

Assessment of Vitamin D and its Correlation with Lipid Markers among Adult Female during the Course of Pregnancy in and Around Dhanbad, Jharkhand

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ABSTRACT

Introduction: Vitamin D deficiency is one of the common health issue and is widespread throughout the world. It's dietary supplementation is generally advised in the general population, including pregnant women. However, data about the relation between vitamin D status and the lipid profile in adult females during pregnancy is inconsistent. The present study was designed with the aim to assess the status of vitamin D and its relationship with the serum lipid profile in the females during pregnancy in and around Dhanbad Jharkhand.

Material and Methods: A total of 110 females were recruited for this study out of which 55 were taken as control and 55 as cases. An informed consent was taken from each patient. Chemiluminescent microparticle immunoassay (CMIA) was used with automated instrument for estimation of 25-hydroxyvitamin D. Lipid profiles were assessed using standard procedures.

Result: In the study, vitamin D deficiency was noted in the case group in 61% females whereas 39% females had values within normal limits. A statistically significant inverse correlation was found between 25 hydroxyvitamin D levels and TC, VLDL, LDL and TG levels in pregnancy.

Conclusion: The status of Vitamin D was found to be less in the pregnant females as compared to in healthy and nonpregnant females. Also, the result showed that the serum 25(OH)D and lipids levels are related to each other. It seems that vitamin D deficiency may be associated with the increased risk of dyslipidemia.

Keywords: Vitamin D, 25(OH)D, Total Cholesterol (TC), Low-Density Lipoprotein (LDL), High-Density Lipoprotein (HDL), Very Low-Density Lipoprotein (VLDL) and Triglycerides (TG), Pregnancy.

INTRODUCTION

Vitamin D is an essential fat-soluble vitamin with multiple functions. The primary source of vitamin D is endogenous synthesis in response to solar ultraviolet (UV) radiation, although individuals also rely on dietary sources, especially in winter months and those in northern latitudes.^{1,2} Dietary sources include fatty fish (salmon and herring), liver, eggs, and fortified foods, such as milk and other dairy products.^{3,4} Besides its classical physiological function of regulation of calcium and bone metabolism, vitamin D is suggested to have many other functions such as modulating immune function, antiinflammatory activity, suppressing the rennin-angiotensin system and reducing insulin resistance.⁵⁻⁸ Vitamin D deficiency is a common disorder, found in all age groups and in both genders. It is prevalent in various parts

of the world including India with an increased occurrence in high and low latitude countries.⁹ In recent years the prevalence of vitamin D deficiency has increased. There is a high prevalence of vitamin D deficiency in pregnant women from nonwestern countries residing in northern Europe, indeed vitamin D deficiency during pregnancy is an ongoing epidemic.¹⁰ Poor vitamin D status has been associated with diabetes, obesity, hypertension, peripheral vascular disease, coronary artery disease, stroke, insulin resistance, heart failure, and dyslipidemia.¹¹ Dyslipidemia is an independent risk factor for cardiovascular and cerebrovascular diseases in individuals.^{12,13} It has been confirmed that lowering of serum cholesterol results in a reduction in cardiovascular morbidity.¹⁴ However, the results of whether vitamin D could influence the serum lipid profile in the adult female during the course of pregnancy are inconsistent. Therefore, we conducted this study to assess the vitamin D status and its relation with serum lipid profile in pregnant females.

MATERIALS AND METHODS

The study was conducted in the department of physiology from the period of Jan 2015 to June 2015. The study was approved by the Ethical Committees of the institution, and written informed consent was obtained from all the participants. A total of 110 females were recruited in the present study. They were divided into two groups i.e cases and controls.

Cases group comprises of 55 females in their 1st trimester of pregnancy

Control group comprises of 55 non-pregnant, healthy women having normal menstrual function with no evident hormonal deficiency.

All the subjects were ranging in age from 20 to 35 years with similar low socio-economic status and dietary habit. No

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Vitamin D status	Value	Percentage
Deficiency of 25-hydroxyvitamin D	≤20 ng/mL	61%
Normal 25-hydroxyvitamin D	≥20 ng/mL	39%

Table-1: Comparison of 25-hydroxyvitamin D values in pregnant females

Lipid parameter	Pregnant females (cases)		Non pregnant healthy (control)	p value
	Deficiency of 25-hydroxyvitamin D	Normal 25-hydroxyvitamin D		
TC	240.47 ± 45.69	201.32 ± 6.58	192.9 ± 26.68	<0.001*
HDL	52.62 ± 9.47	50.26 ± 8.67	49.84 ± 12.67	0.1668
VLDL	61.68 ± 11.54	29.4 ± 9.25	31.7 ± 7.12	<0.001*
LDL	135.85 ± 20.76	110.41 ± 10.76	102.41 ± 12.57	<0.001*
TG	212.25 ± 41.51	169.34 ± 14.73	166.22 ± 24.59	<0.001*

Table-2: Comparison of Lipid parameters and its correlation with 25-hydroxyvitamin D

subjects from either group were suffering from any acute or chronic illness during the study nor did they have any past history of cardiac, renal, hepatic dysfunction, dyslipidaemia, osteomalacia, any other bone diseases, bone pains, muscle weakness, and vitamin D deficiency before pregnancy. Subjects who were on calcium, vitamin D supplements, and lipid lowering medications were also excluded from the study.

