Journal of Pharmaceutical Care
jpc.tums.ac.ir

Association Between Left Ventricle Ejection Fraction and Vitamin D Levels in Congestive Heart Failure; A Cross Sectional Study.

Betul Ozdemir*

*Department of Cardiology, Faculty of Medicine, Nigde Omer Halisdemir University, Campus, 51240, Nigde, Turkey.

Received: 2020-02-12, Revised: 2020-02-27, Accept: 2020-03-09, Published: 2020-06-30

ARTICLE INFO

Article type:
Original article

Keywords:
Heart Failure;
Stroke Volume;
Vitamin D

ABSTRACT

Background: Congestive heart failure (CHF) is a chronic disease that incidence is growing in the population. Vitamin D effects on directly myocardial cells. The aim of this study was to investigate the association between vitamin D levels with ejection fraction of left ventricle.

Methods: The study population consisted of 101 patients admitted with heart failure. Age, gender, and demographic characteristics (diabetes mellitus, hypertension, smoking-nonsmoking, coronary artery disease) of all patients were recorded. In all patients for blood analyses vitamin D, creatine, crp and lipid profile were studied. And all patients were studied echocardiography.

Results: CHF patients, in our population 35 (34.7%) patient is female and 66 (65.3%) patient is male. The mean age of our patients was calculated as 67.4±12.9 years. Our patients laboratory parameters mean were measured for vitamin D 24.3±17.3 ng/ml. Left Ventricular Ejection Fraction (LVEF) mean was measured 31.8±9.5. In our study group LVEF and vitamin D was correlated with each other

Conclusion: Vitamin D and LVEF had a positive correlation in heart failure patients. It may be occured with the protective effect of vitamin D or consequence of hipovitaminosis.

J Pharm Care 2020; 8(2): 50-52.

► Please cite this paper as:

Ozdemir B. Association Between Left Ventricle Ejection Fraction and Vitamin D Levels in Congestive Heart Failure; A Cross Sectional Study. J Pharm Care 2020; 8(2): 50-52.

Introduction

Heart failure (HF) remains a leading cause of morbidity and mortality, affecting more than 37 million people worldwide and conferring a substantial burden on the health-care system (1).

In patients with advanced HF, despite effective medical treatment regimens that target recovery of clinical and prognostic improvement, mortality and morbidity remain substantial. Vitamin D is a lipophilic, secosteroid hormone, which majorly exists in two form; vitamin D2 and vitamin D3. Vitamin D2, commonly known as ergocalciferol, is manufactured through the ultraviolet irradiation of ergosterol from yeast. It cannot be synthesized inside the human organism but can enter blood circulation with dietary sources, such as mushroom, supplementation, and fortification (2). Vitamin D3, commonly known as cholecalciferol, is the only form produced in the human organism that is synthesized in the skin through the ultraviolet irradiation of 7-dehydrocholesterol. It can also be obtained from sources like fatty fish, egg and dairy products, and dietary supplements. In mammals, synthesis of vitamin D3 gets initiated in the epidermis, with cleavage of the B ring of 7-dehydrocholesterol, under UVB radiation of wave length 290 to 315 nm. Vitamin D is affects skeletal and extraskeletal system. It effects on calsium metabolism. And also Vitamin D effects on directly myocardial cells. Vitamin D metabolites have direct effects on cardiomyocytes including anti-hypertrophic actions, regulation of extracellular matrix turnover, and modulation of contractility (3, 4, 5). In addition, vitamin D insufficiency has effect on HF prognosis. There is evidence that low serum 25OHD levels are associated with an increased risk of cardiovascular disease (CVD) (6), including hypertension, coronary artery disease, ischemic heart disease, stroke and type 2 diabetes (7, 8, 9, 10, 11, 12). Decreased Vitamin

*Corresponding Author: Dr Betul Ozdemir
Address: Department of Cardiology, Faculty of Medicine, Nigde Omer Halisdemir University, Campus, 51240, Nigde, Turkey.
Email: betulozaltun@ohu.edu.tr

D levels are common in heart failure patients. There are several mechanisms by which vitamin D may be associated with CVD including its effect on the rennin–angiotensin system, vessel compliance, blood pressure, parathyroid hormone level, and also glycemic control. Correlation of low vitamin D status with cardiovascular diseases is studied in several studies. Vitamin D status has been implicated in the pathophysiology of HF. Vitamin D deficiency is the cause and consequence of heart failure.

The aim of this study was to investigate the association between vitamin D levels with ejection fraction of left ventricle.

