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<u>Research Article</u> Diminished Levels of Vitamin D and Altered Lipid Profile

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Abstract

Vitamin D is synthesized in the skin by exposure to sunlight and known to be involved in bone homeostasis and metabolism. Deficiency of vitamin D is one of the commonest disorders found in all age groups. It is widely prevalent in various parts of the world. Decreased levels of vitamin D are associated with atherosclerosis, obesity, insulin resistance, diabetes mellitus, hypertension, myocardial infarction, and stroke. The low level of vitamin D is related with adverse effects on lipid profile. The present study was conducted with the aim to estimate and compare the total cholesterol and triglycerides level in apparently healthy adults with normal vitamin D levels and those with hypovitaminosis D. It has been observed that patients with low levels of serum vitamin D have higher levels of serum total cholesterol and triglycerides. The further studies should be conducted to find the relation between vitamin D and cardiovascular diseases. **Keywords:** vitamin D, lipid profile, hypovitaminosis, cardiovascular disease.

Introduction

Vitamin D known as an ancient hormone produced in the skin by sun exposure. It is a fat soluble vitamin ⁽¹⁾. It has well known functions in bone homeostasis and metabolism and promotes the intestinal calcium absorption. The role of vitamin D in calcium metabolism and skeletal health is indubitable. It helps in preventing and curing rickets. Vitamin D deficiency is one of the commonest disorders found in all age groups. It is widespread in different parts of the world including India, with an increased incidence in high and low latitude countries ⁽²⁾. The world wide prevalence of vitamin D deficiency in elderly is 50% and within Europe in 2%–30% of adults ⁽³⁾. In the recent years it has been found that hypovitaminosis D is associated with atherosclerosis. obesity, insulin resistance. mellitus, hypertension, myocardial diabetes infarction, and stroke ⁽²⁾. In some observational studies high levels of vitamin D had shown to be associated with favourable lipid profile, whereas low levels of vitamin D were associated with atherogenic lipid profile⁽⁴⁾. Dyslipidemia was defined (ATP III) as the presence of one or more of the following: total cholesterol more than 200

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mg/dL, low density lipoprotein-cholesterol (LDL-C) more than 130 mg/dL, high density lipoprotein-cholesterol (HDL-C) below 40mg/dL, very low density lipoprotein-cholesterol (VLDL-C) more than 30 mg/dL, and triglycerides more than 150 mg/dL $^{(5)}$. It is an independent risk factor for cardiovascular and cerebrovascular diseases in individuals. Low level of vitamin D is related with unfavorable effects on lipid profile and also associated with higher level of total cholesterol with lower apolipoprotein A-1 concentrations in Belgian men⁽⁶⁾. So the present study was conducted with the aim to estimate and compare the total cholesterol and triglycerides level in apparently healthy adults with normal vitamin D levels and those with hypovitaminosis D.

Material and Methods

The study was conducted in the Department of Biochemistry, Super Specialty hospital, Government Medical College, Jammu. A total of 150 patients participated in the study in the age range of 20-70 years irrespective of their sex. Serum obtained from 3 ml of blood drawn from the ante-cubital vein under aseptic conditions from each individual with his/her consent, duly following the guidelines and norms of the hospital, was taken for the estimation of serum total cholesterol levels and triglycerides levels and the vitamin D levels. Out of 150 patients, 70 patients had normal vitamin D levels whereas 80 patients had reduced levels of vitamin D. In both the groups the serum total cholesterol levels and triglycerides levels were compared. The vitamin D levels were estimated in abbott architect chemiluminescent microparticle immunoassay ^(7,8). A 25(OH) D level <10ng/mL was considered as severe vitamin D deficiency, 10-19.9 ng/mL as moderate vitamin D deficiency, 20-29.9 ng/mL as mild vitamin D deficiency, and ≥ 30 mL as vitamin D sufficiency. The serum total cholesterol levels and triglycerides levels were estimated in abbott architect fully automated chemical analyser ^(9,10). Patients with previous history of diabetes mellitus, thyroid disorders, metabolic bone

disorders, malignancy, hyperparathyroidism, antiosteoporotic therapy, dyslipidemia and on statins were excluded from the study. The results were analyzed by applying standard statistical procedures.

Results

In patients with vitamin D deficiency, the mean level was 17.11 ng/ml whereas in normal healthy adults, the levels with vitamin D were 40.94 ng/dl with p-value <0.0001, which is highly significant. In patients with hypovitaminosis D, the mean value of serum total cholesterol was 187.12 mg/dl and in patients with normal vitamin D levels, the mean value of serum total cholesterol was 175.41 mg/dl with p-value of 0.036 (p value < 0.05, which is statistically significant) and the mean triglycerides level in patients with hypovitaminosis D was 152.98 mg/dl whereas and the mean value of serum triglycerides was 129.31 mg/dl with p-value of 0.034 (p value < 0.05, which is statistically significant).

Discussion

It was observed that the mean levels of serum total cholesterol and triglycerides were higher in patients who have lower levels of vitamin D as compared to subjects with normal vitamin D levels. Similar results were reported by various authors in their studies ^(11,12,13). Wang et al also showed that raised levels of vitamin D were related with favorable lipid profile, whereas lower levels of vitamin D were related with atherogenic lipid profile ⁽⁴⁾. Gaddipati et al also suggested that serum vitamin D levels were negatively correlated with total cholesterol, triglycerides and LDL-C and positively correlated with HDL-C in Americans ⁽¹⁴⁾. This rise in cholesterol and triglycerides level in vitamin D deficient patients suggests its influence on lipid profile. In the previous studies it has been suggested that increased absorption of calcium in the intestine could decrease the synthesis and secretion of hepatic triglycerides and also decreases the absorption of fatty acids in the intestine due to

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formation of insoluble calcium-fatty acid complexes. In addition, calcium also reduces the level of cholesterol by promoting the conversion of cholesterol into bile acids ⁽¹⁵⁾. Vitamin D by stimulating intestinal absorption of calcium could inhibit synthesis and secretion of triglycerides. The serum levels of LDL-C would be reduced by the decreased absorption of fat (16). The higher concentrations of 25(OH) D suppress serum PTH levels which in turn results in lowering of triglyceride levels ⁽¹⁷⁾. There is strong evidence that low levels of vitamin D may be associated with impaired functioning of B-cells and insulin resistance which could affect metabolism of lipoproteins thereby leading to raised triglyceride level and reduced HDL-C level (18). In addition, vitamin D may directly affect lipid regulation as it is related to the metabolism of lipids e.g. synthesis of bile acid in the liver^[19].

Conclusion

The present study showed increased levels of serum total cholesterol and triglycerides in vitamin D deficient patients. There are certain limitations of the study as the serum LDL-C and HDL-C were not estimated. Future studies, to estimate the lipid profile and the specific tests like apolipoprotein-A, which is more specific for cardiovascular disease should be conducted and so that their interrelationship with vitamin D can be revealed.

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