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Vitamin D Estimation: A New Biomarker for Cardiovascular Disease

Original Article

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ABSTRACT

Background: *Vitamin D deficiency is prevalent in the majority parts of the world. The prevalence of vitamin D deficiency in India in urban area 9-11% and in rural area 3-6%. Coronary artery disease is worldwide health problem and consists of variety of heart illness. Vitamin D deficiency may cause cardiovascular events by a variety of potential biological mechanism.*

Aims & Objectives: *To evaluate the role of vitamin D as a rising risk factor for coronary artery disease.* ***Materials & Methods:*** *The study was carried out in department of Cardiology, S.P. Medical College included 50 patients of coronary artery disease admitted in H.R.M. Center Bikaner. The control population comprise of age and sex matched 50 healthy persons. Vitamin D was done on ELISA reader and lipid profile assessment was done on fully automated analyzer. The statistical analysis was done by using SPSS software. The results were articulated as Mean ± SD. The Student t-test was carried out for relationship of the data & P value <0.05 was considered statistically significant.*

Results: *The study discovered that vitamin D level was established to be significantly lower in cases as compared to controls. We also noticed significant difference in mean to total cholesterol, HDL cholesterol and LDL cholesterol in between cases and control.*

Conclusion*: This study concluded that continue follow up of vitamin D will be helpful for measurement of increased risk of coronary artery disease episode beyond the traditional risk factors.*

Key words: *Vitamin-d, coronary artery disease, cardiovascular, cholesterol.*

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INTRODUCTION

Cardiovascular disease (CVD) is worldwide considered as the foremost cause of death and disability include India.[1] The prevalence of cardiovascular disease has approximately doubled in Northern India as well over 30 years. In addition it is estimated that by the year 2020, coronary artery disease (CAD) will be the foremost cause of hasty death in India.[2] Vitamin D is one of the fat soluble vitamins also identified as sunshine Vitamin due to its synthesis in the body following exposure to ultraviolet (UV) B rays, however it is exclusive in a way that it acts as a prohormone and mediates its functions by binding to a member of nuclear receptor super family, the Vitamin D receptor.[3] The dynamic form of vitamin D 1,25-dihydroxyvitamin D (1,25(OH)2D), acts as a steroid hormone by binding to the vitamin D receptor (VDR), which is present in many cells throughout the body, including cardiomyocytes, vascular smooth muscle, and endothelium.[4-6] Vitamin D deficiency is common in most parts of the world. Vitamin D has long been known to be an essential part of bone metabolism, although recent evidence suggests that vitamin D plays a key role in the pathophysiology of other diseases, including cardiovascular disease. Emerging data indicates that vitamin D deficiency, cardiovascular disease and endothelial dysfunction are linked together.[7] Endothelial dysfunction is an important precursor event in the development of CHD and atherosclerosis.[8,9] Vitamin D is known to influence vascular endothelium directly or indirectly

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through up directive of the renin-angiotensin system or via induction of smooth muscle proliferation and a proinflammatory state. A diversity of possible biological mechanism (Blood pressure elevation, Insulin resistance, Inflammation , Obesity , Endothelial dysfunction, Vascular remodelling due to hyperparathyroidism) have been proposed by which, vitamin D deficiency may cause cardiovascular events.[10-12] This study aimed to shown the relationship between vitamin D and coronary artery disease. We hypothesize that this relation might be cleared by endothelial dysfunction and atherosclerosis, and development of cardiovascular disease.

METHODS

This study was conducted in the Department of Cardiology S.P. Medical College, Bikaner (Rajasthan) during the period of March 2016 to Aug 2016 after approval from the ethical committee of the institute. Total 100 subjects were incorporated in this study which were categorize into two groups-cases and controls (50 cases and 50 controls). Patients with 20-60 years of age, from both genders were included in the study. Patients who were hemodynamically unstable in shock or heart failure were excluded. Patients who were already on vitamin D therapy, had known chronic kidney disease, Chronic liver disease, diabetes mellitus, Endocrine dysfunction, Malabsorption syndrome, Renal Rickets were excluded from the study. 5 ml overnight fasting blood sample was collected and subjected to biochemical estimation of 25(OH) vitamin D by enzyme immunoassay method and lipid profile by enzymatic end point method in fully automated analyzer. All data were analyzed using SPSS statistical software. Results are presented as mean ± standard deviation. P value <0.05 was considered statistically significant. Student t-test was used to compare means between the groups, and the chi-square test was used to compare proportions between the groups.

