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THERAPEUTIC EFFECT OF VITAMIN D ON PATIENTS WITH DILATED CARDIOMYOPATHY

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ABSTRACT

Objective: Patients with heart failure may benefit from vitamin D treatment, according to new research. **Methods:** In our current nonrandomized clinical research, 43 individuals with dilated cardiomyopathy who did not exhibit substantial gains in physical functioning with optimum heart failure therapy were included. Twelve weeks of weekly vitamin D supplements (200,000 IU) were added to the heart failure therapy to help improve the patient's condition. On the other hand, researchers looked at how it affected the 6-minute walk distance and pro-BNP levels. To analyses the data, we utilized SPSS version 19. Accordingly, we utilized random samples t-tests to assess the substantial role of vitamin D supplementation on pre-intervention vitamin D level, 6-minute walk distance, and pro-BNP level, respectively. Significance was defined as an alpha value less than 0.01. **Results:** Individuals in NYHA class II (66%) were the majority, while those in NYHA classes I, III and IV were represented by 18%, 8% and 5%, accordingly. After a follow-up of 14 weeks, the mean vitamin D level was increased from 17.596 ng/ml at baseline to 32.974 ng/ml ($p < 0.0006$). Pre-intervention mean distance travelled was 806382 ft, and after follow-up it was 945392 ft with p value of 0.07. While before the intervention, the mean per-BNP level of research participant was 1025-636, and after intervention, it had enhanced to 160-80--a statistically significant improvement with p value of < 0.005. **Conclusion:** Vitamin D administration decreases the intensity of heart failure, characterized by a decline in the levels of pro-BNP and an increase in the six-minute walk distance.

INTRODUCTION

Heart failure, which affects about 16 million individuals globally, is a major source of disease and mortality in older adults.[1] Even though the etiology of heart failure has been better understood, the diagnosis for heart failure patients is still dismal, with survival rates as low as 36 percent after five years. In individuals with heart failure, vitamin D insufficiency is prevalent, and the prevalence rises with age.[2-4] An insufficient intake of vitamin D can produce muscular weakness in people with and without heart disease, resulting in less physical activity. Vitamin D contains anti-inflammatory effects as well as the ability to decrease renin levels and enhance muscular strength.[5]

Vitamin D insufficiency is associated with hyperactivity of the renin-angiotensin-aldosterone system, endothelial dysfunction and alterations in calcium flow resulting in reduced cardiac contractility as the primary causes.[6,7] By inhibiting proinflammatory chemicals, reducing renin-angiotensin-aldosterone pathway, and decreasing parathyroid hormone levels, vitamin D supplementation is considered to cut course and intensity of heart failure in individuals having heart failure (Figure 1). In individuals with heart failure, Vitamin D supplementation has been shown to enhance functional status, however there is conflicting data.[8,9] In our study we have summarized the effects of vitamin D supplementation on the physical condition of the patients with congestive heart failure.

