

Original Research Article

To establish the interrelationship between vitamin D status and acute coronary artery disease.

ABSTRACT

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.

Low serum levels of Vitamin D were found in 58% of CHD patients as compared to 4% of healthy participants who were Vitamin D deficient, which means there might be inverse association between CHD and vitamin D deficiency.

Study Design:

Keywords: Vitamin D & Coronary Artery Disease

INTRODCUTION

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 (**Aggarwal et al., 2016**)^[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 (**Nibbelink et al., Wu-Wong et al., Merke et al.**)^[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 (**Zahra Dana Siadat et al. 2012**)^[5]. Endothelial dysfunction is an important antecedent event in the development of CHD and atherosclerosis (**McGreevy et al. 2011, Syal et al., 2012**)^[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

43 been proposed by which, vitamin D deficiency may cause cardiovascular events (**Pittas et al.,**
44 **2007, Saneci et al., 2013, Chitalia et al., 2012**)^[8,9,10]. In addition, vitamin D has anti-
45 inflammatory effects and prevents cholesterol removal by macrophage and foam cell
46 formation on vessels walls. Also found relation has been seen between vitamin D serum level
47 and coronary artery calcification (**Judd et al., 2008**)^[11].

48

49 **AIMS & OBJECTIVE**

50 To establish the interrelationship between vitamin D status and acute coronary artery
51 disease.

52

53 **MATERIAL & METHOD**

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

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

60 **Excluded from the study were subjects with**

- 61 1. Vitamin D supplementation.
- 62 2. Congestive heart failure
- 63 3. Significant chronic liver disease
- 64 4. Chronic kidney disease
- 65 5. Diabetes mellitus
- 66 6. Endocrine dysfunction
- 67 7. Malabsorption syndrome
- 68 8. Renal Rickets
- 69 9. Pregnant Female

70 **Anthropometric measurements:**

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

75 **Collection of Samples:-**

76 After overnight fasting 5 ml of venous blood sample was drawn by venepuncture
77 from a peripheral vein under all aseptic precautions in a disposable syringe. The blood thus
78 collected in clean dry glass tubes was allowed to stand for 30 minutes at room temperature
79 for the retraction of clot. Then it was centrifuged at 3000 r.p.m. for 10 minutes to separate the
80 serum. The serum sample was stored at -20°C in the refrigerator for analysis. Care was taken
81 to avoid haemolysis of the sample. Then serum was analyzed for lipid profile and vitamin D.

82

83

84

85

86

OBSERVATION & RESULTS

Table 1: 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

This table shows that 58% of cases were vitamin D deficient while 22% were insufficient.