Methods

The study population consisted of 101 patients admitted with heart failure. The patients were retrospectively collected in Adana State Hospital between 2013-2015. We enrolled symptomatic HF patients (New York Heart Association functional class ≥II). All patients' demographic characteristics (age, gender, smoking-nonsmoking), underlying diseases (diabetes mellitus, hypertension, coronary artery disease), past medical history (coronary artery disease, a history of by-pass, coronary artery intervention and angiography), patient's blood pressure and pulse were recorded.

Blood test was taken on the first day of hospitalization. 25 (OH) D was measured in ng/mL by enzyme-linked immunosorbent assay (EIA; Immuno Diagnostic Systems, Boldon, UK). Patients with 25 (OH) D levels ≤20 ng/mL are considered vitamin D insufficient.

Examinations were performed using an iE33 ultrasound system (Philips Healthcare, Bothell, WA, USA) with an S5-1 transducer (Philips Healthcare). Patients were examined in the left lateral decubitus position. Measurements were recorded from parasternal long-axis and short-axis views, and apical four- and two-chamber views. All examinations were performed by a single skilled sonographer. All patients underwent echocardiography. LV volume was measured from the end-diastolic and end-systolic endocardial borders on apical four-chamber and two-chamber views. LVEF was calculated using the modified Simpson's method for biplanar assessment, and expressed as a percentage.

All analyses were conducted using SPSS 23.0 (SPSS for Windows 11.5, Chicago, IL). Normally distributed continuous variables were expressed as mean ± standard deviation, non-normally distributed variables were expressed as median (minimum–maximum), and categorical variables were expressed as percentages. For correlation analysis pearson correlation used. P-value less than 0.05 considered as significant.

Results

We examined 101 HF patients. In our population 35 (34.7%) patient is female and 66 (65.3%) patient is male. The mean age of our patients was calculated as 67.4± 12.9 years. In our study population 46 (45.5%) of our patients had diabetes and 63 (62.4%) had hypertension. 40 (39.6%) of our patients had smoking history and 86 (85%) of our patients had coronary atherosclerosis history. Our patients systolic blood pressure mean was calculated 123.8±24 mmhg and diastolic blood pressure mean was calculated 73.9±11.8 mmhg. Our patients laboratory parameters mean were measured for creatinine 1.2±0.6 mg/dl, low density lipoprotein (LDL) 91.7±36.3 mg/dl, triglyceride (TG) 103.3±41.8 mg/dl, hemoglobin (Hb) 12.2±1.8 g/dl, C-reactive protein (CRP) 3.7±6.3 mg/dl and vitamin D 24.3±17.3 ng/ml given Table 1. LVEF mean was measured 31.8±9.5.

Table 1. Laboratory parameters

	Mean
Creatinine (mg/dl)	1.2±0.6
LDL (mg/dl)	91.7±36.3
TG (mg/dl)	103.3±41.8
WBC (cell/mm^3)	10±5
HB (g/dl)	12.2±1.8
CRP (mg/dl)	3.7±6.3
Vitamin D (ng/dl)	24.3±17.3

CRP: C reactive protein, HB: hemoglobin, LDL: low density lipoprotein, TG: triglyceride, WBC: white blood cell

In our study group LVEF and vitamin D was correlated with each other shown in Table 2. (P<0.005)

Table 2. Correlations

		Vitamin D
LVEF	Pearson Correlation	.500**
	Sig. (2-tailed)	.000
	N	101

**. Correlation is significant at the 0.01 level (2-tailed).LVEF: left ventricular ejection fraction

Discussion

Vitamin D extra skeletal effects have attracted much scientific attention over the last few decades and convincing data suggest a possible role of vitamin D in cardiovascular, autoimmune and cancer diseases. The present study shows high prevalence of vitamin D deficiency in patients with heart failure. Our findings are consistent with other studies, showing reduced circulating levels of vitamin D in heart failure patients (13). In this setting, vitamin D deficiency may be a consequent , or contributing factor to heart failure. On the other hand, several animal and human studies suggest that hypovitaminosis D may be a contributing factor to heart failure (14). In a recent study by Kim et al., hypovitaminosis D was highly prevalent in US adults with cardiovascular disorders, particularly those with both coronary heart disease and heart failure (14). Epidemiological data indicate that deficiency of vitamin D is common among CVDs patients with circulating 25(OH)D levels less than 20 ng/mL (15). Similarly, a reduced plasma level of 25(OH)D of around 25 ng/mL has been associated with an increased risk of hypertension (16, 17). A population-based study and meta-analyses associated very low levels of 3–4.8 ng/mL of plasma 25(OH)D levels with an increase

