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**Dr. Kanika Sharma**  
M.B.B.S., M.S. O.B.G.,  
Department of Obstetrics and  
Gynaecology, Civil  
Hospital Nadaun, Distt.  
Hamirpur, Himachal Pradesh,  
India

**Dr. Abhey Minhas**  
Department of Surgery, I.G.M.C.  
Shimla, Himachal Pradesh, India

**Dr. Shikha Sharma**  
Department of OBG, R.H.  
Bilaspur, Chhattisgarh, India

**Corresponding Author:**  
**Dr. Kanika Sharma**  
M.B.B.S., M.S. O.B.G.,  
Department of Obstetrics and  
Gynaecology, Civil  
Hospital Nadaun, Distt.  
Hamirpur, Himachal Pradesh,  
India

## Prevalence of vitamin D deficiency in pregnant women visiting a secondary care centre of North India

**Dr. Kanika Sharma, Dr. Abhey Minhas and Dr. Shikha Sharma**

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### Abstract

Vitamin D deficiency is the most common deficiency in hilly areas of North India. Studies of vitamin D suggest that it is not only responsible for rickets, but is also involved in cardiovascular diseases, diabetes, pregnancy related complications. Data regarding vitamin d deficiency in pregnancy is scanty, especially in hilly areas of north India. Therefore this study was done, to find out the prevalence of vitamin D deficiency and insufficiency in pregnant women of rural north India.

**Method:** 106 pregnant women after 16 weeks of gestation were enrolled in this study after informed consent over a period of 10 months from August 2020 to May 2021 and serum 25(OH)D levels estimated using CLIA. A level <20ng/ml was considered as Vitamin D deficiency, <32ng/ml as insufficiency and >32ng/ml as adequacy. 62.26% women were found to be Vitamin D insufficient and 29.24% were deficient in vitamin D. Only 9 women had sufficient vitamin D levels. Most of the women were lost to follow up, only 47 women were followed up till delivery and their various outcomes noted.

**Conclusion:** There is presence of wide spread vitamin d insufficiency among pregnant women in north India, and since the blood test is expensive, routine supplementation with higher doses of vitamin D in pregnancy is cost effective.

**Keywords:** vitamin D deficiency, pregnant women, cardiovascular disease

### Introduction

Vitamin d deficiency (VD) is the most common deficiency in the hilly states of North India. Vitamin D is a part of complex hormone system and is involved in bone metabolism. Vitamin D deficiency is not only responsible for osteopenia and rickets but also is involved in cardiovascular diseases, cancers, diabetes and pregnancy complications.

In pregnancy, serum levels of 1,25(OH)D start increasing from 10-12 weeks of gestation and reach a maximum level in third trimester [1]. Since, women have higher levels of Vitamin d in pregnancy, they have a higher level of cellular exposure to VD during later periods of gestation, suggesting its role in obstetric well being. There is a wide range of actions of VD in pregnancy, like its effects on placental function and inflammatory response [2]. Pregnancy complications like pre-eclampsia, gestational diabetes, low birth weight and pre-term birth are associated with Vitamin D deficiency [3-6]. Inflammatory mediators like TNF- $\alpha$ , IL-6 are increased in pregnant women who have vitamin d deficiency. 7 Vitamin D has an important role in glucose and insulin metabolism as well [8]. Pancreatic cells express 1 $\alpha$ -hydroxylase, which is the active form of vitamin D.

Vitamin D deficiency can cause pre-term labor as it affects the process of immune-modulation as well as inflammation. There is increased chance of infections because of impairment of induction of antimicrobial compound called cathelicidin from the macrophages [9].

It has also been postulated that vitamin d deficiency causes weakness of pelvic muscles which leads to prolonged labor and hence increased chances of cesarean delivery.

The data regarding vitamin D deficiency is scanty in North India, especially in Himachal Pradesh. Hence, this study was undertaken to find out prevalence of vitamin d deficiency, and insufficiency among pregnant women in rural north India.

### Materials and Methods

This prospective observational study was carried out in a secondary care centre (FRU) in Himachal Pradesh over a period of 10 months from August 2020 to may 2021.

106 pregnant women with singleton pregnancy with a gestation of <16 weeks, who visited the

out-patient department of our institute were consecutively enrolled. Gestational age was determined using last menstrual period if woman was sure of her dates, or by the first trimester ultrasound. Informed consent was taken from all the subjects. Women with known history of medical diseases like thyroid, parathyroid disorders, hepatic or renal dysfunctions, diabetes were excluded from the study. Pregnant women on anticonvulsants, steroids, and those at more than 16 weeks of gestation were also excluded. Women were advised serum vitamin D levels along with other routine antenatal investigations. All investigations were done in a NABL accredited laboratory by Chemiluminescence Assay (CLIA). Vitamin D deficiency is defined as 25(OH) D levels in blood <20ng/ml, and insufficiency of vitamin D as levels <32ng/ml. <sup>[11]</sup> Descriptive statistics were used.

