate quantity of vitamin D.[22] Even 11.1 hours of total body exposure to sunlight per week, according to a recent study among Hawaiians, was insufficient to halt the development of "low vitamin D status."[23]

In a study by Chandel et al, it is reported that majority of vitamin D deficient subjects were <30 years of age.[22] In contrast to this, our study indicated that age groups older than 30 years had a higher prevalence of vitamin D deficiency and insufficiency. In our study, 78% of women over 30 and 58% of women under 30 were impacted by the condition. Our study's higher incidence in the older age group may be attributable to changes in lifestyle, such as fewer outdoor activities as a result of people's increased domestic workloads and aversion to sunshine.

There was high prevalence of vitamin D deficiency in primigravida (73%) than multigravida (57%). This is in contrast from the previous studies, where most of them reported a higher prevalence in multigravida.[8] But a recent study by Tuan et al, had reported a lower deficiency risk in multigravida than primigravida group.[24] Our study's low prevalence of multigravida could be attributed to their heightened awareness from prior pregnancies and consequently greater vigilance throughout the current pregnancy.

A study by Bodnar et al found that pregnant women with pre-pregnancy BMI ≥ 30 had a prevalence of vitamin D deficiency of 61%. This study found a prevalence of 74% in obese (BMI ≥30) individuals.[25] It's possible that vitamin

D is stored in fat cells, explaining the high prevalence of obesity in these individuals.

It was discovered that the level of vitamin D and employment status were significantly correlated. Compared to the group of pregnant women who were not working, 45% of working women had vitamin D deficiencies. This finding might be explained by the fact that the women's work is primarily indoors and that they spend a lot of time indoors, air-conditioned, away from the sun. The socioeconomic position and type of nutrition are intimately associated. Despite their education and middle-to-high socioeconomic position, the lack of knowledge about sunshine exposure and the need for vitamin D in the diet during pregnancy may be a factor in this insufficiency. According to a study, higher levels of maternal education are associated with lower rates of severe vitamin D deficiency and higher rates of acceptable vitamin D levels. In accordance with the "modified Kuppuswamy scale," it has also been found that the incidence of severe vitamin D insufficiency declines with rising socioeconomic position.[26]

Vitamin D is not abundant in vegetarian diets. An average Indian diet does not provide enough vitamin D to prevent vitamin D insufficiency, which is a risk factor for pregnancy. Therefore, for the benefit of both mothers and babies, pregnant women with vitamin D insufficiency need to take vitamin D supplements.

This study has some limitations. Data regarding the extent of sun exposure, measurement of dietary intake of calcium and vitamin D, skin colour, use of sunscreens and other likely factors that are associated with vitamin D deficiency are not included in this study. Study population is of middle-to-high socioeconomic status. Prevalence of vitamin D deficiency and its health problems are expected to be more with poor socioeconomic status people.

CONCLUSION

There is high prevalence of vitamin D insufficiency and deficiency among antenatal women attending the OPD in NIMS Medical College and Hospitals in Rajasthan region. Since vitamin D has crucial role in maternal and foetal health outcomes, it is of utmost importance to correct this deficiency in pregnancy. We concluded that there should be a change in the protocol, to evaluate vitamin D level in every antenatal patient and to start supplements at the correct time to prevent it's adverse effects. Encouraging patient to maintain a certain diet so that prevalence could be curbed. Spreading awareness among patients and healthcare workers should also be given due importance.

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