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ASSOCIATION OF VITAMIN-D DEFICIENCY IN ACUTE ST-ELEVATION MYOCARDIAL INFARCTION: A PROSPECTIVE, CASE CONTROL, HOSPITAL BASED STUDY AT A TERTIARY CARE CENTER IN NORTH INDIA.

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ABSTRACT

Background: Vit-D deficiency is a common nutritional disorder in north India; we designed a study to find its association in Coronary artery disease. **Study design:** Case control prospective hospital based study. **Aim of the study:** To find the association of vitamin D deficiency in patients presenting with acute ST elevation Myocardial infarction and to study risk factor profile in acute ST elevated myocardial infarction in correlation with vitamin D deficiency. **Material and methods:** A total of 150 subjects were selected, out of them 75 were patients with ST elevation myocardial infarction in against with 75 healthy matched checks. Acute myocardial infarction was diagnosed by standard electrocardiographic, clinical and biochemical criteria. Blood sample from each patient with in 48 hrs of admission was taken to assess vitamin-D levels. Data was compiled and results were analyzed for cases against controls. **Results:** Vitamin D deficiency was found to have significant association with acute ST elevated Myocardial infarction. Vitamin D deficiency increases with an increasing age. The independent risk factors for Myocardial infarction like smoking, hypertension, diabetes, Gender, seasonal variation and obesity showed no significant co-relation with Vitamin D.

INTRODUCTION

Coronary Artery disease (CAD) is a major cause of death and disability in developed countries, responsible for about 1 in every 5 deaths (Llyoldetal 2009[1)]. It is assuming pandemic proportions involving the developing world as well where the younger population is also affected (Andrew et al 2009). It is projected that CAD mortality rates will double by the year 2020, with approximately 82% of the increase attributable to the developing world (Okraine et al 2004[3)]. The morbidity, mortality and socioeconomic importance of this disease are dependent upon the identification of risk factors and addressing their modification, its timely accurate diagnosis, proper stratification of the patients and availability of the cost effective management. Cardiovascular disease has been shown to be associated with vitamin D deficiency. Hypertension and Diabetes mellitus are among the leading risk factors for cardiovascular diseases. Several epidemiological and clinical studies have suggested that there is an excess risk of hypertension and diabetes mellitus among persons with suboptimal intake of vitamin-D (Martins 2007). The association of low serum vitamin-D levels with obesity is less likely to be a direct effect of vitamin-D.It has been shown that ultraviolet light exposure and time spent outdoors are better predictors of 25(OH) D levels than dietary vitamin-D intake. Vitamin-D may affect cardiovascular diseases and its risk factors through other pathways, such as its immunosuppressive effects to reduce the proliferation of lymphocytes and the production of cytokines, which have recently been identified as having an important role in atherogenesis (Scraag et al 1990[5)]. Coronary heart disease (CHD) mortality and morbidity in many countries increases by 30-50% in winter compared to summer. This annual variation in CHD occurrence is of a similar order of magnitude to the decline in CHD mortality that has recently occurred in a number of countries. The hypothesis that exposure to sunlight is protective against CHD could explain (in part) the winter increase in CHD mortality and morbidity. In addition it may partly explain the association between age and CHD since the elderly have lower blood levels of 25-hydroxyvitamin D compared to young adults due to a decreased capacity of their skin to produce vitamin D3; and the increased CHD mortality and morbidity rates among some populations with increased skin pigmentation compared to whites, since skin melanin limits the rate of skin vitamin D formation[6Guesseousletal 2011)]. Vitamin D status is best determined by a serum 25(OH)D as opposed to 1,25(HO)2D, for several reasons including: 1) its long circulating half-life (~3 weeks versus ~8 hours), 2) the concentration of 25(OH)D is 1000 times higher in circulation compared to 1,25(OH)2D and 3) the production of 1,25(OH)2D is mainly under the influence of parathyroid hormone which tightly regulates calcium levels. Thus, 1, 25 (OH) 2D levels could be elevated in individuals with severe vitamin D deficiency in order to maintain normal serum calcium levels (Goivannucci 2007)[7].

AIMS OF THE STUDY

To study the association of vitamin D deficiency in acute ST elevated myocardial infarction and to study risk factor profile in acute ST elevated myocardial infarction in correlation with vitamin D deficiency.

MATERIALS AND METHODS

The study was carried out in Department of Cardiology at Sher-i-Kashmir Institute of Medical sciences, Srinagar, J & K India, from July 2011 to October 2013. A total of 150 subjects were selected, out of them 75 were patients with ST elevation myocardial infarction in against with 75 healthy matched checks. Acute myocardial infarction was diagnosed by standard electrocardiographic, clinical and biochemical criteria. We took about 3ml of blood sample from each patient with in 48 hrs of admission for ascertaining the vitamin-D levels. The serum was separated in department of immunology and was stored in refrigerator at -20 degree centigrade. The serum samples for 25-hydroxy vitamin-D levels were analyzed by Radioimmunoassay and equipment using Gama counter has model number; PC-RIA-MAS, STRATECT and was made in Germany. The patients with following co-morbid states were excluded from the study : Recent acute illness, Chronic liver disease and Chronic kidney disease.

