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**Dr. Meenakshi Shankar**
Senior Resident,
Department of Pathology,
Vardhman Mahavir Medical College& Safdarjung Hospital,
New Delhi, India

**Dr. Mukul Singh**
Professor, Department of Pathology, Vardhman Mahavir Medical College and Safdarjung Hospital,
New Delhi, India

**Corresponding Author:**
**Dr. Mukul Singh**
Professor, Department of Pathology, Vardhman Mahavir Medical College and Safdarjung Hospital,
New Delhi, India

# Vitamin D status in pregnant and nonpregnant reproductive women: A comparative study

**Dr. Meenakshi Shankar and Dr. Mukul Singh**

**Abstract**
**Objective:** Comparison of vitamin D status between pregnant females and nonpregnant reproductive women.
**Study Design:** We conducted retrospective analysis of 91 pregnant and 221 nonpregnant women aged 19–44 years at Safdurjung hospital between February to May 2020 in Lab medicine.
**Results:** We included pregnant women age ranged from 20-39years and nonpregnant women age ranged from 22-42 years. The mean ±SD of 25(OH) D in pregnant and nonpregnant women were 23.3±4.5ng/ml (range 8.1 to 43.3) and 18.7±5.3ng/ml (range 5.4 to 36.3) respectively. Vitamin D deficiency, insufficiency and sufficiency were found to be 2.2%, 74.7% and 23% and 3.6%, 90.9% and 13.2% in pregnant and nonpregnant females, respectively.
**Conclusion:** Adult women of childbearing age have a high prevalence of vitamin D insufficiency as compare to pregnant women which may be attributed due intake of calcium and vitamin D supplementation during pregnancy.

**Keywords:** vitamin D deficiency, pregnancy, vitamin D receptor, reproductive women

## Introduction
Vitamin D plays a vital role in growth and development of maternal and infant health. The reemergence of childhood rickets and other disorder related to bone mineralization are associated with severe vitamin D deficiency [1, 2]. Vitamin D readily crosses the placenta hence fetal and newborn vitamin D status is almost dependent on vitamin D from the mother [3, 4]. Therefore, cord blood 25(OH) D levels are strongly correlated with maternal vitamin D status [5]. Vitamin D secretion in breast milk is limited, therefore lactating women require sufficient serum 25(OH)D levels to support vitamin D levels in nursing infants [6, 7]. Many researchers also linked hypovitaminosis D in utero or in early life increases the risk of childhood respiratory infection, wheezing, multiple sclerosis, type 1 diabetes, schizophrenia, and placental development and functions [8-16].
Hypovitaminosis D in adults have also been linked to autoimmune disorders, musculoskeletal disorders, cardiovascular disease, infection, cancer etc. [17-20]Vitamin D receptors (VDR) are found in most tissues and cells throughout the body and it also regulates more than thousand human genes [21]. Vitamin D is fat soluble vitamin and mainly synthesis in cutaneous tissues via exposure to sunlight and dietary intake contributed to very low percentage(5%) [22]. It is stored in liver and adipocytes [22]. Vitamin D status in a person depends on many factors such as, geographic zone and season, race/ethnicity, cultural and religious factors, dietary habits, smoking, sunscreen use, body mass index, education etc [23, 24].
Until recently, serum 25(OH)D levels <20ng/mL appeared adequate based on improved skeletal outcomes but increasing evidence suggests that >30ng/mL or even40ng/mL may be required for optimum health of a person [5, 25].
A high prevalence of vitamin D insufficiency has been documented in pregnant and lactating women [26-28]. These studies have raised awareness of higher doses of vitamin D supplementation that may be required to improve maternal and infant outcomes.

**Aim:** In this study, we sought to measure vitamin D status in pregnant females and nonpregnant reproductive women.

## Material and Methods

In this retrospective study a total of 91 pregnant and 221 nonpregnant females were included. They were recruited in Lab medicine department of Pathology, VMMC and Safdarjung Hospital, during the period from February to May 2020.

Exclusion criteria: Age <18year, history of thyroidectomy, radio-Iodine ablation, history of malabsorption disorder, H/o chronic kidney, liver, thyroid disease, H/o diabetes mellitus, dermatological disease, rheumatological disease, alcoholics. Inclusion criteria: Age >18 years, no history of thyroid problem, no history of chronic illness. After exclusion criteria laboratory investigations (serum vitamin D)was done.

After aseptic precaution, blood sample was collected by venipuncture at the fasting state, the serum was separated by centrifugation and then stored at –80oC for a week or until analysed. Vitamin D status was evaluated by measurement of serum 25(OH)D levels by chemiluminescent immunoassay method (Seimens Adiva centure CP system). Serum 25(OH)D levels were considered as deficient when it is<10ng/ml, insufficient between 10-30ng/ml and >30ng/ml sufficient.

**Statistical Analysis:** Data were statistically analysed by SPSS version-23.0 for Windows. The mean and the standard deviation (SD) for all the variables were calculated. The differences between mean values for each tested variable have been tested by student's "t" test. Results considered significant when p value<0.05.

