



**ORIGINAL RESEARCH PAPER**

**General Medicine**

**ASSOCIATION OF VITAMIN D AND CARDIOVASCULAR DISEASE – A CROSS SECTIONAL STUDY IN A TERTIARY CARE CENTRE**

**KEY WORDS:** Cardiovascular disease, Coronary artery disease, Hypertension, Vitamin D.

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**ABSTRACT**

**Background:** Historically, vitamin D has been linked to absorption of calcium in bones. In addition to bone, the vitamin D receptor (VDR) is expressed in other tissues and cells like lymphocytes, cardiomyocytes and endothelium, among other tissues and cells. Recent research has revealed a link between vitamin D and cardiovascular conditions (CVDs), including hypertension, coronary artery disease (CAD) and heart failure. **Aim:** The aim of the present study is to determine the association between Vitamin D and cardiovascular disease. **Materials And Method:** Cross sectional study conducted in General Medicine department, for a period of 2 years. 4078 cases that satisfy the inclusion criteria during the study period were included. Patient details including age, gender, physical activity, smoking habits and alcohol consumption were collected. Vitals were monitored. Blood sample was collected and sent for assessing to Vitamin D level. Data entered in excel sheet. Statistical Analysis was carried out using SPSS 20.0 version. Chi square test was done to assess statistical significance. **Results:** The age group of patients ranges from 30 to 80 years. Mean age group of CVD group (65.32±16.12) was higher when compared to non-CVD group. The association between age, physical activity, smoking, chronic kidney Disease, Hypertension and Hypercholesterolemia showed statistical significance with CVD. The mean Vitamin D level was lower in CVD group compared to no CVD group. No significant statistical association was found between vitamin D and both groups. **Conclusion:** Vitamin D deficiency was not associated with a significant risk of cardiovascular disease in the present study but showed a reduction in Vitamin D level.

**INTRODUCTION:**

Cholecalciferol (vitamin D3) and Ergocalciferol (vitamin D2) are different forms of vitamin D that are synthesised by animal and plant tissues, respectively. 7-dehydrocholesterol which is also found in human skin, on exposure to Ultraviolet-B light (290 to 310 nm) produces vitamin D.<sup>1</sup> According to estimates, cutaneous synthesis accounts for 80–90% of vitamin D synthesis, with food accounts for the remaining 20%.<sup>2</sup>

The growth and preservation of bone tissue is vitamin D's primary function. It is in charge of preserving the equilibrium of calcium and phosphorus.<sup>3</sup> Vascular smooth muscle, endothelium, and cardiomyocytes are few of the tissues that contain vitamin D receptors.<sup>4</sup>

At all phases of life, vitamin D shortage and insufficiency is being documented worldwide. Regardless of age, ethnicity, or region, a significant portion of the world's population has low serum levels of vitamin D, according to epidemiological studies.<sup>5</sup> Low levels of vitamin D have been associated with the pathogenesis of a number of diseases like cardiovascular diseases, notably hypertension, heart failure, atherosclerosis, and peripheral artery disease. This is recognized as a public health problem.<sup>6</sup>

Cardiovascular disease (CVD) is a serious health issue that increases the risk of morbidity and mortality. Acute myocardial infarction (AMI) patients often have vitamin D insufficiency, and preliminary research suggests that vitamin deficiency may affect both the short- and long-term prognosis for AMI patients.<sup>7</sup>

There is considerable and rising evidence that this chronic process also exhibits inflammation. Recent studies have shown that vitamin D deficiency is linked with increased immune activation and inflammation and can have inverse relation to a variety of health-related processes, including myocardial infarction.

Contrarily, vitamin D insufficiency also seems to safeguard

against CVD, which may be partly related to vitamin D's immunomodulatory and anti-inflammatory properties. Low serum vitamin D levels have been linked to an increased risk of cardiovascular disease in observational studies.<sup>8,9</sup>

**AIMS AND OBJECTIVES:**

To evaluate the association between serum vitamin D and cardiovascular disease.

**MATERIALS AND METHODS:**

Cross sectional study conducted in General Medicine department, Sree Mookambika Institute of Medical Sciences, Kulasekharam for a period of 2 years. Study data was collected from September 2020 to August 2022. 4078 cases that satisfy the inclusion criteria during the study period were included. All patients in the age group ranges from 30 to 80 years were included in the study and patients not willing to participate in the study were excluded.

