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ASSOCIATION OF VITAMIN D DEFICIENCY WITH ISCHEMIC CARDIOMYOPATHY

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Abstract:
Introduction: *Vitamin D plays a vital role in maintaining adequate serum calcium and phosphate levels for bone mineralization and optimal skeletal health.* ***Objectives:*** *The main objective of this study is to analyse the association of vitamin D deficiency with ischemic cardiomyopathy.* ***Material and methods:*** *This cross sectional study was conducted in Central Park Medical College during 2019. All study participants underwent physical examinations, blood analysis, and echocardiographic evaluation. Venous blood samples were collected in the morning after an overnight fast (10 to 12 hours). Afterwards, the serum was separated via centrifugation and immediately transported to the laboratory for biochemical analysis.* ***Results:*** *The data was collected from 50 patients. There were no differences in age, gender, body mass index, and sun exposure within the groups. Biochemical parameters were not significantly different in all study participants except that patients with ICMP had low calcium levels than the control group. The mean 25(OH) D3 levels were significantly lower (14.5 ± 7.4 ng/ml vs. 28.2 ± 12 ng/ml, P = 0.001), whereas PTH (90.5 ± 28.5 pg/ml vs. 57 ± 20.2 pg/ml, P = 0.02) and NT-proBNP levels were significantly greater in patients with ICMP than controls.* ***Conclusion:*** *It is concluded that patients with ICMP had lower Vitamin D levels than controls, and Vitamin D deficiency had a significant correlation with cardiac function.*

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INTRODUCTION:

Vitamin D plays a vital role in maintaining adequate serum calcium and phosphate levels for bone mineralization and optimal skeletal health. Recent literature, however, has indicated a much broader role of Vitamin D than simply the regulation of calcium metabolism as Vitamin D receptors (VDRs) are found in a variety of cells and tissues [1]. These include malignant breast, colon, and prostate cells and normal cells of the immune system, kidney, heart, and vasculature [2]. Vitamin D likely confers physiologically relevant pleiotropic functions that include cardioprotective and immunomodulatory effects as well as enhances antimicrobial function and its deficiency could lead to increased risk of cardiovascular disease and cancer [3].

The cases of vitamin D insufficiency are common both in the North American and in the European countries. Vitamin D, a steroid hormone, is also well known for its necessary role in calcium balance and musculoskeletal metabolism [4]. However, there is a growing body of evidence indicating that there may be a relationship between vitamin D deficiency and cardiovascular diseases [5]. Vitamin D receptors present wide distribution throughout the cardiovascular system including vascular smooth muscle, endothelium, and cardiomyocytes [6].

Recent studies reported that low vitamin D level is very common in the patients with heart failure and it is linked with poor prognosis among these patients. Chen and colleagues have also demonstrated that vitamin D-vitamin D receptor signaling system has a direct antihypertrophic effect on cardiomyocytes. Additionally, previous studies indicate that there is a relationship between vitamin D and left ventricular geometry [7].

Vitamin D insufficiency is a common public health problem, very often unrecognized and untreated, associated with rickets, dental caries, and growth retardation in children and osteomalacia, osteopenia, osteoporosis, decreased muscle strength, falls, and increased risk of fracture in adults [8]. Vitamin D insufficiency is associated with indoor lifestyle, sun avoidance strategies, obesity, diabetes mellitus, low HDL cholesterol, older age, distance from the equator, darker skin, winter season, air pollution, smoking, malabsorption, renal and liver disease, and medication (anticonvulsants, glucocorticoids, antirejection, and human immunodeficiency virus therapy). The heart is particularly noteworthy in that plasma 25-hydroxyvitamin D3 [25(OH) D3] levels have been shown to correlate inversely with the incidence of a variety of cardiac disorders including ischemic heart disease and heart failure [9]. Role of Vitamin D in myocardial contractility was demonstrated in a community study of 870 elderly patients without heart disease during which higher circulating Vitamin D levels were found to correlate with better left ventricular (LV) systolic function and smaller LV end-systolic diameter [10].

The main objective of this study is to analyse the association of vitamin D deficiency with ischemic cardiomyopathy.

MATERIAL AND METHODS:

This cross sectional study was conducted in Central Park Medical College during 2019. This study was done with the permission of ethical committee of hospitals. All study participants underwent physical examinations, blood analysis, and echocardiographic evaluation. Venous blood samples were collected in the morning after an overnight fast (10 to 12 hours). Afterwards, the serum was separated via centrifugation and immediately transported to the laboratory for biochemical analysis. Serum total cholesterol, hs-CRP, glucose, phosphorus, calcium and albumin concentrations were measured by standard laboratory methods. The serum concentration of 25OHD3 was measured by radioimmunoassay. The serum PTH concentration was assessed by immunoassay method.

Statistical analysis

All statistical analyses were carried out with the Statistical Package for Social Science for Windows version 21.0 (SPSS Inc., Chicago, IL). Descriptive statistics are expressed as mean ± standard deviation (SD) for continuous variables and proportion (%) or frequency for categorical variables.

RESULTS:

The data was collected from 50 patients. There were no differences in age, gender, body mass index, and sun exposure within the groups. Biochemical parameters were not significantly different in all study participants except that patients with ICMP had low calcium levels than the control group.

Table 01: Biochemical parameters of patients with ischemic cardiomyopathy and controls

Variables	Patients with ICMP	Controls	*P*
Fasting plasma glucose (mg/dl)	104±18.2	96±12.6	0.2
Total cholesterol (mg/dl)	186±25.6	178±22.6	0.56
LDL (mg/dl)	116±18	112±12	0.06
Hemoglobin (mg/dl)	9.2±1.8	11.2±2.2	0.03
Creatinine (mg/dl)	0.9±0.03	0.82±0.1	0.05
Albumin (mg/dl)	3.4±1.2	4.2±1.4	0.04
Calcium (mg/dl)	8.2±1.4	9.6±0.8	0.01
25(OH) D3 (ng/ml)	14.5±7.4	28.2±12	0.001
Parathyroid hormone (pg/ml)	90.5±28.5	57±20.2	0.02
NT-proBNP (pg/ml)	3482±1256	165±34	0.001

DISCUSSION:

Vitamin D suppresses inflammation via several pathways, such as inhibition of prostaglandin and cyclooxygenase pathways, upregulation of anti-inflammatory cytokines, decrease of cytokine induced expression of adhesion molecules, reduction of matrix metalloproteinase 9, and downregulation of the RAA [11]. Vitamin D deficiency stimulates *systemic and vascular inflammation*, enabling atherogenesis. On the other hand, as already mentioned, hypertension is also associated with lack of vitamin D, due to activation of the RAA system, enabling *endothelial dysfunction*, the first step in plaque formation. The proinflammatory nuclear factor kB mediates partly the association between endothelial dysfunction and low vitamin D status [12].

In the present study, it was observed that 25(OH) D3 levels were lower than normal in both the groups and very significantly low in patients with DCMP than controls who were also the patients with other medical illnesses [13]. There was a negative correlation between 25(OH) D3 and LV dimensions in DCMP patients. This observation was in concordance with Ameri *et al*. who also reported that 25(OH) D3 level had inverse relation with LVESD and LV volume in patients with heart failure [14].

CONCLUSION:

It is concluded that patients with ICMP had lower Vitamin D levels than controls, and Vitamin D deficiency had a significant correlation with cardiac function. Therefore, screening for Vitamin D deficiency along with prompt treatment is recommended in patients with ICMP.

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