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A Comparative study of Vitamin D in Non ST-Segment elevation myocardial infarction and ST-Segment elevation myocardial infarction patients

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A B S T R A C T

Our recent studies have shown that to investigate the diagnostic role of vitamin D in non ST-segment elevation myocardial infarction and ST-segment elevation myocardial infarction patients. Myocardial infarction is the catastrophic frequently fatal form of ischemic heart disease that results from precipitous reduction or arrest of a significant portion of the coronary flow. Vitamin D is a group of fat-soluble secosteroids responsible for intestinal absorption of calcium and phosphate. In humans, the most important related compounds of vitamin D are vitamin D₂ and vitamin D₃. Acute myocardial infarction was studied in three groups depends on with or without associated complications. in all three groups, mean serum levels of Vitamin D is lower than the mean serum control group. The serum levels of Vitamin D were significantly decreased in STEMI and NSTEMI patients compared with control normal subjects Vitamin D is an useful index, not only in the diagnosis and prognosis, but also in some critical situations of taking some important decision.

Introduction

Ischemia heart disease is the most widespread health problem over the age 35. The death rate due to coronary artery disease is increasing in developing countries¹. The diagnosis and inability to predict prognosis, poses difficult problem, because of a non-availability of specific and sensitive laboratory tools. The magnitude of this problem dictates, that many medical

personnel are involved in some aspects of recognition and treatment of ischemic heart disease, of which myocardial infarction is the most important one².

Once the myocardial infarction has set in, it may take up any of the several pathways. The first and foremost is sudden cardiac death. The incidence of which is 20-25%. If the patient reaches the hospital in a stable

condition and has no extension of infarction, 75 – 80% chances of surviving the attack³. However the first one week may be smooth recovery or may be marked by a number of complications^{4,5}. Acute myocardial infarction is a type of acute coronary syndrome, which is most frequently a manifestation of coronary artery disease. The acute coronary syndromes include ST segment elevation myocardial infarction (STEMI), non-ST Segment elevation myocardial infarction (NSTEMI).

The possibility of suffering acute myocardial infarction in 40-60years age group is 8times higher than in people of a less advanced age. More than 50% of in hospital mortality from acute myocardial infarction occurs in subjects older than 65 years⁴.

Vitamin D is a group of fat-soluble secosteroids responsible for intestinal absorption of calcium and phosphate. In humans, the most important related compounds of vitamin D are vitamin D2 and vitamin D3⁶. Vitamin D deficiency continues to be an unrecognized epidemic in many populations around the world⁶. It has been reported in healthy children, young adults, middle-aged adults, and the elderly, and is common among both males and females⁶.

Epidemiological studies indicate an inverse relationship between plasma 25[OH] D and the occurrence of ST segmental elevation myocardial infarction (STEMI) and Non ST segmental elevation myocardial infarction patient. In UK an increased cardiovascular morbidity is associated with low plasma 25[OH] D concentrations in winter.

Materials and Methods

Chemicals

25 [OH] D kits were purchased from immune Diagnostic kits, USA and all the

other chemicals used were of analytical grade.

Experimental Design

Forty two patients in the age group of 45-70 admitted in the intensive care unit of Meenakshi Medical College Hospital and Research Institute, Kanchipuram, Tamil Nadu for the study. This includes 30 male patients with acute myocardial infarction in whom a provisional diagnosis was made with specific change in electrocardiogram, indicating STEMI patients. The remaining twelve patients, including two females were NSTEMI patient. Patients demographic data, including sex, age, and risk factors for cardiac events including high-risk age (men >45, women >55 years old), smoking history, medical history of hypertension, hyperlipidemia, diabetes, and a positive family history, drug history, presence of arrhythmia, laboratory data, ECG, and echocardiography findings, were recorded.

