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TO ASSESS THE EFFECT OF VITAMIN D SUPPLEMENTATION IN THE PROGNOSIS OF CONGESTIVE HEART FAILURE PATIENTS BY 2D ECHOCARDIOGRAPHY IN NORTH INDIAN POPULATION

General Medicine

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KEYWORDS

INTRODUCTION

With growing epidemic of CAD there is a increase of patients of heart failure in our country. Inspite of optimal use of ACE inhibitors, beta blockers, statins (drugs which can alter the natural history of heart failure) these patients have a gradually downhill course. Advanced therapy like CRT and implantable defibrillation therapy to reduce the incidence of sudden cardiac death are very costly. Most of the Indian poor patients can't afford such a costly therapy. Cheap intervention which can alter the natural history of heart failure are strongly needed. Most of the Indian patients have low vitamin D level. Low Vitamin D level have been linked to increase risk of MI, Stroke, CVD mortality and heart failure.

Vitamin D receptors are expressed in vascular tissue including the myocardium and vascular smooth muscles directly influencing the calcium influx and muscles relaxation and diastolic dysfunction. Thus present study is conducted to establish the association of Vitamin D level with CHF and prognostic importance of Vitamin D in these patients. Cheap intervention like vitamin D supplementation can alter the natural history of heart failure.

MATERIAL AND METHOD

Present study is a analytical case control study conducted from August 2019 to August 2020 in the Department of Medicine and Department of Cardiology S.N.Medical College Agra. 140 CHF patients were included in case group supplemented with Vitamin D and 140 patients are included in control group not supplemented with vitamin D. Vitamin D was assayed using solid phase enzyme linked immunoassay(ELISA) based on coagulant coupling to secondary amino group grafted onto polystyrene surface of microtitre wells.

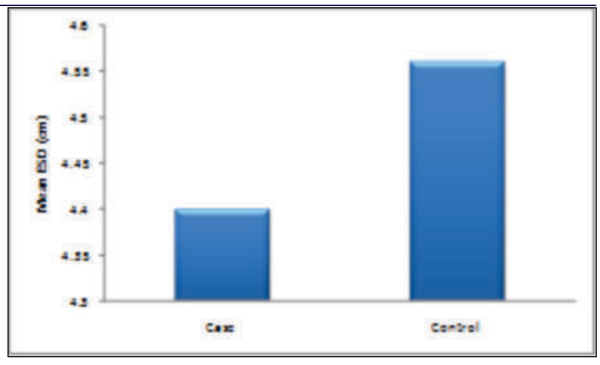
2ml venous sample was obtained of all the patients to assess vitamin D level after proper use of inclusion and exclusion criteria. Level >30ng/ml was considered as normal vitamin D level, <20ng/ml was considered as low vitamin D level. Serial 2d ECHO and Doppler examination of all the patients was done and to assess the LV systolic function parameters like ESD,EDD,EF and for diastolic function parameters like E velocity, A velocity, E/A, E/e' and grading of diastolic function was done.

RESULT

Results were analysed in 140 cases and 140 control group of CHF as shown in Table.1 to assess the systolic function of the patients it was found that ESD in control group was 4.56+/- 0.37 cm and in case group was 4.40+/-0.41 cm so significant(p=0.0007) reduction in ESD of case group was found who were on Vitamin D supplementation.

Table.1:End Systolic Diameter(CM) Of Subjects.

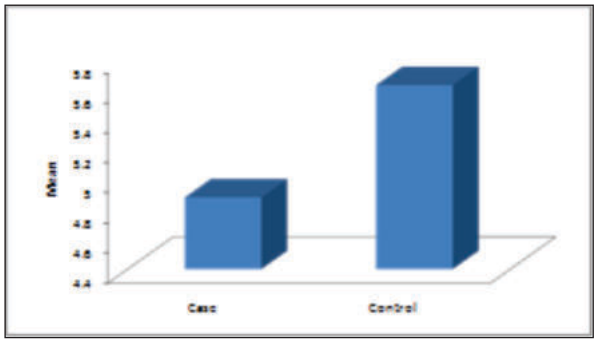
	No.	ESD (cm)		t-value	p-value
		Mean	SD		
Case	140	4.40	0.41	3.428	0.0007
Control	140	4.56	0.37		



Similarly systolic function was assessed by End Diastolic Diameter as shown in Table.2 in the control group mean ESD was 5.63+/-0.55 cm and in the case group was 4.88+/-0.66cm so significant(p=<0.0001) reduction in EDD of case group was found which showed improvement in EDD following Vitamin D supplementation.