Blood samples were drawn from all the subjects following a fast of 12 hours and analyzed for lipid profile and 25-Hydroxyvitamin-D. Serum TG, TC and HDL were analyzed by enzymatic methods with the help of Glaxo kits on ERBA Chem-5 semi auto analyzer. Serum LDL was calculated by Frederickson-Friedwald's formula according to which $LDL = Total\ cholesterol - (HDL + VLDL)$. VLDL was calculated as 1/5 of Triglycerides.

Chemiluminescent microparticle immunoassay (CMIA) was used with automated instrument for estimation of 25-hydroxyvitamin D. The sensitivity and specificity of this instrument was 53% and 90.5%, respectively. As per current literature¹⁵ and according to lab manual, the values ≤20 ng/mL was considered as deficiency of 25-hydroxyvitamin D and values more than 20 ng/mL was considered as normal.

STATISTICAL ANALYSIS

Data were statistically analyzed by Student's 't' test. *P* value < 0.001 was considered statistically significant.

RESULT

The present study comprises of 110 females who fulfilled the inclusion criteria. They were divided into two groups i.e. healthy and non pregnant females (represented as the control group) and pregnant females in their first trimester (represented as the case group). Each group comprises of 55 females. The age of the studied females ranged from 20 to 35 years with the mean age of 27.6 years and 26.5 years in cases and control groups, respectively. In the study, out of 55 pregnant females vitamin D deficiency was noted in 61% females whereas 39% females had values within normal limits. In the control group of 55 females the values of 25-hydroxyvitamin D [25(OH)D] were normal i.e. ≥20 ng/mL.

On comparison between the two groups i.e. cases (Pregnant females) and controls (Non pregnant healthy), 25-hydroxyvitamin D was significantly less in pregnant females. In cases group (pregnant females), on comparing between normal versus 25-hydroxyvitamin D deficiency levels, significant association was seen with serum lipid profile in 25-hydroxyvitamin D deficiency group. The levels of TC, VLDL, LDL and TG were found to be significantly increased while levels of HDL was found to be insignificant in females with 25-hydroxyvitamin D deficiency when compared to females with normal 25-hydroxyvitamin D levels. There was significant inverse correlation between 25 hydroxyvitamin D levels and TC, VLDL, LDL and TG levels in pregnancy.

DISCUSSION

In the present study, the serum vitamin D status of 110 females was assessed and was correlated with serum lipid. Out of total subjects, 55 females were in their first trimester of pregnancy, and were taken as cases while rest 55 healthy and non pregnant females were taken as control. The result of the present study showed that 61% of pregnant females had their vitamin D status below an optimal level (i.e., ≥20.0 ng/mL). Similarly, Holmes VA et al¹⁶ conducted a study on Caucasian women of the United Kingdom and found that plasma 25(OH)D concentrations were lower among pregnant women than among non pregnant controls. The lower levels of 25(OH)D concentrations may be as a result of increased fetal demand for this essential nutrient which is almost entirely dependent on vitamin D from the mother.^{17,18} Widespread prevalence of hypovitaminosis D among adolescent girls and pregnant and post-natal women in Saudi Arabia and around the world has also been reported in several studies, which is in accordance with the result of present study.¹⁹

In the human body, about 50–90% of vitamin D comes from the biosynthesis of vitamin D₃ (cholecalciferol) in the skin from 7-dehydrocholesterol that requires sunlight (ultraviolet radiation), and the remainder comes from a limited number of foods (mainly fatty fish, eggs, and liver as well as foods fortified with vitamin D such as margarine, cereals, and milk products) and from dietary supplements. Low

vitamin D levels are linked to increased risk for high blood pressure, insulin resistance and diabetes, dyslipidemia and cardiovascular disease in the general population.²⁰ In present study we correlated vitamin D status with serum lipid and found that vitamin D deficiency was significantly associated with increased levels of TC, LDL, VLDL and TG in pregnant females when compared with healthy and non pregnant females. The value of HDL was found to be insignificant. It was thought that the positive correlations between vitamin D and lipids may be the outcome of a combination of deficient vitamin D status with the high metabolic demands of pregnancy.

In a study by Al-Ajlan et al¹⁹, it was found that the serum vitamin D level was positively correlated to TC and TG while the mean serum levels of these same parameters were within their normal ranges for the total population. Vitamin D level was even more strongly correlated to TC and TG in the vitamin D deficient sub-group of women which is similar to the present study. Jungert A et al²¹ found that 25(OH)D levels were positively associated with HDL and inversely associated with TC, HDL, LDL:HDL and TC:HDL among the elderly women in Germany which is in accordance to the present study.

CONCLUSION

The results of the present study shows reduced level of vitamin D in females during the first trimester of pregnancy. Also, positive correlation is noticed with the serum lipids i.e. TC, LDL, VLDL, TC and Vitamin D deficiency. It seems that vitamin D deficiency may be associated with the increased risk of dyslipidemias. However, data pertaining to the result is less. Future studies should be planned to understand the relationship between vitamin D and serum lipid profiles in a better way.

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