The patients were divided into three groups are included

Group-I-Patients were ultimately discharged in good condition (Control)

Group-II-Patients were admitted with ST segmental elevation myocardial infarction Patients (STEMI)

Group-III-Patients were admitted with non ST segmental elevation myocardial infarction Patients (NSTEMI)

Collection of Samples

Peripheral venous blood (10 ml) samples were collected from each patient upon admission to determine the 25(OH)D serum level. Serum level of 25[OH] D was measured by direct ELISA kit method. In this study, 25(OH)D levels greater than 30

ng/ml were considered normal; 25(OH)D concentrations of equal to or less than 30 ng/ml were considered deficient.

Statistical Analysis

Data were analyzed using the SPSS software package, version 17.0 (SPSS Inc., Chicago, Illinois, USA). Quantitative data were expressed using range, mean, SD, and median, whereas qualitative data were expressed as frequency and percentage. Qualitative data were analyzed using the χ^2 - test; also, exact tests such as Fisher's exact were used to compare the two groups. Non-normally distributed quantitative data were analyzed using the Mann-Whitney test to compare the two groups. The Pearson coefficient was used to analyze the correlation between any two variables. *P* value was assumed to be statistically significant at 0.05.

Ethical Concern

Ethical clearance was obtained from the Ethical committee meeting conducted at Meenakshi Medical College and Hospital.

Results and Discussion

Presentation According to ECG in Myocardial Infarction Patients

Table 1 shows the presentation according to ECG in myocardial infarction. This table demonstrates the percentage of STEMI, NSTEMI of male and female in myocardial infarction patients attending Meenakshi Medical College, Enathur, Kanchipuram, India. The percentage of presentation according to ECG with male STEMI, Male NSTEMI and Female NSTEMI levels were respectively 71.4%, 23.8% and 4.76%. 12 patients (28.57%) presented with NSTEMI symptoms of ECG. In this group, 10 patients

were males (23.8%) and 2 patients were females (4.76%).

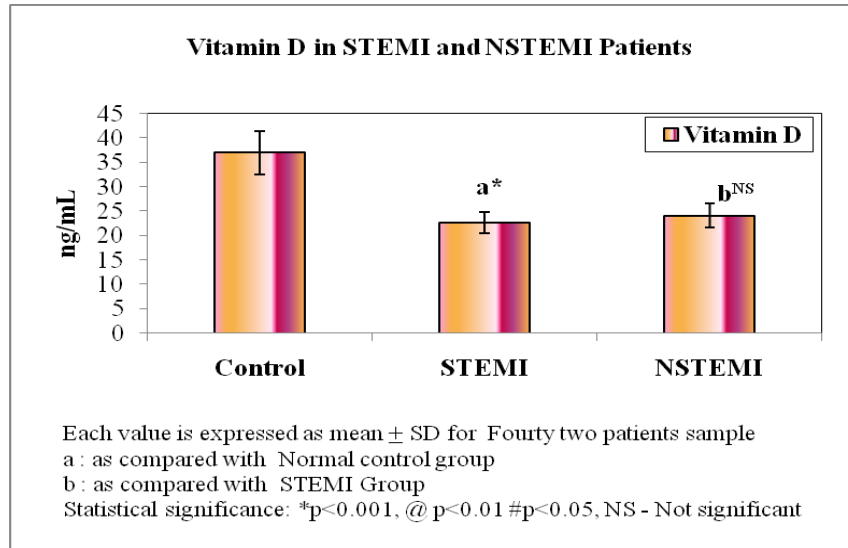
Vitamin D in STEMI and NSTEMI Myocardial Infarction Patients

Fig. 1 represents the study of vitamin D in STEMI and NSTEMI myocardial infarction patients. Group- II STEMI myocardial Infarction patients shows a significantly ($p < 0.001$) decreased when compared with Group I normal control subjects. In Group II NSTEMI myocardial infarction patients were significantly ($p < 0.001$) decreased when compared with normal control Group-I but Group-II STEMI myocardial infarction patients were slightly significantly ($p = 0.701$) decreased when compared with Group-III NSTEMI myocardial infarction patients. There was a trend toward lower vitamin D levels with increasing severity of CAD, but the differences were not statistically significant.

