

Prevalence of Hypovitaminosis D Among Primigravidas in First Trimester of Pregnancy

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Abstract

Background: Over the few decades, various studies have documented remarkable status of vitamin D deficiency in male and female population. We planned our study to find its prevalence among our local pregnant population. Primigravidas were especially selected to avoid any after effects of previous pregnancies. So that the seriousness of the situation can be assessed and preventive strategies can be developed.

Objective: to determine the prevalence of deficiency of vitamin D levels in first trimester of pregnancy among primigravida women.

Study design; Prospective cross section study.

Place and Duration: The study period was from October 2017 till May 2018. It was conducted on outpatient cases At Gulab Devi Hospital feroze pur road Lahore.

Methodology: in this study we included 100 women who were first time pregnant (primigravida). The search was further narrowed by collecting the subjects who were in their first trimester of pregnancy. Their blood samples were taken and sent for serum 25-hydroxy vitamin D3 [25 (OH) D3] level.

Results: Out of 100 (n=100) primigravidas, 85 % (n=85) were found deficient in their serum vitamin D level (following the overall criteria of deficiency); i.e. serum 25 (OH) D3 < 30 ng/mL).

Conclusion: Prevalence of hypovitaminosis D is significantly high in Pakistani urban pregnant population.

Key words: Vitamin D, pregnancy, primigravida, first trimester.

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Introduction

In recent time, the deficiency of vitamin D has almost taken the shape of an ongoing epidemic. According to one estimation around one billion population of the world is deficient in vitamin D.¹ The problem is not only affecting the developed countries, but it has also become an enormous problem in developing countries too.² When the problem is so prevalent among men and women then why not we should have the concern of pregnant population. Especially in Pakistan, where

we are not having awareness of the up-to-date status of the condition or specific preventive or monitoring plan in pregnancy.

Vitamin D is a fat soluble vitamin which has its role in calcium metabolism. It is metabolized by liver into 25-hydroxy vitamin D3 [25(OH) D3] which is specifically measured in blood. Its serum estimation collectively represents vitamin D attained from sun exposure and diet. The desirable serum level is 30ng/ml (75nM/L)

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though 20ng/ml is considered enough to prevent bone problems.³ This is to notify that these normal parameters are for non-pregnant population and we are yet to define the specific normal criteria for pregnancy.⁴

The role of vitamin D is not only related to the bones integrity but its low level have found association with preeclampsia and gestational diabetes and other adverse pregnancy outcomes.⁵ Moreover, the studies have found low vitamin D level in cord blood of the newborns in concordance with hypovitaminosis D of the mother. In turn, the long term neonatal stores of vitamin D are also dependent on its levels acquired during fetal life. So by managing the vitamin D of the mother, we are preventing hypovitaminosis in the newborn at birth and infancy. In short vitamin D is needed for maternal skeletal preservation as well as for fetal skeleton formation and development and chronic diseases tendency after birth and in later life.⁶

In general, serum vitamin D level depends on one's diet, sun exposure, clothing and melanin content of skin. But does the sun exposure and the usual daily intake of 200 IU would be enough to meet the increasing demands of pregnancy? However, the cause of its deficiency can vary place to place.⁷ In the studies of past few decades⁸, there has been a focus on the western countries as well as the countries like Saudi Arabia, Iran, and India where women wear concealing clothes. The statistics were higher than the expectation. It was observed by Christopher Naugler, Jianguo Zhang et al⁹ that the condition even worsened in winter especially when the outdoor activities were sparse.

Little we know about our women in Pakistan. The culture for men and women is to dress up completely and only the face, hands and feet are uncovered routinely. The women in Pakistani urban areas have developed awareness to use sun blocks and to avoid direct exposure to sunlight. These measures help them preventing tanning of skin as fair skin is taken as a mark of beauty in our culture. As far as pregnancy is concerned, the multi-vitamin supplements used in pregnancy are containing a very minimum amount of vitamin D (between 5-12.5 microgram/d). Moreover, the routine food, flour or dairy products are not fortified with vitamin D. The other qualitative variables could be a geographic factor, education level, exercise, parity, socioeconomic status, smoking, maternal BMI (as obesity has an inverse relationship with serum vitamin D level)¹⁰ and gestational age.

Methodology

The study had approval by the hospital research ethics committee. We enrolled 100 healthy primigravida women with singleton pregnancies who came to visit the antenatal clinic at Gulab Devi hospital Lahore. Prior to inclusion, consent was taken after explaining the research intent. A list (n=100) was prepared. These women were in their first trimester; mostly from 8th to 13th week gestation. The gestational age was estimated by LMP and confirmed by obstetric ultrasonography. Information like age, educational level, gestational age, parity, monthly income, smoking, daily sun exposure or use of multivitamins were recorded. Their BMI were noted. Their blood sample were taken in the outpatient department. The blood samples were referred to the hospital's own laboratory. After centrifugation and storage at -10°C, the ELIZA technique was applied to measure serum 25 (OH) D3 level.

