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The Relation of Vitamin D Status and Presence of Acute Coronary Syndrome in Patients

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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ABSTRACT

Background: Cardiovascular disease (CVD) is consists of a variety of heart disease, illnesses and events that impact the heart & circulatory system, including high blood pressure & coronary artery disease (CAD). Vitamin D is one of the fat soluble vitamins also known as sunshine Vitamin due to its synthesis in the body following exposure to ultraviolet (UV) B rays. The aim of the study is to find the status of Vitamin D & there relation to Acute Coronary Syndrome.
Materials and Methods: The present study included 50 cases of diagnosed acute coronary artery disease patients aged between 20 to 60 years and 50 apparently healthy controls and TMT negative matched for age and sex. Serum vitamin D was the measurement by ELISA method.
Study Design: Prospective Observational Study.
Results: The present study showed that significantly decreased levels of serum vitamin D ($p<0.001$) in acute coronary syndrome patients as compared with healthy controls.
Conclusion: Decreased levels of vitamin D are a risk factor for the acute coronary syndrome, and also novel marker of CHD.

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1. INTRODUCTION

Vitamin D is one of the fat soluble vitamins also known as sunshine Vitamin due to its synthesis in the body following exposure to ultraviolet (UV) B rays, however it is unique 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 [1]. The active 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 [2,3,4].

Vitamin D deficiency is prevalent 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 evidence indicates that vitamin D deficiency, cardiovascular disease and endothelial dysfunction are linked together [5]. Endothelial dysfunction is an important antecedent event in the development of CHD and atherosclerosis [6,7]. Vitamin D is known to affect vascular endothelium directly or indirectly through up-regulation of the renin-angiotensin system or via induction of smooth muscle proliferation and a proinflammatory state. A variety of possible biological mechanism (Blood pressure elevation, Insulin resistance, Inflammation, Obesity, Endothelial dysfunction, Vascular remodeling due to hyper-parathyroidism) have been proposed by which, vitamin D deficiency may cause cardiovascular events [8,9,10]. In addition, vitamin D has anti-inflammatory effects and prevents cholesterol removal by macrophage and foam cell formation on vessels walls. Also found relation has been seen between vitamin D serum level and coronary artery calcification [11].

According the Endocrine Society Practice Guideline (2011)

Reference value of vitamin D

Vitamin D level	ng/mL
Deficiency	<20
Insufficiency	20-29
Sufficiency	30-100

2. MATERIALS AND METHODS

The present study was conducted in the Department of Biochemistry in association with Department of Medicine of Major S.D. Singh Medical College Fatehgarh Farrukhabad. The period of study was from May 2016 to April 2017.

The present study included 50 cases of diagnosed acute coronary artery disease patients aged between 20 to 60 years and 50 apparently healthy controls and TMT negative matched for age and sex. Informed written consent was taken from all the subjects.

2.1 Inclusion Criteria

Patient having Acute coronary syndrome with Chest Pressure

Acute Ischaemia
Sweating
Jaw Pain
Chest Burning

2.2 Exclusion Criteria

1. Vitamin D supplementation.
2. Congestive heart failure
3. Significant chronic liver disease
4. Chronic kidney disease
5. Diabetes mellitus
6. Endocrine dysfunction
7. Malabsorption syndrome
8. Renal Rickets
9. Pregnant Female

2.3 Anthropometric Measurements

Anthropometric indices including height and weight were taken while subjects were in the standing position and wearing light clothing without shoes. Body weight and height were measured in kilograms and in centimeters, respectively. Body mass index (BMI) was calculated as weight (kilo- grams) divided by height squared (in square meters).

2.4 Collection of Samples

After overnight fasting, 5 ml of venous blood sample was drawn by venepuncture from a peripheral vein under all aseptic precautions in a disposable syringe. The blood thus collected in clean dry glass tubes was allowed to stand for 30 minutes at room temperature for the retraction of the clot. Then it was centrifuged at 3000 r.p.m. for 10 minutes to separate the serum. The serum

sample was stored at -20°C in the refrigerator for analysis. Care was taken to avoid haemolysis of the sample. Then serum was analyzed for lipid profile and vitamin D.

2.5 Data Analysis

The Statistical software namely SPSS 20.0 is used for the analysis of the data. Microsoft Word and Excel software have been used to generate graphs, tables etc.

3. OBSERVATION AND RESULTS

Table 1 shows basic characteristics of study subjects, mean age of the cases were 47.8±10.3 and that of controls were 45.4±11.1. Mean BMI of cases were 26.89±4.75 and of control were 23.93±3.42. SBP and DBP were shown significant correlation.

Table 3 shows that mean value of vitamin D in cases was 20.9±11.8 while mean value of vitamin D in controls was 37.28±8.80, the difference was statistically significant.