RESULTS

In cases and controls mean value of 25(OH) vitamin D (20.11±10.39 and33.89±15.3, P<0.001), Total cholesterol (180.66±30.37 and 150.34±27.3, P<0.005), triglycerides (178.73±34.94 and 158.02±34.74, P <0.05), LDL cholesterol (130.38±32.6 and 100.82±28.06, P<0.05) and HDL (30.16±6.45 and 35.38±5.67, P<0.005) were obtained. Statistically significant differences were seen for serum 25(OH) vitamin D, cholesterol, triglycerides, LDL and HDL levels in cases as compared to controls.

Table 1: Demographic and clinical details of the patients

Parameter	Cases (Mean ± SD)	Control (Mean ± SD)	p-value
Age	50.34±6.34	45.68±10.6	0.06
Sex (male)	40(80%)	25(50%)	0.103
BMI (≥30)	15	4	<0.05*
BMI (<30)	35	46	
Hypertension	39	10	<0.05*
Smoking	38	15	<0.005**

DISCUSSION

In our study, we have compared the value of 25(OH) vitamin D activity and lipid profile in healthy subjects and patients with myocardial infarction. We found decreased level of 25(OH) vitamin D and increased levels of cholesterol, triglycerides and low-density lipoprotein in myocardial infarction patients. Numerous studies showed vitamin D as a new risk factor for cardiovascular events and mortality. In addition, vitamin D has anti-inflammatory effects and prevents cholesterol removal by macrophage and foam cell formation on vessels walls. Also an contrary relation has been seen between vitamin D serum level and coronary artery calcification.[13] Recently, Zittermann *et al*[14] reviewed various studies reported association between cardiovascular disease (CVD) and Vitamin D deficiency (VDD) in context of increased prevalence of coronary artery disease (CAD), vascular calcification and essential hypertension. Study by Watson *et al*[15] reported inverse correlation of serum 1, 25(OH) 2D3 and presence of coronary artery calcification in subjects with hypercholesterolemia who are at high risk for CAD (Framingham cohort). Mahdavi K *et al*[16] reported 72% of Patients with acute coronary syndrome had serum 25-hydroxyvitamin D level of 20 ng/ml or less. The observational study by Lindquist, et al[17] has report a reverse relationship between vitamin D levels and thrombosis. Another prospective study by Giovannucci[18], funded by the National Cancer Institute and the National Heart, Lung, and Blood Institute, vitamin D deficiency was found to be an independent risk factor for development of AMI after adjusting for all known CAD risk factors. Datas from prospective observational studies indicate that vitamin D deficiency is also an independent risk factor for stroke.[19,20] *A.K.Pancholia et al(2012)*[21]This study revealed that vitamin D as a potential risk factor for cardiovascular events and mortality. Skaaby et al[22] concluded that important association of hypovitaminosis with hypercholesterolemia. The high levels of serum total cholesterol, triglycerides and LDL-C and low level of HDL-C is called dyslipidemia, which is a major risk factor for CVDs. All the ingredients are associated with increased incidence of coronary artery disease. A large number of studies conduct in the past have provide the basic scientific framework and our study attempts to explore the role of Vitamin D deficiency in the pathogenesis of CAD. In addition, the prevalence of vitamin D is quite high among CAD patients.

Table 2:- Comparison of biochemical parameter between cases and control

Parameter	Cases (Mean ± SD)	Control (Mean ± SD)	p-value
25(OH)Vitamin D (mg/ml)	20.11±10.39	33.89±15.3	<0.001***
Total Cholesterol (mg/dl)	180.66±30.37	150.34±27.3	<0.005**
Triglycerides (mg/dl)	178.73±34.94	158.02±34.74	<0.05*
HDL-Cholesterol (mg/dl)	30.16±6.45	35.38±5.67	<0.005**
LDL-Cholesterol (mg/dl)	130.38±32.6	100.82±28.06	<0.05*

*Significant
** Highly Significant
* ** Very Highly Significant

CONCLUSION

In this study patients of coronary artery disease had considerably low level of vitamin D as compared to individuals without coronary artery disease. Vitamin D deficiency was found to be a self-determining predictor of CAD after adjusts other risk factors emphasizes that vitamin D can be a possible risk factor for CAD. Hence, this study suggests that vitamin D might be measured as one of the risk factor for cardiovascular events. This study suggests that vitamin D deficiency & dyslipidemia potentiate the risk of

cardiovascular disease. A number of studies have shown strong self-regulating association between hypovitaminosis D and cardiovascular risk. Hence, vitamin D might be calculated as one of the risk factor for cardiovascular events. We conclude that early screening programme for patients with vitamin D deficiency that could be sign of illness and therefore should be treated on time.

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