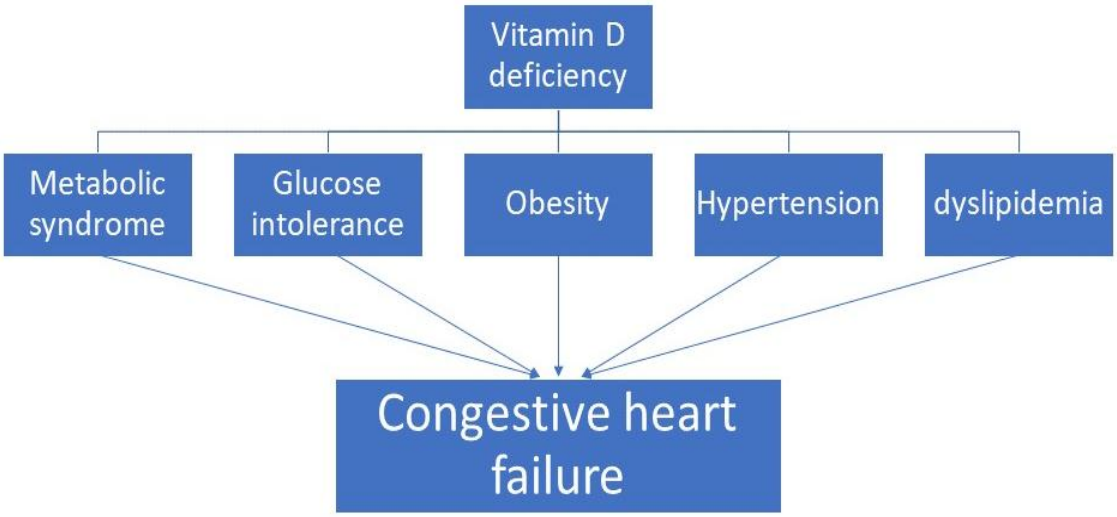

Figure 1: Relationship between vitamin D and congestive heart failure.

MATERIAL AND METHODS

A non-randomized randomized study was done at the General Hospital Lahore, Pakistan, at the Department of Cardiology from May 1 to November 30, 2019. A total of 78 participants were diagnosed after receiving ethical permission, of which 35 were lost to follow-up and 43 stayed until the completion of the research. Study participants ranged in age from 15 to 70 years and had nonischemic cardiomyopathy according to New York Heart association of America (NYHA) (class I-IV) and vitamin D levels below 30 ng/ml. Even with optimum heart failure therapy, none of the other patients' physical activity levels improved much. Fourteen weeks following the addition of vitamin D, we re-examined the patients' blood pressure levels. These individuals were excluded from the model if they were less than 16 years old, had renal failure or a myocardial infarction in past several months, or had valvular cardiovascular disease or cardiomyopathy. We acquired each patient's written, informed permission.

Each patient got 200,000 IU of oral vitamin D every week for 14 weeks. Before and after therapy, C-reactive protein, serum calcium, vitamin D levels, and pro-BNP levels were measured in blood samples taken before and after treatment. In addition, a six-minute walk test (6MWT) with blood pressure and oxygen saturation was also measured before and after the follow-up. The distance travelled by each patient was monitored as a function of time for every patient's record.

A comprehensive physical examination was used to assess the severity of HF. Each patient's NYHA functional class was determined by observing them while they relaxed, dressed, climbed stairs, and walked. Following the procedure of Guyatt and colleagues, individuals' physical efficiency was evaluated using the six-minute walk distance (6MWD).

Early in the morning, before breakfast, blood was taken from each patient and submitted to the lab for analysis. Enzyme immunoassay was used to measure pro-brain natriuretic peptide (pro-BNP) concentrations.

To analyze the data, we utilized SPSS version 19. Demographic data and the NYHA functional class were calculated by using percentages. To assess the significance of vitamin D supplementation's influence on preintervention vitamin D levels, 6MWD and ProBNP levels, a dependent samples t-test was performed on the variable samples. Significance was defined as an alpha value less than 0.01.

RESULTS

Table I: Demographic and NYHA Efficient Features.

Variable	***Value***
Number of cases	43
Male	29 (67.4%)
Female	14 (32.6%)
Mean Age	47.42±11.25
>30 Years	4 (9.3)
30-50 Years	23 (53.5)
>50 Years	16 (37.2)
Illiterate	38 (88.4)
Literate	5 (11.6)
Urban	15 (34.9)
Rural	28 (65.1)
NYHA Functional Class Class I	8 (18.6)
Class II	28 (65.2)
Class III	4 (9.3)
Class IV	3 (6.9)

Table-II: Comparison of Outcome Variables.