The results were interpreted according to the recent medical guidelines i.e. severe deficiency (<10 ng/ml [25nmol/L]); deficiency (< 20 ng/ml [50nmol/L]); insufficiency (21–29 ng/ml [51–74 nmol/L]); and sufficiency (≥ 30 ng/ml [75nmol/L]). Optimum levels in pregnancy are yet to be identified.

Women belonged to Lahore and nearby districts of Punjab. Women having any associated medical illnesses e.g. hypertension, diabetes, tuberculosis, cardiac illness, especially those which can interfere the metabolism of calcium and vitamin D like gastrointestinal tract diseases, bone problems or renal illness etc. were not included in our study. Also the women with a previous miscarriage or intra-uterine fetal death were excluded from our subjects.

We used SPSS (statistical software package version) 20.0 and mean, ± standard deviation and percentages were calculated.

Results

Total 100 primigravidas at first trimester of pregnancy took part in our study. 85 women (85%) were variably deficient in vitamin D levels and 15 women (15%) were recorded with just sufficient serum vitamin D level. Among 85 deficient subjects, 10 women (10% of the total) were severely deficient (i.e. <10ng/ml). 15 women (15% of the total) were deficient (i.e. between 10 - <20ng/ml). While 60% were insufficient (i.e. between 20 - <30ng/ml). Although 15 women (n=15) were having sufficient levels, though none of them exceeding 30ng/ml.

The mean serum level of vitamin D was 12.5 ± 4.3 (Range 5-29.9). The prevalence of vitamin D deficiency was 85%.

The mean age of the participants was 25 ± 2.9 years. (Range 20-37 years) Mean BMI was 19 ± 3 kg/m². Only 4 women had BMI > 25. Most (80%) of the women belonged to Lahore city. None of them was a smoker. 29 were highly educated (college and above) while 71 were matric or below. 8 women were sunblock users (but not on regular basis). 2/3 of women had family's monthly income 15-20,000 rupees while rest of the women had monthly income more than 20000 rupees. 30 primigravidas were regularly using vitamins in the form of folic acid. Average sun exposure was 30-45 minutes.

Regarding the qualitative variables, well educated women were not in the severely deficient group. The educated women had more average daily sun exposure (1.08 ± 0.75 hours versus less educated women 0.4 hour ± 0.3 hours) Similarly women with more daily sun exposure made them less deficient.

Age, gestational age variation, BMI and monthly income did not significantly mark any difference regarding vitamin D deficiency. Sun exposure had a significantly positive correlation with serum vitamin D level.

25(OH)D levels	Number of women	% Results
Severe deficiency (< 10ng/ml)	10	10%
Mild deficiency (10 - <20ng/ml)	15	15%
Insufficiency (20 - <30ng/ml)	60	60%
Sufficiency (30ng/ml)	15	15%
Total	100	100.0

Discussion

Vitamin D deficiency among the general population might be an expanding problem globally but it becomes even a more serious issue if pregnancy is involved.¹¹ It is rapidly evolving a topic of interest for researchers. A pregnant woman has to keep herself vitamin D sufficient as well as her baby. N.Q. Liu et al¹² have identified adverse fetal outcome when the mother is severely vitamin D deficient though no evidence could be found that mild deficiency or insufficiency of maternal vitamin D effects the fetus in any way.

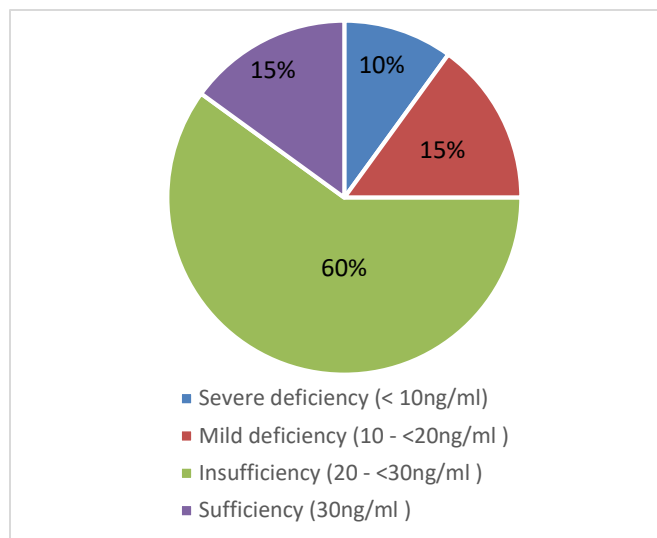


Figure 1. Prevalence of vitamin D deficiency in early pregnancy among primigravidas.

