ASSOCIATION OF VITAMIN D LEVELS WITH IN-HOSPITALS & SHORT TERM CARDIOVASCULAR OUTCOMES IN ACUTE CORONARY SYNDROME

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Abstract
Background: Our goal was to evaluate vitamin D3 levels in the following patients. ACS and its potential influence on hospitals Short-term cardiovascular outcome. **Method and materials:** This prospective observational study included 310 patients. Consecutive ACS in Wazirabad Institute of Cardiology Gujranwala during July 2019 till February 2020 diagnosed with a shared history of angina, changes in electrocardiography, and cardiac enzymes were included in the research. The main results of the study were all-cause hospital deaths. The secondary endpoint in hospitals for important adverse heart events (MACEs). **Results:** patients with dyslipidemia(45.4% p= 0.001) & diabetes (46.7%, p = 0.04%) significantly higher in the vitamin-deficient population. In group D deficiency, blood glucose levels increased significantly (P = 0.045, 0.048, 0.013 and 0.024), hbA1C, LDL, & total cholesterol. There was no association between mortality and MACE in patients with recurrent vitamin D and vitamin D deficiency. **Conclusion:** in acute coronary syndrome, the deficiency, and insufficiency of vitamin D were typical. In the present research, there is a strong link in ACS patients with diabetes and dyslipidemia and deficiency of vitamin D, but no association between vitamin D deficiency and outcomes of ACS.
Keywords: acute coronary syndrome, vitamin D deficiency, diabetes,

Introduction

Cardiovascular diseases (CVDs) are the most common health conditions globally, leading to increased mortality and morbidity.[(1)] Many conventional risk factors for coronary artery disease (CAD) prognosis exist; however, several novel risk factors have been evaluated in previous studies and remain a source of debate due to their association and relationship in the pathophysiology of CVD. (2) Deficiency of Vitamin D has recently been recognized as a possible risk factor for underlying CVD. [(3)] Vitamin D deficiency affects approximately one billion people worldwide. As a result, the focus of research has turned to the function of vitamin D levels in the pathophysiology of cardiovascular disease. According to previous research, in India, the occurrence of Vitamin D deficiency is between 50 - 90 percent. [(4)] Deficiency of Vitamin D has also been connected to cardiovascular disease risk factors: hypertension, increase sugar level in the blood, metabolic syndrome, heart enlargement, and chronic kidney disease [(5, 6)] deficiency of Vitamin D has been related to CVD risk factors and myocardial infarction and all-cause mortality, including cardiovascular mortality, in epidemiologic studies. (7) Shanker *et al*.(8) showed that patients in the lowest quartile of Vitamin D had a higher risk of CAD; however, there was no connection between CAD intensity and Vitamin D levels. Endothelial activity, arterial stiffness, and coronary flow reserve are all independently correlated with 25(OH) D levels in healthy volunteers. (9) Normalization of 25(OH) D levels at six months was related to a substantial increase in reactive hyperemia indices in a subgroup of participants with Vitamin D deficiency (monitoring endothelium-dependent relaxation). Treatment with Vitamin D increased arterial stiffness in other studies as well (pulse wave velocity).

This research aimed to see if any connections existed in an unselected cohort of acute coronary syndrome (ACS) patients with 25-hydroxy (OH) D levels and complications in hospital, including morbidity and mortality, were present. We studied the plasma level of vitamin D and its association to clinical outcomes for patients with ACS in this context.

Materials and methods

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Study population

This prospective observational study included a total of 310 patients. Consecutive ACS in Wazirabad Institute of Cardiology Gujranwala during July 2019 till February 2020 diagnosed with a shared history of angina, changes in electrocardiography, & cardiac enzymes were involved in the research. In ACS patients with acute ST-segment elevation myocardial infarction, the third universal myocardial infarction conception was diagnosed (STEMI). Patients with a history of ischemic heart disease have also been enrolled. The research removed ACS patients with chronic kidney disease, valvular heart disease, chronic heart disease, liver cirrhosis, and alcoholic liver disease, use of corticosteroids and rifampicin, and failure to give written consent. After Ethics Committee's approval, each patient signed a written consent form and was tested using a pre-designed proforma.

Data collection

Data were collected using direct anthropometric measurements (vitamin D serum, liver function tests, cardiac enzymes, and lipid profiles) and biochemical tests. A Standard face-to-face questionnaire was used indirectly. More variables were used in the questionnaire. The essential components of the questionnaire were personal demographic and socioeconomic data such as gender, age, marital status, and employment. Students clinically studied a family history of coronary heart disease and hyperlipidemia based on a medical history predicting coronary heart disease and factors related to lifestyles like physical activity and smoking. To confirm or exclude ACS, the clinical review was performed for patients and controls: a family history of participants, medical history of ACS predisposition, history of drug use, and a comprehensive physics exam, including 12 lead ECGs and 2D echocardiography to prove ACS in both cases.