in multivariable-adjusted risk by 40% for ischemic heart disease, by 64% for myocardial infarction (MI), and by 57% for early death when compared with the individuals having plasma 25(OH)D levels of 18.83–28.44 ng/mL (18).
In our study, there was direct correlation between serum vitamin D and its deficiency with LVEF.
In conclusion, vitamin D and LVEF had a positive correlation in heart failure patients. It may be occured with the protective effect of vitamin D or consequence of hipovitaminosis. Taking vitamin D in can reduce mortality in people with CVDs. The low levels of vitamin D in HF patients are associated with poor physical function

References

1. Mozaffarian D, Benjamin EJ, Go AS, Arnett DK, Blaha MJ, Cushman M, et al. Heart Disease and Stroke Statistics-2016 Update: A Report From the American Heart Association. Circulation 2016;133(4):e38-360.

2. Tsuprykov O, Chen X, Hocher CF, Skoblo R, Lianghong Yin, Hocher B. Why should we measure free 25(OH) vitamin D? J Steroid Biochem Mol Biol 2018;180:87-104.

3. Cozzolino M, Ketteler M, Zehnder D. The vitamin D system: a crosstalk between the heart and kidney. Eur J Heart Fail 2010;12(10):1031-41.

4. Pilz S, Tomaschitz A, Drechsler C, Dekker JM, Marz W. Vitamin D deficiency and myocardial diseases. Mol Nutr Food Res 2010;54(8):1103-13.

5. Liu LC, Voors AA, van Veldhuisen DJ, van der Veer E, et al. Vitamin D status and outcomes in heart failure patients. Eur J Heart Fail 2011;13(6):619-25.

6. Skaaby T, Husemoen LL, Pisinger C, et al. Vitamin D status and incident cardiovascular disease and all-cause mortality: a general population study. Endocrine 2013;43(3):618-25.

7. Wang L, Song Y, Manson JE, et al. Circulating levels of 25hydroxy-vitamin D and risk of cardiovascular disease: a meta-analysis of prospective studies. Circ Cardiovasc Qual Outcomes 2012;5(6):819-29.

8. Lugg ST, Howells PA, Thickett DR. Optimal vitamin D supplementation levels for cardiovascular disease protection. Dis Markers 2015;2015:864370.

9. Judd SE, Tangpricha V. Vitamin D deficiency and risk for cardiovascular disease. Am J Med Sci 2009;338(1):40-4.

10. Kestenbaum B1, Katz R, de Boer I, et al. Vitamin D, Parathyroid hormone, and cardiovascular events among older adults. J Am Coll Cardiol 2011;58(14):1433-41.

11. Muscogiuri G, Nuzzo V, Gatti A, et al. Hypovitaminosis D: a novel risk factor for coronary heart disease in type 2 diabetes? Endocrine 2016;51(2):268-73.

12. Skaaby T, Husemoen LL, Pisinger C, et al. Vitamin D status and 5-year changes in urine albumin creatinine ratio and parathyroid hormone in a general population. Endocrine 2013;44(2):473-80.

13. Zittermann A, Schleithoff SS, Tenderich G, Berthold HK, Körfer R, Stehle P. Low vitamin D status: a contributing factor in the pathogenesis of congestive heart failure? J Am Coll Cardiol. J Am Coll Cardiol 2003;41(1):105-12.

14. Kim DH, Sabour S, Sagar UN, Adams S, Whellan DJ. Prevalence of hypovitaminosis D in cardiovascular diseases (from the National Health and Nutrition Examination Survey 2001 to 2004). Am J Cardiol 2008;102(11):1540-4.

15. Holick MF. Vitamin D deficiency. N Engl J Med 2007;357(3):266-81.

16. Forman JP1, Giovannucci E, Holmes MD, et al. Plasma 25-hydroxyvitamin D levels and risk of incident hypertension. Hypertension 2007;49(5):1063-9.

17. Forman JP, Curhan GC, Taylor EN. Plasma 25-hydroxyvitamin D levels and risk of incident hypertension among young women. Hypertension 2008;52(5):828-32.

18. Brondum-Jacobsen P, Benn M, Jensen GB, Nordestgaard BG. 25-hydroxyvitamin d levels and risk of ischemic heart disease, myocardial infarction, and early death: population-based study and meta-analyses of 18 and 17 studies. Arterioscler Thromb Vasc Biol 2012;32(11):2794-802.