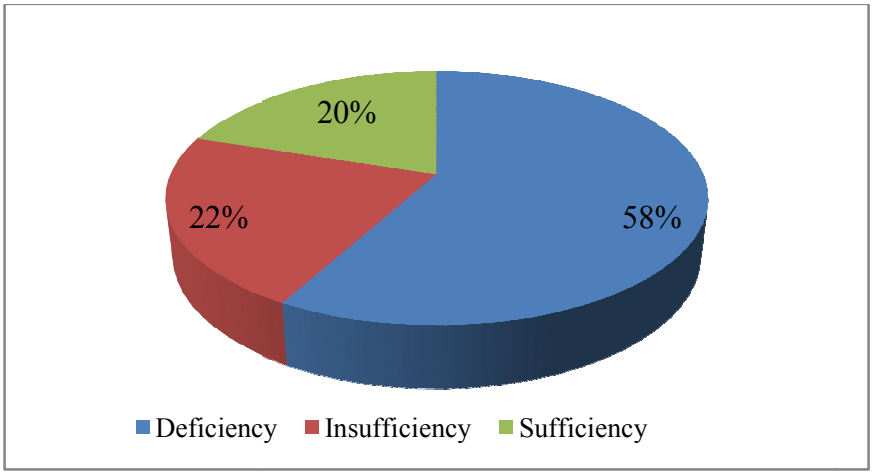
4. DISCUSSION

Vitamin D has increasingly been recognized to play a role in a broad range of bodily functions beyond bone health, including CV health. In parallel, the recognition of the presence of widespread vitamin D deficiency is increasing. The consequences of this growing epidemic of vitamin D deficiency are still not well understood. However, recent reports of the associations of vitamin D deficiency with multiple CV conditions have been of great interest, suggesting the need for prospective validation and extended observations. In the present study, we evaluated vitamin D in patients of ST-segment elevated MI.

In a research conducted by Thomas on the survivors of the Framingham study, the risk of cardiovascular disease was estimated 1.62 [12]. The findings of both of these studies suggested that vitamin D deficiency can be associated with a high risk of cardiovascular disease. Several mechanisms may explain the association between vitamin D and cardiovascular disease. Decholecalciferol regulates renin-angiotensin axis through the suppression of the renin gene. A change of 25- hydroxycholecalciferol causes changes in the smooth muscle of the vascular wall and also inflammation and thrombosis and that could explain cardiovascular complications [13,14].

Table 1. Baseline characteristics of study population

Baseline characteristics	Case (Mean±SD)	Control (Mean±SD)	P value
Age	47.8±10.3	45.4±11.1	0.266
BMI	26.89±4.75	23.93±3.42	0.001
Pulse	82.7±17.4	76.98±4.04	0.025
SBP	127.8±24.6	117.60±8.47	0.007
DBP	86.80±13.0	75.80±4.76	0.000



Graph 1. Comparison of serum vitamin D level in study population

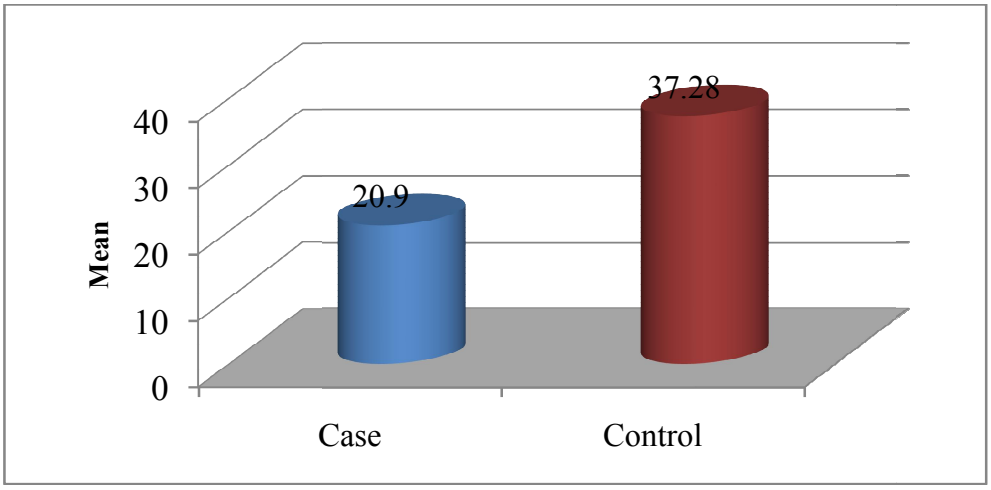
Table 2. Comparison of serum vitamin D level in study population

Vitamin D Level	Case	
	No.	%
Deficiency	29	58
Insufficiency	11	22
Sufficiency	10	20
Total	50	100

Table 2: show that 58% of cases were vitamin D deficient while 22% were insufficient

Table 3. The difference of mean of 25(OH) D serum levels between the two study groups

Parameter	Case (Mean±SD)	Control (Mean±SD)	p value
Vitamin D (25-OHD)	20.9±11.8	37.28±8.80	0.000



Graph 2. The difference of mean of vitamin D serum levels between the two study groups

4.1 VITAMIN D

In the current study, vitamin D deficiency was observed in 58% and insufficiency in 22% of total patients of ACS on taking total count to 80%. Whereas, only 20% of the population had adequate Vitamin D levels in our analysis. The results of the current study are in accordance with the study of lee JH et al. [15] wherein they reported very high prevalence up to 75% as vitamin D deficient and 21% as insufficient, making a total of 96% of patients with abnormally low vitamin D levels who presented with coronary artery disease.

5. CONCLUSION

The conclusion of the present study moderate to severe vitamin D deficiency is a new risk factor for developing cardiovascular disease. Vitamin D deficiency might be considered as a surrogate marker of poor health status. Because measurement of vitamin D levels is easily done and vitamin D supplements are readily available and inexpensive; so, further large-scale prospective studies and clinical trials are needed to establish the cause-effect relationship and to evaluate the efficacy of vitamin D supplementation in prevention of CAD.

ETHICAL DISCLAIMER

As per international standard or university standard written ethical permission has been collected and preserved by the authors.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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