Laboratory measurements

Statistical analysis

For the analysis of results, spss version 20 was used. The standard deviation & mean of the quantitative variable were calculated, and the qualitative variable was expressed as a percentage (percent). The independent sample t-test was used to compare the parameter values between classes. The chi-square test was used to evaluate categorical variables. Two-tailed P 0.05 was used to find out the nominal significance.

Results

As shown in table 1, the study population's baseline characteristics were divided into three categories: average, inadequate, and deficient Vitamin D levels. The baseline characteristics of the three classes were statistically indistinguishable. There was no gender gap in Vitamin D deficiency in our sample population.

Characteristics	All patients (*n*=310), *n* (%)	>30 ng/ml (*n*=16), *n* (%)	20-30 ng/ml (*n*=37), *n* (%)	<20 ng/ml (*n*=257), *n* (%)	*P*
Age	55.86±10.02	57.12±7.08	55±12.50	55.45±10.49	0.79
Male	235 (76)	12 (75)	28 (75.6)	195 (75.8)	0.77
Female	75 (24)	4 (25)	9 (24.4)	62 (24.2)	0.87
STEMI	192 (62)	9 (56.2)	23 (62.1)	160 (62.2)	0.83
NSTEMI	52 (16.7)	1 (6.3)	6 (16.2)	45 (17.5)	0.50
UA	66 (21.3)	6 (37.5)	8 (21.7)	52 (20.2)	0.26

STEMI: ST elevation myocardial infarction, NSTEMI: Non-ST elevation myocardial infarction, UA: Unstable angina

This table shows the relationship between cardiovascular disease and various risk factors for vitamin D. the patients with hyperlipidemia and diabetes was significantly higher (P = 0.04; P 0.001).

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	All patients (*n*=310), *n* (%)	>30 ng/ml (*n*=16), *n* (%)	20-30 ng/ml (*n*=37), *n* (%)	<20 ng/ml (*n*=257), *n* (%)	*P*
HTN	113 (36.4)	6 (37.5)	13 (35.1)	94 (36.6)	0.98
Diabetes	136 (43.8)	3 (18)	13 (35.1)	120 (46.7)	0.04
Smoking	100 (32.26)	8 (50)	11 (29.7)	81 (31.5)	0.28
Dyslipidemia	128 (41.2)	3 (24.2)	4 (10.8)	121 (45.4)	<0.001

In addition, the relationship between the occurrence of a significant adverse cardiac event (MACE) and Vitamin D levels is depicted in table 3. The occurrence of MACE and the amount of Vitamin D did not vary significantly.

Events	Vitamin D normal (*n*=16), *n* (%)	Vitamin D deficiency (*n*=257), *n* (%)	*P*
Death	1 (6.2)	20 (7.7)	0.79
Cardiogenic shock	1 (6.2)	15 (5.8)	0.63
AKI	1 (6.2)	16 (6.2)	0.59
VT	1 (6.2)	18 (7)	0.69
Acute pulmonary edema	1 (6.2)	16 (6.2)	0.59
Mechanical ventilation	1 (6.2)	16 (6.2)	0.59

AKI: Acute kidney injury, VT: Ventricular tachycardia

Table 4 shows the laboratory profiles of the patients based on their Vitamin D levels. Blood glucose, HbA1C, LDL, and T. CHL. all in the group related to vitamin D deficiency (P = 0.045, 0.048, 0.013, and 0.024) were significantly higher.

Parameters	All patients (n=310)	>30 ng/ml (n=16)	20-30 ng/ml (n=37)	<20 ng/ml (n=257)	P
SBP (mm of Hg)	126.95±17.02	126.37±12.14	126.97±20.52	127.50±18.40	0.96
Blood glucose (mg/dl)	144.20±92.73	126.31±19.66	141.84±20.12	160.49±20.42	0.04
HbA1c (%)	6.01±1.28	5.83±0.82	5.89±2.03	6.9±0.98	0.04
Serum creatinine (mg/dl)	0.89±1.37	1±0.42	0.55±0.37	1.11±3.32	0.57
HB (g/dl)	12.84±3.67	12.42±1.85	12.63±2.16	13.46±7.01	0.65
Troponin (ng/ml)	10.27±16.09	10.76±16.67	10.37±16.04	9.69±15.56	0.94
HDL (mg/dl)	44.98±14.08	44.81±10.64	44.03±11.79	46.11±19.80	0.79
LDL (mg/dl)	128.16±18.51	104.20±19.29	128.50±18.89	132.78±17.44	0.01
Total cholesterol (mg/dl)	181.1±47.2	174.4±42.2	180.4±49.2	186.6±50.2	0.02

