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Research Article

A Study of Vitamin D Levels in Patients with Acute Myocardial Infarction in a Tertiary Care Hospital in Western India

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Abstract
Introduction: *Either independently or in association with other factors low vitamin D is one of risk factors in coronary atherosclerosis athough the causal relationship is not yet established.*
Aim & Objective: *To study the prevalence of vitamin D deficiency in patients with acute myocardial infarction and to study if any association exists between them.*
Materials & Methods: *Hundred cases of acute myocardial infarction (MI) and hundred healthy controls were included in this study. The study was conducted at SDM hospital Cum Medical Research Institute, Jaipur during November 2015 to October 2016. Biochemical and clinical risk factors assessed for MI .Serum 25 (OH) vitamin D levels measured using radioimmunoassay.*
Results: *Severe vitamin D deficiency (25(OH) vitamin D less than 10 ng/ml) found in 67% of cases and 48% of controls. Vitamin D deficiency (25(OH) vitamin D 10_<30 ng/ml) found in 24% of cases and 34% of controls. Sufficient vitamin D (25(OH) vitamin D >30 ng/ml) found in 9% of cases and 18% of controls. Risk of Myocardial infarction in patients with severe vitamin D deficiency associated with an odds ratio of 2.19 (95% CI 1.1-4.9) (statistically significant p<0.05).*
Conclusions: *High prevalence of vitamin D deficiency was found among patients of acute Myocardial Infarction and controls. 25 (OH) vitamin D was significantly lower in cases as compared to controls. Even after considering for conventional risk factors for myocardial infarction severe vitamin D deficiency was associated with risk of acute myocardial infarction.*
Keywords: *Myocardial Infarction, Vitamin D Level, Atherosclerosis.*

Introduction

Vitamin D deficiency seems to predispose to hypertension, diabetes and the metabolic syndrome, left ventricular hypertrophy, congestive heart failure, and chronic vascular inflammation.(1) Epidemiologic studies have also recently linked vitamin D deficiency with increased risk of major adverse CV events.(2) Several mechanisms, direct and indirect, have been proposed for the association of vitamin D with CHD. Vitamin D could be related to CHD via blood pressure, glycemic control or parathyroid hormone (PTH). An excess of PTH levels is known to promote atherosclerosis, thus PTH excess associated with vitamin D deficiency maybe one of the contributory factors

to CHD.[3] Vitamin D deficiency is known to up-regulate Renin Angiotensin Aldosterone System (RAAS) and lead to hypertrophy of smooth muscles and left ventricle, an adverse marker of cardiovascular event.[4,5]Additionally, the effects of vitamin D deficiency on type 2DM could be mediated by its role on pancreatic b -cell function, insulin resistance, or inflammation.[6,7] Vitamin D is also known to down-regulate pro-inflammatory cytokines (e.g., TNF-a, IL-6) and up-regulate anti-inflammatory cytokine (IL-10) .[8,9]

Aims & Objectives

To study the prevalence of vitamin D deficiency in patients with acute myocardial infarction. To study any association between vitamin D deficiency and acute myocardial infarction .

Materials & Methods

A case control study included hundred cases of first incident acute myocardial infarction (MI) and hundred age and gender matched healthy controls. The study was conducted at SDM hospital Cum Medical Research Institute, Jaipur during November 2015 to October 2016. Both cases and controls were assessed for standard clinical and biochemical risk factors for MI .Serum 25 (OH) vitamin D assay was performed from stored samples for cases and controls using radioimmunoassay.

Acute myocardial infarction defined as patient having classical symptoms and electrocardiogram changes of a new Myocardial Infarction (pathological Q waves and more than 1 mm ST elevation found in any two or more contiguous limb leads or 2 mm ST elevation in contiguous precordial leads or a new LBBB) and increased level of creatine kinase-MB (CK-MB).[10,11] Hypertension was diagnosed if systolic blood pressure ≥140 mm Hg and/or diastolic blood pressure ≥90 mm Hg or having antihypertensive medication in past.[12] Fasting plasma glucose ≥126 mg/dl or post-prandial plasma glucose ≥200 mg/dl or anti diabetic medication use defined as having diabetes mellitus (DM).[13] Tobacco users defined as who smoked/chewed tobacco in the last six months and having used it continuously for more than six months.