**Results**

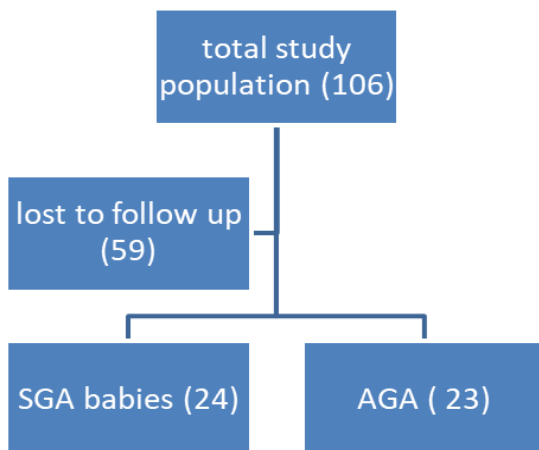
106 pregnant women, with a gestation of >16 weeks were included in the study. The mean age of the study population was 27.71± 9.8 and the mean parity of the subjects was 2.6 ± 1.1. Women were divided into three groups according to their vitamin D levels: vitamin D deficient group (<20ng/ml), vitamin D insufficient group (<32ng/ml), and vitamin D adequate group (>32ng/ml).

Parameters	Mean
Mean age	27.71 ± 9.8
Mean parity	2.6± 1.1
Mean vitamin d level in insufficient group	23.18±3.1
Mean vitamin d level in deficient group	11.91±2.09

Vitamin D insufficiency group had a mean value of serum vitamin D levels of 23.18. The subjects who had deficiency of vitamin D, their mean serum vitamin d level was 11.91. 62.26% of the subjects had vitamin D insufficiency, and 29.24% had vitamin D deficiency. Only 9 subjects had sufficient vitamin d levels.

Vitamin D levels	No. of subjects	Percentage
Sufficient (>32ng/ml)	9	8.4%
Insufficient (<32ng/ml)	66	62.26%
Deficient (<20ng/ml)	31	29.24%

Out of these women most were lost to follow up. Only 47 women were followed till delivery. 54% of these women had to undergo LSCS due to one reason or another. And the rest delivered vaginally. Out of these 47 women, 24 had small for gestational age babies.



**Discussion**

In this prospective observational study, the prevalence of Vitamin d deficiency and insufficiency was found to be 91.6%. Sun exposure is considered to be one of the major factors influencing vitamin D levels in individuals. It is also affected by latitude, season as well as cultural factors. In Himachal Pradesh, in our region of district hamirpur, the temperature in summers ranges from 33-38 °C and in winters the temperature is around 18-20 °C. in winters, there is usually fog present which hampers direct sun exposure. The town features subtropical climate. Culturally, the married women, especially in rural areas keep their heads and faces covered and stay indoors. The diet here comprises of vegetarian meals mostly, and is not rich in vitamin D.

A vitamin D level of <20ng/ml were found in various studies done across the world. 64% middle eastern women, 47% Indian women, 13% Caucasian women were found to be deficient in Vitamin D. <sup>[10]</sup> In India, Vitamin D deficiency is widely prevalent <sup>[11, 12]</sup>. Parity is found to be directly related to vitamin D deficiency. Vitamin d deficiency is related with increased risk of pre-eclampsia, gestational diabetes mellitus and small for gestational age babies <sup>[13, 14]</sup>

An RCT done in Britain showed that the women who received 1000IU of vitamin D per day during third trimester had less incidence of delivering small for gestational age babies compared to women who only received a placebo <sup>[15, 16]</sup>.

However, one study showed that there is no correlation between Vitamin D deficiency and adverse pregnancy outcomes <sup>[17]</sup>.

Our study showed that the prevalence of vitamin d deficiency and insufficiency in pregnancy is very high. Current recommendations for daily intake of 200IU of vitamin D are inadequate to maintain serum levels of 25(OH)D in normal range during pregnancy. Further studies are needed to find out the serum levels and the amount of supplementation needed to optimize outcomes of pregnancies. ACOG and RCOG both advocate increased supplementation in pregnant women to keep serum levels of vitamin D >32ng/ml.

**Limitations:** Small sample size and inadequate follow up of the study population.

**Conclusion**

The prevalence of vitamin D deficiency and insufficiency in pregnancy is very high. There is no protocol at present for screening of vitamin d deficiency in antenatal women. As the test is costly as well, it is prudent to routinely supplement women with higher doses of vitamin d in pregnancy as treatment is cost effective and safe.

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