Table.2:End Diastolic Diameter(CMS) Of Subjects.

	No.	EDD (cm)		t-value	p-value
		Mean	SD		
Case	140	4.88	0.66	10.329	<0.0001
Control	140	5.63	0.55		



Further systolic function was assessed by measuring Ejection Fraction as shown in Table.3 in the control group mean EF was found 35.25+/-5.24 % and in case group mean EF was found to be 38.39+/-6.53 so there was significant(p=<0.0001) increase in EF in the vitamin D supplementation group.

Table.3: Ejection Fraction(%) Of The Subjects.

	No.	EF (%)		t-value	p-value
		Mean	SD		
Case	140	38.39	6.53	-4.438	<0.0001
Control	140	35.25	5.24		

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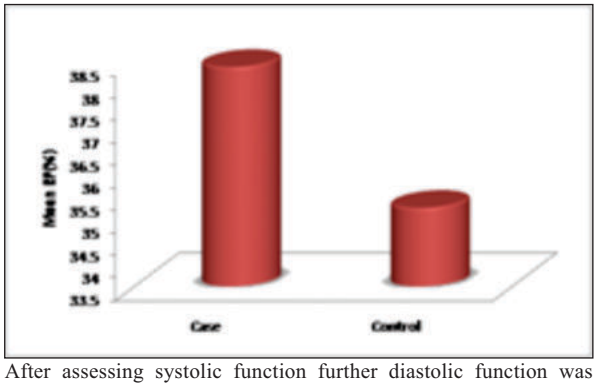
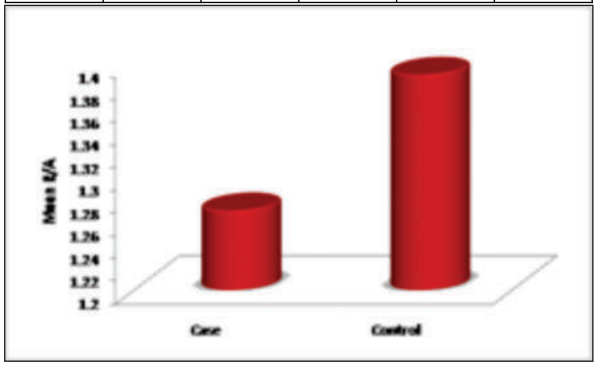


After assessing systolic function further diastolic function was assessed by measuring E/A ratio as shown in Table.4 and mean E/A ratio in the control group was found to be 1.39+/-0.37 and in the case group it was found to be 1.27+/-0.50 there was significant(p=0.0232) increase in E/A ratio in the vitamin D supplementation group.

Table.4: 'E/A' Of The Subjects.

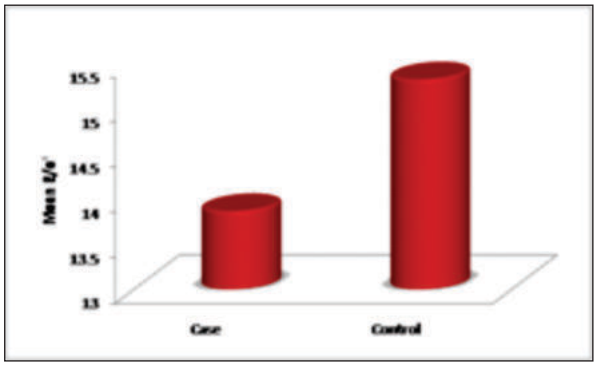
	No.	E/A		t-value	p-value
		Mean	SD		
Case	140	1.27	0.50	2.283	0.0232
Control	140	1.39	0.37		



Diastolic function was further assessed by evaluating E/e' ratio as mentioned in Table.5 and mean E/e' in the control group was found to be 15.32+/-2.36 similarly in case group it was found to be 13.86+/-2.43 there was significant(p=<0.0001) decrease in the vitamin D supplementation group.

Table.5: 'E/e" Of The Subjects.