Patient details including age, gender, physical activity, smoking habits and alcohol consumption were collected. Vitals were monitored. Blood sample was collected and sent for assessing to Vitamin D level. Data entered in excel sheet. Statistical Analysis was carried out using SPSS 20.0 version. Chi square test was done to assess statistical significance. A p value <0.05 was considered statistically significant.

**OBSERVATION AND RESULTS:**

The age group of patients ranges from 35 to 80 years. Mean age group of CVD group (65.32±16.12) was higher when compared to non-CVD group (49.82±17.83). The common age group affected in CVD group was 51 to 70 years.

The association between both groups showed statistical significance. Smoking showed significant association with CVD while no significance was found with alcohol consumption. (Table 1). Physical activity also showed significant association with CVD. (Table 2)

**Table 1: Comparison Of Smoking And Alcohol**

**Consumption With Both Group**

	No CVD	CVD	p-value
Smoking status, n (%)			<.001
Current smoking	984 (27.52)	97 (19.32)	
Former smoking	494 (13.81)	186 (37.05)	
Never smoking	2098 (58.67)	219 (43.63)	
Alcohol consumption, n (%)	2634 (73.65)	391 (77.89)	0.276

**Table 2: Comparison Of Physical Activity With Both Group**

Physical activity (Minutes/week)	No CVD	CVD	p-value
No (0)	2156 (60.29)	367 (73.11)	<.001
Inactive (1-149)	303 (8.47)	46 (9.16)	
Active (Above 150)	1723 (48.18)	89 (17.73)	

Association between hypertension, Diabetes mellitus, Hypercholesterolemia and Chronic kidney Disease (CKD) with CAD was given in table 3.

**Table 3: Comparison Of Associated Disorders With Both Group**

Associated disorders	No CVD	CVD	p-value
Hypertension, n (%)	1032 (28.85)	276 (54.98)	<.001
Diabetes mellitus, n (%)	674 (18.84)	165 (32.86)	<.001
Hypercholesterolemia, n (%)	962 (26.90)	210 (41.83)	<.001
CKD, n (%)	239 (6.68)	209 (41.63)	<.001

The mean Vitamin D level was lower in CVD group compared to no CVD group. No significant statistical association was found between vitamin D and both groups. (Table 4)

**Table 4: Comparison Of Vitamin D Levels With Both Group**

Vitamin D level	No CVD	CVD	p-value
25(OH)D (nmol/mL) - Mean	69.35±29.34	65.83±43.12	0.423
Normal (>75)	1089 (30.45)	123 (24.50)	0.934
Insufficiency (50-74.9)	1389 (38.84)	247 (49.20)	
Deficiency (25-49.9)	909 (25.42)	98 (19.52)	
Severe deficient (<25)	189 (5.29)	34 (6.77)	

**DISCUSSION:**

In the present study, common age group affected in CAD patients was 51 to 70 years with a mean age group of 65.32±16.12 years. Comparison between both groups showed statistical significance. This finding was comparable to study done by Shechter M et al.<sup>9</sup> in 42 stable coronary patients found a mean age of 68 years (range 48–83). Kondreddy R et al.<sup>10</sup> in their study also found that incidence of CAD was common in the age group of 51 to 60 years. Maha A et al.<sup>11</sup> conducted a study in 300 subjects aged between 40 to 69 years found a mean age (57.41±6.38) higher in CVD patients compared to control group.

Smoking and Alcohol consumption showed significant association with CAD in the current study. Shin J et al.<sup>12</sup> conducted a study to find the association of CVD incidence with smoking pack-years and alcohol consumption. They investigated using the multivariate Cox proportional hazard model and found that Smoking and alcohol consumption, independently and jointly, were associated with CVD risk in men and women.

In the present study lack of physical activity was found to be increased in patients with CAD. This was similar to study done by Franco OH et al.<sup>13</sup> In comparison to males aged 50 or older who maintained a low physical activity level, they observed

that moderate and high levels of physical exercise resulted in 1.3 and 3.7 years greater total life expectancy and 1.1 and 3.2 years lived without cardiovascular disease, respectively. For women, the differences in total life expectancy and the additional years without cardiovascular disease were 1.5 and 3.5 years, respectively.