Name of Variable	*Earlier Intervention*	*Afterward Intervention*	*P-value*
Mean Vitamin D levels (ng/mL)	17.58±14.55	32.98±4.65	<0.0006
Distance travelled during 6MWD test (feet)	807±381	946±394	0.009
Pro-BNP levels (pg/mL)	1025±636	158±81	<0.0006

Pro-BNP=Pro Brain Natriuretic Peptide, pg=Pico Gram, 6MWD=7 minutes' walk Distance.

Forty-three (43) patients were included in the study. Among them 29 (67.4%) were male and 14(32.6%) were female. Four patients (9.3%) were less than 30 years of age, 23 (53.5%) were among age of 35-55 years. Seventeen (38.3%) remained more than 55 years of age. 39 individuals (89.5%) were illiterate, while just five (12.7%) were literate. 33 people (66.3%) lived on farms; 16 people (35.8%), on the other hand, resided in urban areas. Patients with NYHA class II (66%) were the most common, followed by those with NYHA class I (4%), III (8%), and IV (8%).

After a follow-up of 14 weeks, the mean vitamin D level was increased from 17.596 ng/ml at baseline to 32.974 ng/ml ($p < 0.0006$). Pre-intervention mean distance travelled was 806382 ft, and after follow-up it was 945392 ft with p value of 0.07. While before the intervention, the mean per-BNP level of research participant was 1025-636, and after intervention, it had enhanced to 160-80--a statistically significant improvement with p value of < 0.005.

DISCUSSION

Vitamin D deficiency has many detrimental effects on various systems of the body including bone, breast, gastrointestinal system, and immune system. Supplementation with vitamin D has shown beneficial effects on immune system, musculoskeletal, and gastrointestinal system.[10] It has been shown that vitamin D administration improves functional status in patients with cardiovascular disease in a small number of trials. This meta-analysis by Ford and colleagues found that vitamin D treatment can help prevent individuals from heart failure.[11,12]

Subjects with heart failure were given vitamin D for 12 weeks to see if it had any effect on pro-BNP levels and 6MWD. Physical activity levels were considerably increased in individuals with heart problems and vitamin D insufficiency after 14 weeks of daily vitamin D3. Vitamin D supplementation has been proven to increase muscular contractility and walking capacity in the aged, while reducing their risk of falling.[13]

Supplementing with vitamin D considerably decreased the extent of heart failure, according to Amin and colleagues. In this research, they included patients with and without vitamin D insufficiency, and discovered that 6MWD rose in all patients, whereas pro-BNP levels declined.[14,15] After 12 weeks of supplementing with vitamin D, our results were comparable to theirs, and we also discovered that 6MWD was considerably enhanced. There remained 807381 feet in our study before the operation, and 946394 feet after the treatment weeks, according to our research (p-Wert 0.009). After 14 weeks of treatment, the pro-BNP levels in our study dropped from 1025-636 to 157-81 pg/ml ($p < 0.006$). A recent study found no difference in 6MWD, and muscle strength after six months of vitamin D supplementation in patients with heart failure. When it comes to patients with heart failure, Witham et al revealed no difference correlation among vitamin D and quality of life.[16-19]

Most congestive heart failure patients have insufficient Vitamin D, due to reduced sunlight exposure, difficult mobilization and outdoor activity, nutritional factors, and malabsorption of Vitamin D due to intestinal edema in severe right heart failure and comorbidities such as obesity and renal and hepatic failure.[20,21]

Our study has got several limitations. Being a cross-sectional one, neither we could prove a causal relationship between Vitamin D deficiency and congestive heart failure, nor we could demonstrate the exact role of Vitamin D in pathogenesis of heart failure.[22,23] In view of small sample size of our study, we would suggest a prospective study having many patients with a long follow-up to determine the precise therapeutic role of vitamin D on congestive heart failure.[24,25]

CONCLUSION

There is increasing evidence that vitamin D therapy has promising effects on cardiovascular disease pathogenesis. Vitamin D may play role in decreasing morbidity and mortality in patients with congestive heart failure and further studies are warranted for beneficial effects of vitamin D on therapy.

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