Inclusion criteria for cases: Cases with first time acute myocardial infarction, age between 25years to 75 years. Exclusion criteria for cases: Age less than 25 year and more than 75 year, those with prior history of cardiac disease diagnosed more than thirty days before enter in the study or patients with cardiac shock, cases having pregnancy, known hepatic, thyroid or renal diseases, malignancy, patients on calcium supplementary drugs, patients on vitamin D supplementary drugs. Inclusion criteria for controls: random from general population unrelated to known or potential risk factors for MI, age between 25 years to 75 year. Exclusion criteria for controls: Age less than 25 year and more than 75 year, those with history of cardiac disease, controls having pregnancy, known hepatic, thyroid or renal diseases , malignancy, and those on calcium supplements, those on vitamin D supplements.

Refrance range Vit D level –(ng/ml)

<10 - Severly deficient

10- ≤30 - Deficient

30-100 - Sufficient.

Results

Cases has high family history of cardiovascular disease, DM, hypertension, and high tobacco and alcohol user. Cases has high total cholesterol and LDL cholesterol. There is no difference in age, HDL cholesterol, body mass index, and triglycerides in cases and controls. The 25(OH) vitamin D level (median) is significantly low in cases as compare with controls (Table 1).

We found that vitamin D deficiency shows significant difference in the distribution among the cases and controls. Table shows high prevalence of vitamin D deficiency in cases and controls. Table shows prevalence of severe deficiency of vitamin D (25(OH) vitamin D less than 10 ng/ml) was present in 79.2% of cases

and in 46.7% of controls. Vitamin D levels was sufficient only in 1.7% of cases and 4.2% of controls. (Table 2)

Table : 1 The Charastric of Cases and Controls

	Cases (n=100)	Controls (n=100)	p value
Age(years)(mean ± sd)	57 ± 10.98	56 ± 8.69	>0.05
Male%	72%	65%	>0.05
Hypertension%	58%	22%	<0.05
Diabetes%	30%	18%	<0.05
Tobacoo use%	58%	42%	<0.05
Alcohol use(%)	4%	2%	<0.05
Family hisory of CHD(%)	22%	8%	<0.05
Body Mass Index(mean±sd)	26.9 ± 3.59	26.6 ± 4.32	>0.05
Total Cholestrol(mean±sd) (mg/dl)	182.1 ± 20.54	170 ± 11.48	<0.05
HDL Cholestrol (mean ± sd) (mg/dl)	37.4 ± 2.50	38.97 ± 2.30	>0.05
LDL Cholestrol(mean±sd) (mg/dl)	132±21.40	115.4±11.43	<0.05
Triglyceride(mean±sd) (mg/dl)	154±13.87	142.3±11.64	>0.05
25 (OH)Vitamin D levels (ng/ml) (median, interquartile range)	9.1 (6.3-12.1)	15.45 (11.5-19.4)	<0.05

Table: 2 Distribution of Vitamin-D level between cases and controls

	Cases n=100	Controls n=100	p value
Severe deficiency (<10 ng/ml)	67(67%)	48(48%)	<0.05
Deficiency (10 - ≤30 ng/ml)	24(24%)	34(34%)	
Sufficient (>30 ng/ml)	9(9%)	18(18%)	