	No.	E/e'		t-value	p-value
		Mean	SD		
Case	140	13.86	2.43	5.100	<0.0001
Control	140	15.32	2.36		



DISCUSSION

At present, different studies have reported controversial conclusions regarding the influence of Vitamin D on ventricular remodelling in patients with Heart Failure but still it was found that Vitamin D supplementation could improve QOL and reduce inflammatory response in patients with CHF. So far, Vitamin D supplementation guidelines have not been included in heart failure guidelines by European Society of Cardiology or American College of Cardiology[1,2]. Vitamin D directly affects the parathyroid gland, and deficiency of Vitamin D results in secondary hyperparathyroidism as circulating level of 20ng/ml vitamin D presents a 2-fold risk of secondary hyperparathyroidism over levels greater than 30ng/ml. Low vitamin D levels can also activate the rennin-angiotensin system, give rise to inflammatory reactions. In the previous meta-analysis of RCTs, vitamin D supplementation showed no benefit in reducing MI, but a potential benefit for heart failure was observed. Higher prevalence of lower 25-hydroxyvitamin D levels among racial/ethnic groups who are darker skinned than white people are, likely in association with lower vitamin D synthesis in the skin and differences in vitamin D metabolism, has been reported previously[3].

In our analytical case control study which was conducted in Post Graduate Department of Medicine in collaboration with Cardiology Department of S.N.Medical College, Agra we found that mean LVESD among cases was 4.40+/-0.41 cm while among control was 4.56+/-0.37 cm which is significant(p=<0.0001), mean FS among cases was 19.53±3.97% while among control was 18.03±2.18% which is significant (p=0.0001), mean EF among cases was 38.39±6.53% while among control was 35.25±5.24% which is significant (p=<0.0001). Similar results were found in other studies such as **Vivek Mohanty et al (2021)**[4] demonstrated that reduced Vitamin D level(<20ng/ml) was associated with worse systolic function in terms of systolic volume and diameter, **Jin Dong Zhao et al (2018)**[5] found a decrease in the LVEDD(Mean difference=-2.31mm, 95% confidence interval -4.15 to -0.47, p=0.01) and an increase in the EF(Mean difference=4.18%, 95% confidence interval 0.36 to 7.99, p=0.03) were observed in the Vitamin D group, **Whitte KK et (2016)**[6] demonstrated that a significant improvement in the secondary outcomes of the echocardiographic parameters of EF,LVEDD,LVEDV,LVESV and LVESD. The difference in mean change in EF was 6.07%(3.20-8.94 ; p<0.001), **A.Dalbein et al (2014)**[7] demonstrated that EF increased significantly in the intervention group(6.71 vs -4.3% ; p=<0.001). Among cases mean E velocity was 0.79±0.10 m/s while among control was 0.75±0.15 m/s which is significant (p=0.0091), mean A velocity among cases was 0.63±0.14 m/s while among control was 0.59 m/s which is significant(p=0.0063), mean E/A among cases was 1.27±0.50 while among control was 1.39±0.37 which is significant (p=0.0232), mean E/e' among cases was 13.86±2.43 while among control was 15.32±2.36 which is significant (p=<0.0001). Similar results were obtained in following studies **Whitte KK et al (2016)**[6] demonstrated that a significant improvement in the secondary outcomes of the echocardiographic parameters of EF, LVEDD, LVEDV, LVESV and LVESD. The difference in mean change in EF was 6.07% (3.20-8.94 ; p<0.001), **Vivek Mohanty et al (2021)**[4] found that reduced Vitamin D level(<20ng/ml) was associated with worse diastolic function in terms of lower e', higher E/e', and longer IVRT.

Israel Gotsman et al (2012)[8] demonstrated that Vitamin D deficiency is highly prevalent in Heart failure patients and is a significant predictor of reduced survival. Vitamin D supplementation was associated with improved outcomes and reduced mortality (Hazard ratio 0.68, 95% Confidence interval 0.54-0.85, p<0.0001).

CONCLUSION

From our study it is very clear that low Vitamin D level in heart failure patients have a direct correlation. Vitamin D repletion may provide an important improvement in QOL as an adjuvant treatment to appropriate guideline directed therapy. Probably sample size in our study is too small to give a definitive conclusion so further study is needed to get robust data to establish the prognostic importance of Vitamin D in CHF patients. Further there is a need to identify factors which are responsible for low level of Vitamin D in Indian patients especially the genetic factors which can alter the Vitamin D metabolism in dark skin people so that appropriate guideline in context to Indian scenario can be formulated.

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