Our study has shown a significantly high prevalence (85%) of vitamin D deficiency in a pregnant population of the urban area which is alarming. Rather none had its level >30ng/ml. especially when other studies have correlated vitamin D deficiency with preeclampsia, gestational diabetes, anemia and adverse neonatal conditions. Overall the western studies show the prevalence of 8-15% and in non-western population, the incidence is between 59-94%.¹³

Regarding maternal complications, several studies indicate its association with preeclampsia, gestational diabetes, fetal growth restriction, miscarriages and high cesarean section rate. Hypovitaminosis D is reported to enhance insulin resistance in pregnancy and impaired glucose tolerance test. Yonatan Yeshayahu et al¹⁴ reported that women with gestational diabetes have a markedly lower serum level of vitamin D. While more than half of the women with gestational diabetes have coexistent vitamin D deficiency. Sahu M, Bhatia et al¹⁵ in their Indian study appreciated this correlation which was not encouraged in a similar kind of study from Natasha Nassar, Genevieve H. Halligan.¹⁶ The study have found that more than half of the women with anemia were having vitamin D deficiency. While women without anemia were not having vitamin D deficiency. Similarly, Dror DK et al¹⁷ showed that the risk of preeclampsia was directly proportional to vitamin D deficiency. In short, one cannot deny the importance of vitamin D in a healthy individual, let alone the fact that adequate level of vitamin D has positive influence on maternal and fetal health.

In our study, the consideration of socio-demographic factors brought up the facts that educated working women were having less chance of vitamin D deficiency as compared to the uneducated women or housewives. Lifestyle and socioeconomic status had its own influence.

Pregnancy itself demands higher levels of vitamin D. And it seems all the pregnant women are at risk of vitamin D deficiency.¹⁸ The deficiency is usually attributed to low dietary intake or inadequate sun exposure. In standard care, there is no monitoring protocol of vitamin D level during the antenatal period. No wonder the studies of sun enriched countries of south Asia also have remarkable data of vitamin D deficiency during pregnancy.¹⁹ Since the risk factors can be easily modified by awareness and prompt response, one can encourage pregnant women to carefully watch their vitamin D intake and to adopt simple lifestyle modifications.

Sun light have been found helpful in a synthesis of cholecalciferol in the skin. But how much sun exposure is sufficient? Or how much sun exposure is to be increased to meet the needs of pregnancy? There is no answer. The duration of sun exposure depends upon the skin pigmentation. It is suggested that Indians need three times more sun exposure as compared to Caucasians to generate the same quantity of vitamin D.^{17, 18, 19} Season and latitude are the other determinants of duration of sun exposure. Similarly, only face, hands and feet exposure to sun shine will produce not more than the nominal difference in serum vitamin D level. Pollution further dilutes its effect. Even the children of polluted areas are vitamin D deficient. Infact the studies have proved that only the specific vitamin D supplement can show a marked improvement. Madar AA et al²⁰ support it too that the women taking multivitamins in routine are less likely to develop its deficiency. However, the pregnancy specific multivitamin contains very low quantity of vitamin D (5-12.5 µg/d) which cannot prevent or treat hypovitaminosis D during pregnancy. So only the appropriate supplementation is beneficial.

In non-pregnant state, either single dose of 200,000 IU or daily 800 IU is recommended. While some researchers recommend 1000-2000 IU/day for adults. In pregnant state approved dosage regimen is not available but study by Hensel KJ, Randis TM et al²¹ shows that below <2000 IU/day is not found beneficial to achieve desirable serum vitamin D level.

The distinctive aspect of our study is that we enrolled young healthy primigravidas with no known medical illness or concurrent drug therapy. But the limitation of our study is that we did not study the whole length of pregnancy which could have helped to predict cord blood levels on delivery. Moreover, the study was based in one hospital and the sample size was not big enough to set the standard. The vitamin D levels vary with seasonal variation and latitude which were not our variables. Moreover our study is based in urban area so we cannot predict the situation in rural areas. Especially when we did not have the dietary Information of our subjects

In our country there is no standard routine to prescribe vitamin D during pregnancy. Though our study has highlighted the issue still randomized trials are worthwhile to conduct in our local setup to adjust the daily dosage and safety profile before setting a standard protocol.

Conclusion

In our present circumstances, the urban population of young primigravidas is highly prone to develop serum 25(OH) D3 deficiency. We need to determine a standard policy to prevent it by additional oral supplements and lifestyle modifications e.g. in the form fortification of selected food items, exercise and outdoor activities

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