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

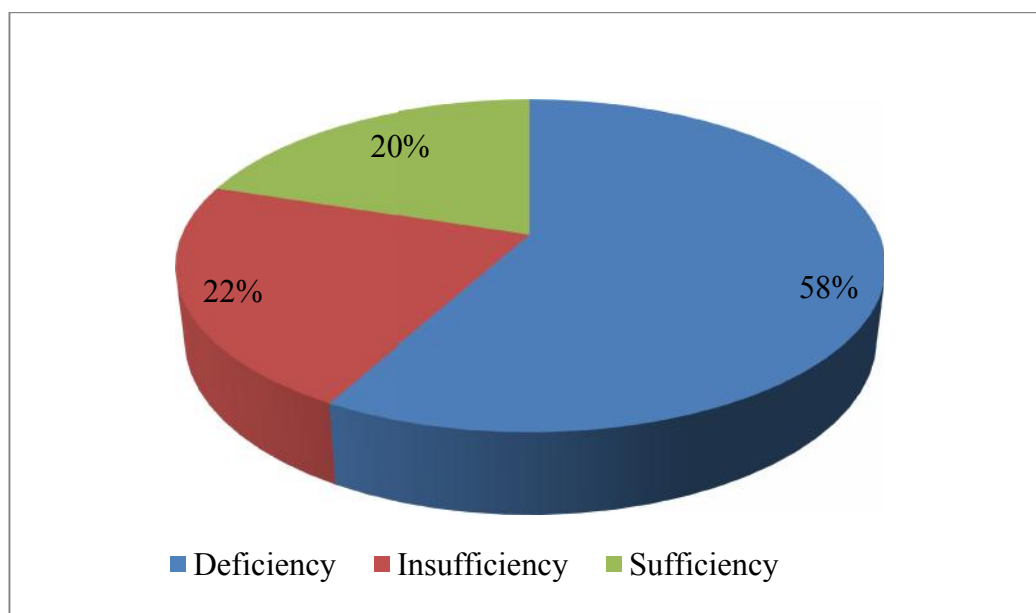
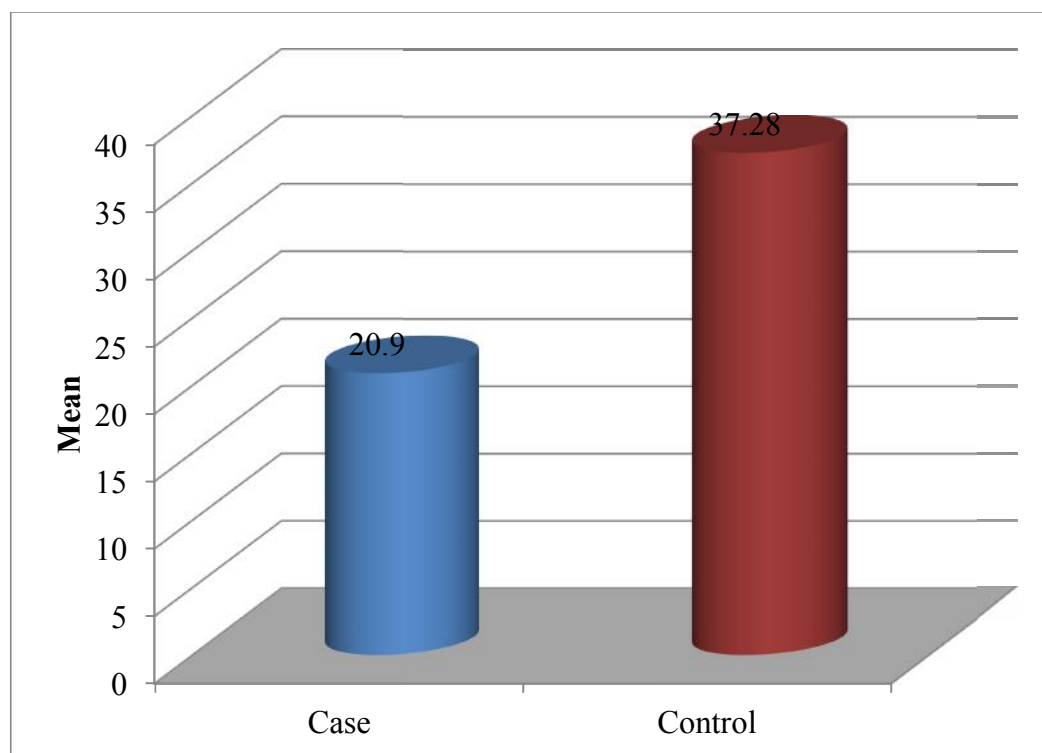


Table 2: The difference of mean of 25(OH) D serum levels between the two study groups

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

This table shows that mean value of 25 (OH) D in cases was 20.9±11.8 while mean value of 25 (OH) D in controls was 37.28±8.80, the difference was statistically significant.

Graph 2: The difference of mean of 25(OH) D serum levels between the two study groups



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 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 (Kim et al., 2004)^[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 (Zehnder et al., 2004 and Daynes et al., 1990)^[13,14].

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 25(OH)D deficient and 21% as insufficient, making a total of 96% of patients with abnormally low 25(OH)D levels who presented with coronary artery disease.

CONCLUSION

Low serum levels of Vitamin D were found in 58% of CHD patients as compared to 4% of healthy participants who were Vitamin D deficient, which means there might be inverse association between CHD and vitamin D deficiency.

We observed strong association between vitamin D and coronary artery disease. The results of the present study suggest that 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.

