

Study on Vitamin D deficiency in patients of diabetes mellitus presenting with Acute Coronary syndrome in a tertiary care hospital in South India



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ABSTRACT

Background: Vitamin D, a fat-soluble vitamin has its receptor present in myriad of tissues and it modulates multiple cellular processes. Vitamin D deficiency is reported to be associated with coronary artery disease. Cardiovascular disease is the leading cause of mortality worldwide.

Aims and Objective: The primary outcome was to investigate if there is a correlation of 25-OH levels with the percentage of luminal stenosis, as measured with coronary angiogram.

The secondary outcome was to determine the differences in angiographically proven luminal stenosis across categories of 25-OH vitamin D levels. **Materials and Methods:** Thirty patients with acute coronary syndrome with diabetes mellitus were included in this cross-sectional descriptive study. All patients were tested for fasting vitamin D levels, fasting blood sugar, HbA_{1c} and serum creatinine. Detailed history of the patients was recorded. Data was analyzed by the statistical software SPSS version 19 and p value < 0.05 was considered significant. Statistical tests like Chi-square, independent t test and log regression was used.

Results: In this study 30 patients undergoing coronary angiography for acute coronary syndrome, Vitamin D levels showed severe deficiency in 6.7% (2) cases while mild deficiency was seen in 50% of the cases. Patients with single vessel disease on the coronary angiogram had lower mean HbA_{1c} (9.18) levels in our study. Patients with triple vessel disease had poorly controlled mean HbA_{1c} levels (10.42). **Conclusion:** In this study we did not find any significant difference between the serum Vitamin D deficiency levels with patients with angiographic severity of the coronary artery disease. Patients with poorly controlled diabetes mellitus had more severe angiographic proven coronary artery disease.

Key words: Coronary angiogram; Vitamin D; Diabetes Mellitus, HbA_{1c}

INTRODUCTION

Vitamin D, a fat soluble vitamin has its receptor present in myriad of tissues and it modulates multiple cellular processes.¹ Vitamin D acts on the renin-angiotensin aldosterone system and effects changes in cardiomyocytes as a result of the presence of its receptor in this type of cell which may explain its effect on the cardiovascular system.² Coronary artery disease (CAD) is one of the common causes of death and disability in developed countries. Experimental evidence points to the involvement of

multiple factors in coronary plaque formation, including vitamin D.³ The study aimed to examine the association of coronary artery disease with vitamin D level in patients with diabetes mellitus.

MATERIALS AND METHODS

The study was approved by the ethics committee of Father Muller Charitable College Institution. It was conducted according to the standards of the declaration

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of Helinski. It was a prospective study done in a tertiary hospital from February 2019 to February 2020. Thirty patients of diabetes mellitus presenting with acute coronary syndrome were included in this study. All patients presenting with acute coronary syndrome underwent coronary angiogram. The angiogram was evaluated by the cardiologist as single, double or triple vessel disease. In these entire patient's vitamin D levels assay, fasting blood sugar, HbA_{1c}, serum creatine and fasting lipid profile tests was done. Only patients who signed informed consent were included in the study. The study was approved by the institutional review board. HbA_{1c} levels less than 7 was taken as well controlled diabetes mellitus. HbA_{1c} levels between 7 to 8.9 was taken as out of control (uncontrolled) diabetes mellitus. Above 9 was taken as poorly controlled diabetes mellitus in this study. All patients presenting with acute coronary syndrome will undergo coronary angiogram .Presence of significant vessel disease CAD was defined as at least >70% stenosis at one or more major coronary arteries (left anterior descending, left circumflex and right coronary artery) Coronary angiogram will be evaluated by the cardiologist as single, double or triple vessel disease. Serum 25(OH) Vitamin D concentrations was analysed by Roche Hitachi COBAS 6000 automatic machine by electrochemiluminescence method and the values was expressed in ng/ml. The values less than 10ng/ml were considered as severe vitamin D deficiency while 10- 20ng/ml was considered as vitamin D deficiency.

The primary outcome was to investigate if there is a correlation of 25-OH levels with the percentage of luminal stenosis, as measured with coronary angiogram. The secondary outcome was to determine the differences in angiographically proven luminal stenosis across categories of 25-OH vitamin D levels. The gathered information was analysed by the statistical software SPSS version 19 and p value < 0.05 was considered to be significant. ANOVA, chi square test and fishers exact test were used to assess the relationship between the coronary angiogram reports and the Vitamin D levels.

RESULTS

Out of the 30 patients in the study 46.7% (14) were above 60 years 36.7% (11) patients were in the age above 51 years 16.7% (5) patients were below 50 years as shown in Figure 1. 80% (24) patients were males and 20% (6) patients were females as shown in Figure 2. The HbA_{1c} levels were out of control in 40% (12) patients and were poorly controlled in 60% (18) patients as shown in Table 1. None of the patients had HbA_{1c} less than 7. Vitamin D reports analysed showed severe deficiency in 6.7% (2) cases while

