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To Study Correlation between Serum Vitamin D_3 Deficiency with Individual Parameters of Metabolic Syndrome and Left Ventricular Ejection Fraction in Coronary Angiographically Proven Coronary Artery Disease Patients At Central India

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ABSTRACT
Vitamin D is thought to alter cholesterol metabolism and calcium metabolism, modulate immune system, impair inflammation, associated with insulin resistance and metabolic syndrome. thats why aim of the study was to study correlation between vitamin D deficiency with metabolic syndrome and left ventricular ejection fraction in coronary artery diseased patients.
METHODS: *This was an observational cross-sectional study which was carried out in consecutive 60 coronary artery disease patients from OPD and ward from Department of Cardiology, Gandhi Medical College and associated Hamidia Hospital Bhopal from November 2011 to December 2012.*
RESULTS: *Statistically Significant correlation between CASES and CONTROLS for vitamin D_3 deficiency with mean blood pressor, HDL, triglycerides, fasting blood sugar, left ventricular ejection fraction (p-<0.01) except waist circumference. In present study Vitamin D had direct correlation with EF% in Echocardiography (Correlation coefficient = 0.268, p value = 0.000000) and HDL (Correlation coefficient=0.422,p=0.000000) and inverse correlation with other parameters.*
CONCLUSION: *Vitamin D deficiency may provoke metabolic syndrome, athermanous plaque formation and establish coronary artery disease.*
KEY WORDS : *Vitamin D Deficiency, Metabolic Syndrome*

INTRODUCTION

Vitamin D deficiency can decrease insulin sensitivity. Decreased insulin sensitivity is part of the metabolic syndrome, thought to be a pre-diabetes state, which by raising LDL-C and triglyceride levels, while lowering HDL-C levels, predisposes to the development of CAD. Improving vitamin D status could reduce the risk of cardiovascular disease indirectly by improving insulin sensitivity. Vitamin D is thought to modulate the inflammatory process in a positive manner to delay the progression of the atherosclerotic process. By suppressing the production and negative effects of cytokines might be a mechanism used by vitamin D to prevent cardiovascular disease. Staple foods such as milk, flour and margarine are artificially fortified with vitamin D, and it is also available as a supplement in pill form.[1,2] Food sources such as fatty fish, mushrooms, eggs, and meat are rich

in vitamin D and are often recommended for consumption to those suffering vitamin D deficiency.[3] Vitamin D also modulates neuromuscular function, reduces inflammation, and influences the action of many genes that regulate the proliferation, differentiation and apoptosis of cells.[4] calcium or phosphorus deficiency as well as a lack of vitamin D; today it is largely found in low income countries in Africa, Asia or the Middle East[5]and Obesity increases the risk of many physical and mental conditions. These co-morbidities are most commonly shown in metabolic syndrome, a combination of medical disorders which includes: diabetes mellitus type 2, high blood pressure, high blood cholesterol, and high triglyceride levels.[6]

Vitamin D deficiency plays a role in obesity[7].Two human feeding studies using calcium (543 mg) and vitamin D (349 U) indicated that combination of both reduced subsequent food intake and increased the metabolism of fat[8]. There is a possibility that the addition of vitamin D to a reduced calorie diet will lead to better weight loss[9]. A raised blood cholesterol causes atheroma in the aorta and coronary arteries in many experimental species and specially in man. In general the higher the concentration the greater the extent of atheromatous involvement. Raised low density lipoprotein (LDL) and low high density lipoprotein (HDL)[10] are separately and jointly responsible.

The terms "metabolic syndrome," "insulin resistance syndrome" and "syndrome X" are now used specifically to define a constellation of abnormalities that is associated with increased risk for the development of type 2 diabetes and atherosclerotic vascular disease (e.g., heart disease and stroke).the prevalence of metabolic syndrome increases with age.The metabolic syndrome consists of a constellation of metabolic abnormalities that confer increased risk of cardiovascular disease (CVD) and diabetes mellitus (DM). The criteria for the metabolic syndrome have evolved since the original definition by the World Health Organization in 1998, reflecting growing clinical evidence and analysis by a variety of consensus conferences and professional organizations. The major features of the metabolic syndrome include central obesity, hypertriglyceridemia, low HDL cholesterol, hyperglycemia, and hypertension.