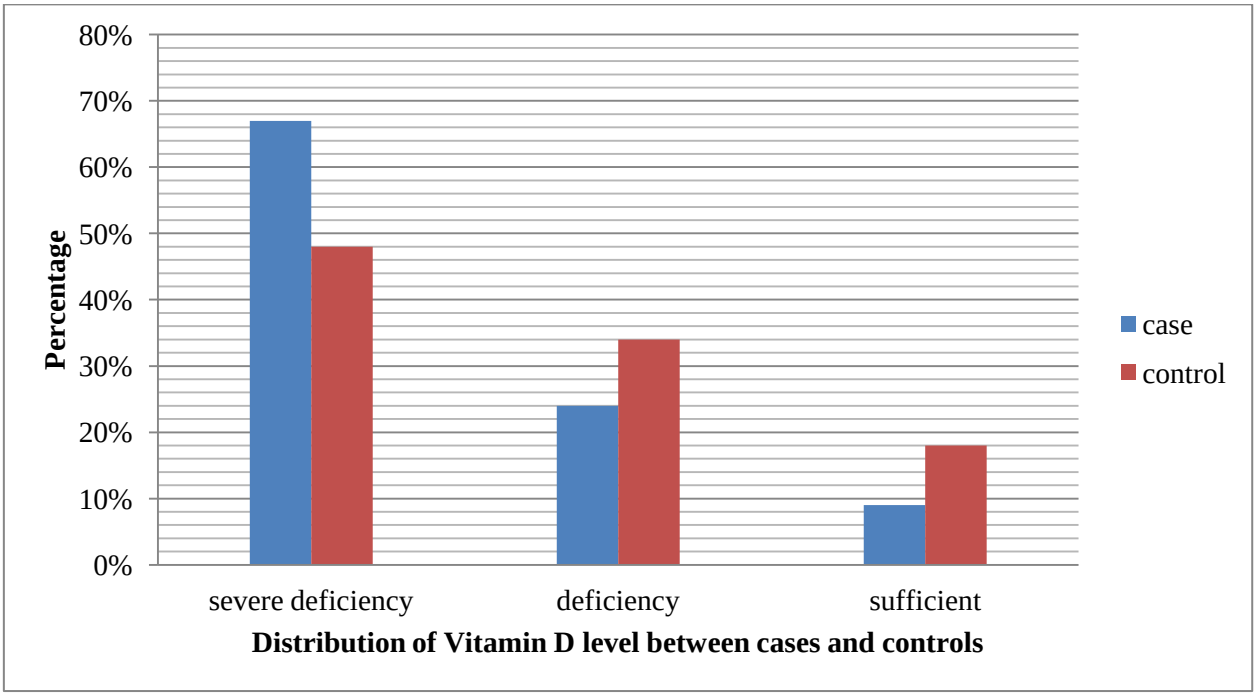

Figure-1 Distribution of Vitamin D Level between Cases and Controls

Discussion

Deficiency of vitamin D is highly prevalent in western part of India. Study shows that vitamin D level is much lower in cases as compared to controls. Despite the rampant vitamin D deficiency, Risk of acute Myocardial Infarction is associated with severe vitamin D deficiency even after adjusting to the previously known risk factors for cardiovascular diseases. This study is comparable with other studies from India as it shows comprable high prevalence of vitamin D deficiency.

The present study show high prevalence of vitamin D deficiency which is similar to a study of Vitamin D levels in rural population in North Indians shows high prevalence of Vitamin D deficiency as compared to urban population, the prevalence of vitamin D deficiency [serum 25(OH) vitamin D < 30 ng/ml] found was as high as 70%.[14] Similar results seen in a study from Delhi, in healthy people above 50 years of age found deficiency in 91.2% which include severe deficiency in 62% and vitamin D insufficiency in 6.8% of the population.[15] Similar a study from Andhra Pradesh in India reported a very high prevalence of vitamin D deficiency.[16] Similar results in a nested case-control study of the Health Professional Follow-Up Study (HPFS), individual with vitamin D deficiency were at high risk of Myocardial Infarction compared to individual with normal vitamin D levels.[17]

A case-control study done in patients of acute Myocardial Infarction in America reported similar inverse association between 25(OH) vitamin D levels and the risk of acute Myocardial Infarction.[18] Similarly a study from Pakistan found that people with normal levels of 25(OH) vitamin D had low risk of Myocardial Infarction as compared to people with vitamin D deficiency.[19] Similar results from a study by Syal et al at North India shows that in patients with vitamin D deficiency coronary angiography show more severe coronary artery disease and greater endothelial dysfunction .[20]

However, there were many limitations in the study including design (case control study) with its limitations. Physical activity information was limited and no data available on skin pigmentation and pattern of diet varies with communities and regions. Women representation was less an compared to men. Exposure to sunlight varies with distance from equator.

Summary & Conclusion

In conclusion, the study shows a high prevalence of vitamin D deficiency among patients of acute Myocardial Infarction. As compared to controls levels of serum 25 (OH) vitaminD was significantly lower among cases. Even after adjusting to the previously known risk factors for cardiovascular diseases, severe vitamin D deficiency is associated with risk of acute Myocardial Infarction. To prevent vitamin D deficiency, people should be encouraged for sun exposure and to take diet rich of vitamin D by food fortification

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