MI is myocardial necrosis occurring as a result of critical imbalance between coronary blood supply and myocardial demand. Myocardial infarction is the impairment of heart function due to inadequate blood flow to the heart compared to its need, caused by obstructive changes in the coronary circulation to the heart. In more than 90% of cases, the cause of myocardial ischemia is reduced blood flow due to obstructive atherosclerotic plaque lesions in one of the three large coronary arteries or its branches. Despite impressive strides in diagnosis and management over the last three decades, acute myocardial infarction continues to be a major public health problem in the industrialized world. Although the death rate of MI has declined by about 30% over the last decade, its development is still a fatal event in approximately one third of the patients.

Table.1 Presentation According to ECG in Myocardial Infarction Patients

GENDER	STEMI	NSTEMI
MALE	30 (71.4%)	10 (23.8%)
FEMALE	--	2(4.76%)



In the present study shows age wise distribution of controls, STEMI and NSTEMI Myocardial Infarction cases. It included healthy controls with mean age of 48.8 +5.3Years, STEMI Myocardial Infarction cases with mean age of 56.7+ 6.2 years and NSTEMI Myocardial infarction cases with mean age of 57.1+ 6.3 years.

In patients with STEMI male and female percentage in the present study was (66% and 50%) was comparable with Mutlu et al (67% and 51.2%) and L. Newby et al (66% and 50.2%). In patients with NESTEMI, males and female percentage in the present study was 26.6% and 57.1% comparable with Mueller et al⁷.

The present study, aimed at investigating the role of vitamin D in a consecutive, nonselected cohort of STEMI and NSTEMI patients. Multiple lines of evidence suggest a link between Vitamin D and cardiovascular disease. Epidemiological studies reported that the rates of coronary

artery disease, diabetes, hypertension, as well as of vitamin D deficiency, increase in proportion to increasing distance from the equator⁸. Cardiac death has also been reported to be at its highest during periods of decreased sunlight exposure. Moreover, observational studies, small clinical trials, and meta- analyses indicate that vitamin D therapy may reduce cardiovascular events and mortality.^{9,10} Clinical interest derives from the fact that vitamin D deficiency can be readily determined by blood testing and treated by supplementation. In particular, a single oral ultra – high dose of vitamin D has been shown to restore normal 25(OH)D levels within 2 days in critically ill patients, without causing adverse effects. Khalili H et al¹¹ observed that Vitamin D levels were significantly decreased in Myocardial infarction patients

VDR has also been demonstrated in heart muscle cells and 1,25(OH)₂D may play a role in the maintenance of ventricular pump function. Patients with heart failure have

lower plasma levels of 25(OH)D and 1,25(OH)₂D than controls¹². There is growing evidence that atherosclerosis may be viewed as a chronic inflammatory disease that involves tumour necrosis factor alpha (TNF- α) and interleukin-6(IL-6). Active vitamin D [1,25(OH)₂D] can suppress these cytokines *in vitro* and TNF- α is inversely related to plasma 25(OH)D *in vivo*^{13,14}. Epidemiological studies indicate an inverse relationship between plasma 25(OH)D and the occurrence of acute myocardial infarction (AMI)¹⁵. In UK an increased cardiovascular morbidity is associated with low plasma 25(OH) D concentrations in winter.

Conclusion

From the present study, estimation of serum vitamin D is an useful index, not only in the diagnosis and prognosis, but also in some critical situations of taking some important decisions like assessment of condition of the patients for transfer from coronary unit or for discharge. Vitamin D levels were significantly lower in patients with STEMI and NSTEMI Patients compared with controls. Patients with lower levels of vitamin D had higher prevalence of severe disease on coronary angiography. Further studies with a larger number of patients are warranted to confirm our results.

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