The approximate prevalence of the metabolic syndrome in patients with coronary heart disease (CHD) is 50%, with a prevalence of 37% in patients with premature coronary artery disease (age 45), particularly in women. With appropriate cardiac rehabilitation and changes in lifestyle (e.g., nutrition, physical activity, weight reduction, and, in some cases, pharmacologic agents), the prevalence of the syndrome can be reduced. The relative risk for new-onset CVD in patients with the metabolic syndrome, in the absence of diabetes, averages between 1.5- and threefold. In an 8-year follow-up of middle-aged men and women in the Framingham Offspring Study (FOS), the population attributable risk for patients with the metabolic syndrome to develop CVD was 34% in men and 16% in women.

AIMS AND OBJECTIVES

To determine correlation between serum vitamin D3 level with individual parameter of metabolic syndrome and left ventricular ejection fraction in coronary artery diseased patients

METHODOLGY

This was an observational cross-sectional study, consisting of consecutive 60 coronary artery disease patients (20-75 years) from OPD and ward from Department of Medicine and Department of Cardiology, Gandhi Medical College and associated Hamidia Hospital Bhopal from November 2011 to December 2012.Patients with 50% or more stenosis of at least one coronary artery on coronary angiography are included as **CASE** while Subjects without stenosis or less than 50% stenosis in coronary artery on coronary angiography are included as **CONTROL** Patients suffering from any chronic renal, hepatic, GIT,

skeletal, or endocrine (except diabetes) disease, any acute critical illness and patients on longstanding calcium and vitamin D supplementation were excluded from study.

After evaluation, both the groups were compared for vitamin D level and to see the prevalence of vitamin D insufficiency and other risk factors in cases. Cases were further divided in three subgroups based on the extent and severity of diseases that was group A (Single vessel disease n= 17), group B (Double vessel disease n=7), group C (Triple vessel disease n=6).Similar comparisons were further evaluated and studied.

The cut off value of Vitamin D was: Deficiency: <6 ng/ml, Insufficiency: 6-20 ng/ml., Sufficiency: 21-100 ng/ml,Toxicity: >100 ng/ml.

OBSERVATIONS

TABLE-1 Correlation between Case and Control with Serum Vitamin D_3 Level, Individual Parameter of Metabolic Syndrome and Left Ventricular Ejection Fraction

S. No.	Variants	Cases	Controls	p-value
1.	SERUM VITAMIN 'D_3' (ng/ml)	15.9±5.10	21.67±6.65	0.000387
2.	WAIST CIRCUMFERENCE (cm)	95.43±6.11	91.06±8.83	0.029697
3.	MEAN B.P. (mm/Hg)	103.43±9.11	91.71±4.49	0.000000
4.	H.D.L. (mg/dl)	41.66±8.08	61.26±13.12	0.000000
5.	TOTAL SERUM TRIGLYCERIDE (mg/dl)	173.13±15.20	106.13±15.95	0.000000
6.	F.B.S. (mg/dl)	106.4±17.97	95.4±11.48	0.006743
7.	LVEF% (ECHO).	45.9±8.02	58.1±4.85	0.000000

TABLE-2 Correlation between Serum Vitamin D_3 Level with Individual Parameter of Metabolic Syndrome and Left Ventricular Ejection Fraction In Cases