## Result

We included pregnant women age ranged from 20-39years and nonpregnant women age ranged from 22-42 years. In this study out of 91pregnant females, 10.9%(10)females were muslim and out of 221 nonpregnant females, 9.9%(22/221)females were muslim with religious practice of wearing burka. (Table-1)

The mean ±SD of 25(OH) D in pregnant and nonpregnant women were 23.3±4.5ng/ml (range 8.1 to 43.3) and 18.7±5.3ng/ml (range 5.4 to 36.3) respectively. Pregnant and nonpregnant women showing vitamin D deficiency, insufficiency and sufficiency were shown in Table-2

**Table 1:** Demographic profile

| Variants | Pregnant Women (n=91) | Nonpregnant Women (n=221) | P Value |
|---|---|---|---|
| Age<br>18-34YEARS<br>Mean ± SD<br>35-44YEARS<br>Mean± SD | n=77/91(91%)<br>23.4± 3.2years<br>n=14/91(9%)<br>36.1± 3.3years | n=153/221(69.2%)<br>25.4± 3.4years<br>n=68/221(30.7%)<br>Mean 38.4± 4.5years | 0.56 |
| Cultural Habits<br>BURKA YES<br>NO | 10/91(10.9%)<br>81/91(89.1%) | 22/221 (9.9%)<br>199/221(90.04%) | 0.37 |
| Calcium And Vit D Supplementation | 100% | 0% | |

**Table 2:** Serum 25-hydroxyvitamin D levels

| Variants | Pregnant Women (N=91) | Nonpregnant Women (N=221) | P Value |
|---|---|---|---|
| Age<br>18-44 Years | Mean ± SD<br>23.3±4.5ng/ml | Mean ± SD<br>18.7±5.3ng/ml | 0.06 |
| | Deficient 2/91 (2.2%)<br>Insufficient68/91(74.7%)<br>Sufficient 21/91(23%) | Deficient 8/221(3.6%)<br>Insufficient 201/221(90.9%)<br>Sufficient 12/221(13.2%) | |
| Cultural Habits<br>Burka<br>Yes | 17.4±3.6ng/ml (Mean ± SD) | 15.8±4.2ng/ml (Mean± SD) | 0.35 |
| | Deficient 1/10(10%)<br>Insufficient 9 /10(90%)<br>Sufficient 0/10 | Deficient 2/22(9%)<br>Insufficient 19/22(86%)<br>Sufficient 1/22 (4.5%) | |

## Discussion

Vitamin D deficiency in pregnancy as well as normal adult women is a public health problem [29]. Vitamin 25(OH) D deficiency/ insufficiency in pregnant women ranges from 5%-83.6% [30, 31]. In India 84.3% of urban and 83.6% of rural women had 25 (OH)D values below <20ng/ml [32] Various studies have found that hypovitaminosis D leads to unfavourable outcomes in pregnant females and in their offspring. Hence, they are classified into high-risk group [33]. Our results are similar to the studies by Bodnar LM *et al* and Xiang F *et al* [30, 31] In our study we found 76.9% prevalence of 25 hydroxyvitamin D deficiency /insufficiency in pregnant women. We observe high prevalence (94%) of hypovitaminosis D nonpregnant adult female then other studies. We found high prevalence of vitamin D deficiency in nonpregnant as compare to pregnant which may be explained due to calcium and vitamin D supplementation is given during pregnancy. This study is conducted in northern part of India during summer time having very good exposure of sunlight. However such high levels of sunshine still not sufficient for vitamin D levels in body. In females many other factors contributes to deficiency like duration of exposure to sunlight, lack of outdoor activities, clothing habits, use of sunscreen, air pollution and vit D status before the pregnancy and after pregnancy [22].

Maternal vitamin D deficiency during pregnancy has adversely effects both mother and child [4, 6]. As we know 25(OH)D readily crosses the placenta and can be correlated with fetal cord blood [3, 5] Gordon *et al* in their study found that one third of infants and toddlers with a serum 25(OH)D level <50 nmol/L(20ng/ml) were found to have some evidence of bone demineralization.[34] Moreover, rickets is seen more in infants with serum 25(OH)D levels less then to 50 nmol/L(20ng/ml) [1, 2, 5]. Most investigators and clinicians would agree that, minimum of 50 to 75 nmol/L 25(OH)D

levels are needed for health benefits in children and adults, particularly for non skeletal outcomes [35, 36]

There is mounting evidence that 25(OH) D levels ≥75 nmol/L might also be required for pregnant women and infants [6, 8-10].

Therefore, by measuring routinely serum 25(OH)D levels during pregnancy and early childhood may help in prevention of many problems.

We conclude that adult women of childbearing age having 25(OH)D levels <20 ng/ml, a daily vitamin D supplementation is recommended [36, 37] Additionally, because duration of vitamin D supplementation is important, therefore it is wise to start vitamin D supplementation a few months before becoming pregnant.

This study is cross sectional study, hence causal link cannot be found. In our study we concluded high prevalence of hypovitaminosis D in nonpregnant women hence public health awareness is needed. We also recommend supplementation of vitamin D before and after pregnancy is essential for both mother and fetus wellbeing.

## Conclusion

We concluded that there is high prevalence of hypovitaminosis D seen in nonpregnant females than pregnant women.

## Limitations and Recommendations

The limitations of this study the small number of subjects, therefore, further prospective large clinical studies are required to verify the results

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## Conflicts Of Interest

There are no conflicts of interest.

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