REFERENCES

1. Aggarwal R, Akhthar T, and Jain SK. Coronary artery disease and its association with Vitamin D deficiency J Midlife Health. 2016; Apr-Jun; 7(2): 56–60.=5
2. Nibelink KA, Tishkoff DX, Hershey SD, Rahman A, Simpson RU. 1,25(OH)2-vitamin D3 actions on cell proliferation, size, gene expression, and receptor localization, in the HL-1 cardiac myocyte. J Steroid Biochem Mol Biol Mar. 2007;103:533–7.=6
3. Wu-Wong JR, Nakane M, Ma J, Ruan X, Kroeger PE. Effects of Vitamin D analogs on gene expression profiling in human coronary artery smooth muscle cells. Atherosclerosis. 2006;186:20–8. [PubMed]=7
4. Merke J, Milde P, Lewicka S, Hügel U, Klaus G, Mangelsdorf DJ, et al. Identification and regulation of 1,25-dihydroxyvitamin D3 receptor activity and biosynthesis of 1,25-dihydroxyvitamin D3. Studies in cultured bovine aortic endothelial cells and human dermalcapillaries. J Clin Invest.=8.
5. Zahra Dana Siadat, Keyvan Kiani, Masoumeh Sadeghi, Amir Sina Shariat, Ziba Farajzadegan, and Maryam Kheirmand Association of vitamin D deficiency and coronary artery disease with cardiovascular risk factors J Res Med Sci. 2012 Nov; 17(11): 1052–1055.=9
6. Cora McGreevy and David Williams New Insights About Vitamin D and Cardiovascular Disease Ann Intern Med. 2011;155:820-826=10
7. Syal SK et al Vitamin D Deficiency, Coronary Artery Disease, and Endothelial Dysfunction: Observations From a Coronary Angiographic Study in Indian Patients Volume 24 - Issue 8 - August 2012 (/issue/3452)=11
8. Pittas AG, Harris SS, Stark PC, et al. The effects of calcium and vitamin D supplementation on blood glucose and markers of inflammation in nondiabetic adults. Diabetes care 2007;30(4):980-986=12

- 175 9. Saneei P, Salehi-Abargouei A, Esmailzadeh A. Serum 25-hydroxy vitamin D levels in
176 relation to body mass index: a systematic review and meta-analysis. *Obes Rev*
177 2013;14(5):393–404.=13
- 178 10. Chitalia N, Recio-Mayoral A, Kaski JC, et al. Vitamin D deficiency and endothelial
179 dysfunction in non-dialysis chronic kidney disease patients. *Atherosclerosis* 2012;
180 220(1):265-268.=14
- 181 11. Judd S, Tangpricha V. Vitamin D deficiency and risk for cardiovascular disease.
182 *Circulation*. 2008;117:503–11.=15
- 183 12. Kim DH, Sabour S, Sagar UN, Adams S, Whellan DJ. Prevalence of hypovitaminosis D
184 in cardiovascular diseases (from the National Health and Nutrition Examination Survey
185 2001 to 2004). *Am J Cardiol* 2008; 102(11): 1540-4.=143
- 186 13. Zehnder D, Bland R, Chana RS, Wheeler DC, Howie AJ, Williams MC, et al. Synthesis
187 of 1,25-dihydroxyvitamin D(3) by human endothelial cells is regulated by inflammatory
188 cytokines: a novel autocrine determinant of vascular cell adhesion. *J Am Soc Nephrol*
189 2002; 13(3): 621-9.=144
- 190 14. Daynes RA, Araneo BA, Dowell TA, Huang K, Dudley D. Regulation of murine
191 lymphokine production in vivo. III. The lymphoid tissue microenvironment exerts
192 regulatory influences over T helper cell function. *J Exp Med* 1990; 171(4): 979-96.=145
- 193 15. Lee JH, Gadi R, Spertus JA, Tang F, O'Keefe JH. Prevalence of vitamin D deficiency in
194 patients with acute myocardial infarction. *Am J Cardiol* 2011; 107(11):1636-8.