1.	**Vitamin D3±SD (ng/dl)**	**Waist Circumferences±SD (cm)**
Group A	16.59±5.10	93.58±6.11
Group B	16.13±5.54	98.28±5.88
Group C	13.68±4.45	97.33±6.55
2.	**Vitamin D3±SD (ng/dl)**	**Mean B.P.±SD (mmHg)**
Group A	16.59±5.10	100.5±5.10
Group B	16.13±5.54	103.34±5.54
Group C	13.68±4.45	111.83±4.45
3.	**Vitamin D3±SD (ng/dl)**	**HDL±SD (mg/dl)**
Group A	16.59±5.10	41.76±8.08
Group B	16.13±5.54	41.57±9.03
Group C	13.68±4.45	41.50±9.34
4.	**Vitamin D3±SD (ng/dl)**	**Total Serum Triglyceride±SD(mg/dl)**
Group A	16.59±5.10	165.94±15.20
Group B	16.13±5.54	183.28±15.93
Group C	13.68±4.45	181.66±11.34
5.	**Vitamin D3±SD (ng/dl)**	**FBS±SD (mg/dl)**
Group A	16.59±5.10	101.82±5.10
Group B	16.13±5.54	109.42±5.54
Group C	13.68±4.45	115.83±4.45
6.	**Vitamin D3±SD (ng/dl)**	**LVEF(%) ± SD**
Group A	16.59±5.10	51.23±8.02
Group B	16.13±5.54	41.14±5.65
Group C	13.68±4.45	36.33±7.59

RESULTS and DISCUSSION

For the last two to three decades vitamin D deficiency has been associated with obesity and Metabolic syndrome. Obesity and metabolic syndrome is a known risk factor for coronary artery disease. Several studies suggest that vitamin D deficiency has with various direct and indirect effect on atheromatus plague formation. Many

studies have been done to establish association between vitamin D levels and occurrence of obesity / metabolic syndrome. "Body weight increase with bigger latitude with lower attitude and in winter.[11] Different explanations exist for all three associations but vitamin D provides a parsimonious explanation as vitamin D decreases with higher latitude, lower altitude and with winter in a South Carolina study.[12] All obese subjects had vitamin D levels (<2.2 ng/ml) lower than non obese subjects (>8 ng/ml). These two studies suggested a inverse relation between vitamin D level and metabolic syndrome but no causal relationship was explained. No insight into the pathogenesis was made. These landmark publications[11,12] set the stage for further studies to establish this apparent relationship between vitamin D level, obesity, metabolic syndrome and coronary artery disease.

In the present study, patients with coronary artery disease had lower serum 25 OH vitamin D levels than non-Coronary Artery Disease controls The difference was statistically significant P value 0.000387 (<0.01). [TABLE-1]

Mean serum 25OH vitamin D level in studied cases was 15.90 ng/ml, this is significantly lower than 21.67 ng/ml of controls.In cases vitamin D insufficiency was noted in 86.66% of cases as compared to 56.66% of control (p value = 0.000387). This difference is statistically significant. In cases vitamin D insufficiency was significantly higher in Triple vessels disease (13.68 ng/ml) as compared to single vessels disease (16.59 ng/ml). [TABLE-1,2] Thus, it can be concluded that vitamin D insufficiency has an association with extent and severity of coronary artery disease.

In present study Vitamin D had inverse Correlation with Fasting Blood Sugar (Correlation co efficiency = -0.911, p value = 0.006743), Mean Blood Pressure (Correlation coefficient = -0.995, p value = 0.000000), waist circumference (Correlation coefficient= -0.291, p value = 0.029697), Total serum Triglycerides (Correlation coefficient=-0.376, p value = 0.000000) and had direct correlation with EF% in Echocardiography (Correlation coefficient = 0.268, p value = 0.000000) and HDL (Correlation coefficient = 0.422, p value = 0.000000). [TABLE-2] This was statistically significant and consistent with the studies of Kamyceva et al.[13] and Lagunora et al.[14]

Various risk factors probably either predisposed to vitamin D deficiency or were associated with the deficiency. These factors in combination with vitamin D deficiency, possibly acted as precursor or associated with progression of coronary artery disease of metabolic syndrome in various extent and severity.

CONCLUSION

The observation recorded in this study support that vitamin D deficiency having significant association with individual parameter of metabolic syndrome and left ventricular dysfunction coronary artery disease patients.

It can thus, be concluded that **vitamin D** is an important component of human body. Its deficiency may provoke athermanous plaque formation and establish coronary artery disease.

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