The present study found association with diabetes mellitus and CAD. Al-Nozha, M.M et al.<sup>14</sup> in their study confirmed that CAD occurs much more common in diabetics than in the general population, as shown by our results of fasting blood glucose of 7.5 mmol/l in subjects with CAD compared to 6.7 mmol/l for subjects without CAD (P<0.0001).

Hypertension was seen in 54.98% of the CAD patients. Eswaran A et al.<sup>15</sup> in their study found that among the 102 patients, Hypertension was seen more in patients with CAD 75 (73.5%) when compared to non-CAD patients 27 (26.5%). This was similar to the present study.

Lipid profile was elevated in 41.83% of the CAD patients. Comparison between both groups showed statistical significance. This shows the relationship between dyslipidemia and CVD. Kumar L et al.<sup>16</sup> found that the total cholesterol, HDL cholesterol, LDL cholesterol and triglycerides concentrations were significantly higher (p < 0.05) in coronary heart disease patients. Similarly, Mohsen M et al.<sup>17</sup> observed that hypercholesterolemia was a strong risk factor of CHD.

McCullough PA et al.<sup>18</sup> did a study to compare National Kidney Foundation Kidney Early Evaluation Program (KEEP) with National Health and Nutrition Examination Survey (NHANES) 1999-2004 data for prevalence of cardiovascular disease risk factors and cardiovascular outcomes. According to the study, people with and without CKD experienced myocardial infarction or stroke rates of 16.5% in KEEP and 15.1% in NHANES (P 0.001) and 7.8% in KEEP and 3.7% in NHANES, respectively. The current investigation, in which we found an association between CVD and CKD, was comparable.

Present study showed that the mean Vitamin D level was reduced in CVD patients compared to non-CVD patients. But no association was found between Vitamin D and CVD. Li Q et al.<sup>19</sup> found that percentage of subjects with CVD was higher in those with lower levels of vitamin D, yet this did not reach a statistically significant (P = .887). This was comparable with the current study. But in the same study they found a significant positive association between vitamin D level and CVD was observed only in the high CRP group.

In a study by LaCroix et al.<sup>20</sup> 1,000 mg CaCO3 Plus 10 g/d of cholecalciferol were administered for 7 years to 36,282 participants in the Women's Health Initiative (18,176 postmenopausal women received vitamin D and 18,106 received a placebo). They discovered that there had been no discernible drop in cardiovascular mortality.

Men who took part in the Health Professionals Follow-up Study were evaluated by Giovannucci et al.<sup>21</sup> for their risk of cardiovascular disease and their serum 25(OH)D levels. When compared to men with adequate levels of vitamin D (30 ng/mL or 75 nmol/L), men with vitamin D deficiency (15 ng/ml or 37 nmol/L) had a significantly higher risk of myocardial infarction (RR 2.09; 95% CI: 1.24–3.54).

Pilz et al.<sup>22</sup> found that patients with severe vitamin D deficiency [25(OH)D 25 nmol/L] had a chance of dying from heart failure or cardiac arrest that was three to five times greater than among patients with ideal levels of vitamin D [25(OH)D 75 nmol/L]. This was determined by comparing vitamin D status among more than 3000 subjects over a seven-year follow-up period.

Vacek JL et al.<sup>23</sup> conducted a study in 10,899 patients. Of the

10,899 patients, 3,294 (29.7%) had vitamin D levels within the normal range, whereas 7,665 (70.3%) had deficiencies. According to the study's findings, vitamin D deficiency was linked to a number of cardiovascular diseases, such as hypertension, coronary artery disease, cardiomyopathy, and diabetes (all p 0.05), and vitamin D supplementation significantly improved survival rates (odds ratio for death 0.39, 95% confidence interval). This was in contrast to the present study.

**CONCLUSION:**

Worldwide, there is a high prevalence of vitamin D deficiency, and numerous studies have found a direct link between low vitamin D levels and cardiovascular illnesses. Finding the right connections between vitamin D status and cardiovascular disease is crucial since it could help avoid these diseases. In the current investigation, mean vitamin D levels were found to be lower in CVD patients, although there was no statistically significant link between vitamin D and CVD.

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Nil.

**Conflicts Of Interest:**

There are no conflicts of interest

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