RESULTS AND DISCUSSIONS:

Table No. 1

Number of patients	75
Male/Female	65/10
Age in years	32-82 (55.64±11.12)
Diabetes	8(10.6%)
Hypertension	40(53.3%)
Obesity	2(2.66%)
Smoker	54(72%)

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Number of cases taken in different seasons:	
Winter	20(26.6%)
Spring	10(13.3%)
Summer	25(33.3%)
Autumn	20(26.6%)
Cases with normal or above normal vitamin-D	15(20%)
Vitamin-D deficient cases	55(73.3%)
Cases with Vitamin-D insufficiency	05(6.7%)

Table No. 1 shows overall prevalence of vitamin-D deficient patients was 73.3% while as 6.67% had vitamin-D insufficiency and 20% had normal or above normal vitamin-D levels. Overall out of 75 patients of acute myocardial infarction 60 (79.97%) patients were having abnormally low vitamin-D levels. These results are in conformity with the earlier findings of **Lee and colleagues(2013)** in which 25(OH)D levels were assessed in 239 subjects enrolled in a 20-hospital prospective myocardial infarction registry. Out of the 239 enrolled patients, 179 (75%) were 25(OH)D deficient and 50 (21%) were insufficient, 96% of patients had abnormally low 25(OH)D levels(8).

The same table depicts that there is no significant co-relation between Vitamin D deficiency and Diabetes Mellitus. It has also observed that only 8 patients (10.9%) were having diabetes and out of these,6 (75%) patients were found to have vitamin-D deficiency(p value = 0.657).Because of small sample size the significance of correlation between diabetes and low vitamin-D levels cannot be commented upon. In our study in the same table it has been observed that co-relation between Vitamin D deficiency and hypertension has little or no significance. This is the conformation with the results of **Martinetal(2007)** who observed that an excess risk of hypertension and diabetes mellitus in persons with suboptimal intake of vitamin-D has been suggested. There were 7186 male and 7902 female adults with available data in the Third National Health and Nutrition Examination Survey. The mean 25(OH)D level in the overall sample was 30 ng/mL.The 25(OH)D levels were lower in women, elderly persons (age ≥60 years), racial/ethnic minorities, and those with obesity, hypertension, and diabetes mellitus. The adjusted prevalence of hypertension (odds ratio [OR], 1.30), diabetes mellitus (OR, 1.98), obesity (OR, 2.29), and high serum triglyceride levels (OR, 1.47) was significantly higher in the first than in the fourth quartile of serum 25(OH) D levels (P <0.001 for all) (6).

The afore said table also shows that there is no significant relationship between Vitamin D deficiency and obesity and is supported by **Shamiketal** (2004) who observed that out of the 302 enrolled subjects,152 obese subjects were similar in age, gender, and race to the 148 non-obese subjects . Mean serum 25-OH-vitamin D in the obese group was 23.5 ± 12.2 ng/ml, significantly lower (P < 0.0001) than that of the non-obese group (31 ± 14.4 ng/ml)(9). Again in the same table it has been observed that the co-relation between Vitamin D deficiency and smoking are in significant manner and had justified earlier by **Oren, et al(2010)** showed that differences by gender were significant only in the infant age group (i.e. vitamin D status was worse among females) and were not prominent across older ages (10).

Table No. 2 Relation between vitamin-D levels and Seasons

SEASON		Values			Total	P-valve
		Deficient	Insufficient	Normal		
	Spring	9	0	1	10	0.548
		16.4%		6.7%	13.3%	
	Summer	17	1	7	25	
		30.9%	16.7%	46.7%	33.3%	
	Autumn	15	3	2	20	
		27.3%	50.0%	13.3%	26.6%	
	Winter	14	1	5	20	
		25.5%	16.7%	33.3%	26.6%	
Total		55	5	15	75	
		100.0 %	100.0%	100.0%	100.0%	

Table No. 2 indicates that there was no significant relation between vitamin-D levels and different seasons. There were 14 (70%) out of 20 patients whose blood samples were taken for vitamin-D levels during winter season and had vitamin-D deficiency, 9 (90%) had vitamin-D deficiency in spring season out of 10 patients, 17(68%) were vitamin-D deficient in summer season out of 25 patients and 15 (75%) were vitamin-D deficient in autumn season out of 20 patients. No significant relationship between season and vitamin-D deficiency could be documented (p=0.548). The same results supported by by Ann Burgaz et al (2007).

Table 3 shows that vitamin-D deficiency increases with advancing age and hence show a significant relationship with advancing age. The same results were reported earlier by Janssen et al who stated that older people were prone to develop vitamin D deficiency because of various risk factors, decreased dietary intake, diminished sunlight exposure, reduced skin thickness, impaired intestinal absorption, and impaired hydroxylation in the liver and kidneys (12).

Values	Number	Mean Age	Minimum Age	Maximum Age	Std. Deviation
Normal	15	53.67	35	75	10.902
Insufficient	5	60.00	45	80	11.839
Deficient	55	62.83	45	82	9.805
Total	75	55.64	35	82	11.120

Table No.3 Relation between vitamin-D levels and age.

CONCLUSION

Vitamin D deficiency was found to have significant association with acute ST elevated Myocardial infarction. Vitamin D deficiency increases with an increasing age. The independent risk factors for Myocardial infarction like smoking, hypertension, diabetes, Gender, seasonal variation and obesity showed no significant co-relation with Vitamin D.

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