SBP: Systolic blood pressure, HbA1c: Hemoglobin A1C, HB: Hemoglobin, HDL: High-density lipoprotein, LDL: Low-density lipoprotein

Discussion

Current studies show that most enrolled ACS patients had vitamin D. deficiency, which confirms that ACS patients have a shortage of vitamin D. Additionally, patients with heart risk factors such as diabetes and dyslipidemia have low vitamin D levels in this study. It was also supplemented with slightly higher blood sugar levels: Hba1c, LDL, and T.CHOL. However, in patients with vitamin D deficiency, no association was observed between vitamin D levels in patients with ACS and hospital complications, death, or MACE.

In the present work, 62 percent of the 310 patients had STEMI, 16.7% had NSTEMI, and 21.3 percent had dysfunctional angina. Following that, an Indian study examined the clinical profile of ACS patients in a tertiary care center and discovered that 76 percent of STEMI patients, 18.2% of NSTEMI patients, and 5% of dysfunctional angina patients had STEMI. (10)

According to Dziedzic et al., the lowest Vitamin D level was found in a group of ACS patients with diabetes. [(11)] Vitamin D deficiency and insufficiency were diagnosed in 46.7 percent and 35.1 percent of diabetic ACS patients, respectively, in this study, and the difference was clinically significant (P = 0.047). In addition, blood glucose (P = 0.045) and HbA1c (P = 0.048) levels were significantly higher in the Vitamin D deficient and inadequate classes. Gagnon et al. It was found that the average serum vitamin D concentration in diabetic patients was lower than that in non-diabetic patients(12).In our sample, 63.4 percent of patients with Vitamin D deficiency had extreme LVD, compared to 31.5 percent of patients with average Vitamin D levels who had severe LVD. The difference (P = 0.04) was statistically significant.

In this study, total cholesterol and LDL levels were significantly higher in patients with vitamin D deficiency (P = 0.024 and P = 0.013, respectively). These levels steadily increased from normal to vitamin deficiency. D. Vitamin D deficiency is positively correlated with T. CHL (coefficient = 0.35, P 0.002) and inversely associated with triglyceride (coefficient = 0.24, P 0.001) and LDL (coefficient = 0.34, P 0.001), according to Wang et al.(13) Dziedzic et al. confirmed this statement by conducting a study of the effect of vitamin D on the incidence of coronary atherosclerosis and lipid profile in heart patients. They found a significant inverse relationship between D25 (OH) levels and hyperlipidemia (hyperlipidemia is explained by T. CHL> 200 mg/dL or triglyceride> 150 mg/dL) (= 0.13, P 0.05). According to a previous study, low Vitamin D levels promote atherosclerosis by increasing the inflammation of vessels, dysfunction of endothelium, and proliferation of smooth muscle cells. (14) Vitamin D deficiency is a possible and graded risk factor for CVD. According to a multivariate analysis study conducted by Wang et al., Given the high occurrence of Vitamin D deficiency, these results can benefit public health.

Deficiency of vitamin D is linked with the risk of mortality (15) (16). Twenty (7.7%) of the 257 Vitamin D-deficient patients in our study died. The difference in mortality rates between the groups was not statistically meaningful. It was most likely due to the limited number of participants in our research. Furthermore, our study found no correlation between vitamin D levels & age or gender. According to Karur et al., there was no significant difference in Vitamin D deficiency by age or gender. Still, it was more common in people with lower socioeconomic status, higher cholesterol levels, dyslipidemias, and diabetic patients. [17]

Limitations

The current study limitations should be acknowledged when interpreting the findings. First, the study's limited sample size made it difficult to identify in-hospital mortality. Second, since the research was performed in a single large high-volume tertiary care center, the findings do not apply to the general population. Third, we just looked at in-hospital results with no follow-up. Fourth, latitude, season, sunlight exposure, skin color, and serum albumin affect Vitamin D status, which was not included in the study.

Conclusion

In patients with ACS, deficiency and insufficiency of vitamin D were common. Lack of Vitamin D was strongly connected to diabetic and dyslipidemic ACS patients in the current study, but there was no connection between Vitamin D deficiency and MACE. Extensive, multicenter studies are also required to determine the relationship between Vitamin D levels and ACS, as well as its long-term prognosis. In vitamin D supplementation interventional trials, such confirmation is needed.

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