Figure 1: Age stratification of the patients

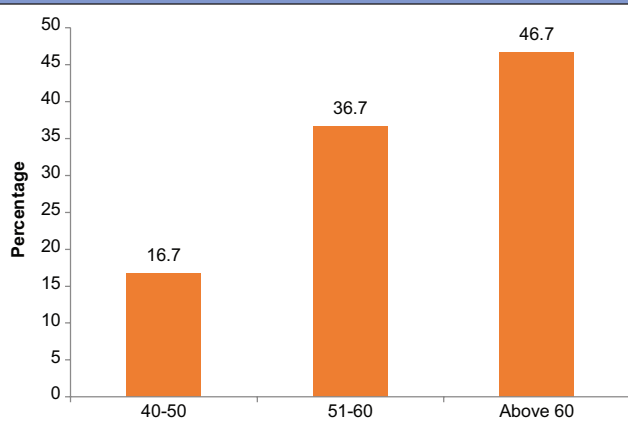


Figure 2: Gender wise analysis

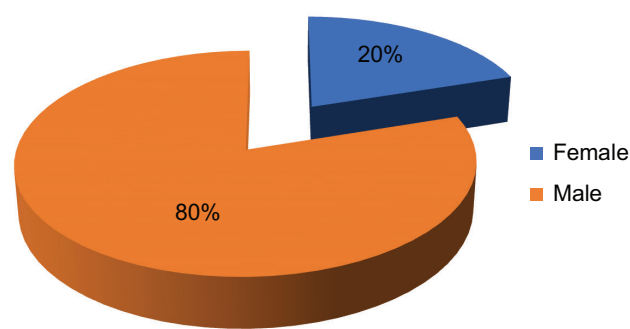


Table 1: Analysis based on values of Glycated Hemoglobin (HbA_{1c})

	Frequency	Percent
Out of control	12	40.0
Poorly control	18	60.0
Total	30	100.0

mild deficiency was seen in 50% (15) cases. Vitamin D levels was normal in 43% (13) patients as shown in Figure 3.

Coronary angiogram report was analysed to single, double and triple vessel disease. Single vessel disease was seen in 43.3% (13) cases. Double vessel disease was seen in 26.7% (8) cases and triple vessel disease was seen in 30% (9) cases as shown in Table 2.

50% (15) patients in our study group had mild vitamin d deficiency and severe vitamin d deficiency was seen in 6.7% (2) cases and 43.3% (13) patients had normal vitamin D levels in this study.

In the subgroup elderly patients 14.3% (2) above age group 60 years had severe vitamin D deficiency. 57.1% (8) of the elderly patients had mild vitamin D deficiency. Mild vitamin D deficiency was seen in 36.4% (4) in the subgroup age group 51-

60 years. The vitamin D levels analysed with age group did not show any statistical significance in this study (p value=0.319). All the baseline characteristics are explained in Table 3.

8.3% (2) cases of the patients with severe vitamin D deficiency were males. In male patients mild vitamin D

deficiency was seen in 45.8% (11) cases and vitamin D levels were normal in 45.8% (11) cases. Vitamin D levels showed mild deficiency in 66.7%(4) of the female patients and 33.3% (2) had normal vitamin D levels.

There was no statistical significance between the gender of the patient and the vitamin D levels in this study.

Figure 3: Analysis based on values of Vitamin D

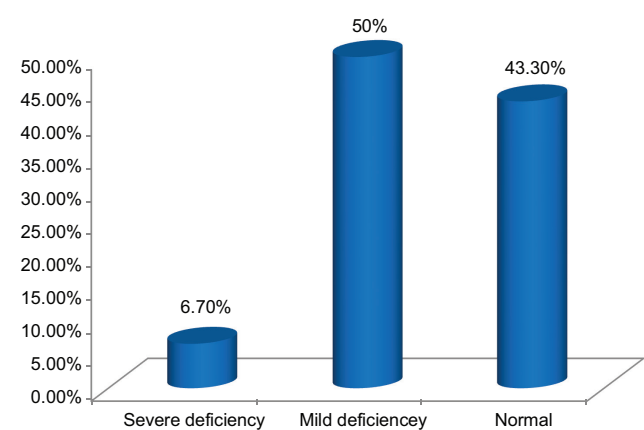


Table 2: Distribution of frequency of subjects based on Coronary Angiogram report

	Frequency	Percent
Single	13	43.3
Double	8	26.7
Triple	9	30.0
Total	30	100.0

60% (18) of patients in our study had poorly controlled diabetes mellitus. In this group 50 % (9) had normal vitamin d levels 38.9% (7) had mild vitamin D deficiency and 11.1% (2) had severe vitamin D deficiency. 40%(12) of patients in this study had out of control diabetes mellitus. In this group 66.7% (8) patients had mild vitamin Deficiency and 33.3% (4) had normal vitamin D levels. There was no statistical significance between vitamin D levels and the HbA_{1c} levels as shown in Table 4.

Coronary angiogram report was analysed with the vitamin D reports. 6.7% (2) patients with triple vessel disease had severe vitamin D deficiency,50% patients showed mild vitamin D deficiency and 43.3% (13) had normal vitamin D levels. In this group of patients with mild vitamin D deficiency 46.7% (7) patients had single vessel disease on the coronary angiogram report, double vessel disease was seen in 26.7% (4) patients and 26.7% (4) patients had triple vessel disease.

43.3% (13) patients had normal vitamin D levels. In this group 46.2%(6) patients had single vessel disease on the coronary angiogram 30.8% (4) patients had double vessel

Table 3: Baseline characteristics of the study cases

		VIT D								
		Severe			Mild deficiency			Normal		
		Count	Row N %	Column N %	Count	Row N %	Column N %	Count	Row N %	Column N %
Age	40 – 50	0	.0	.0	3	60.0	20.0	2	40.0	15.4
	51 – 60	0	.0	.0	4	36.4	26.7	7	63.6	53.8
	Above 60	2	14.3	100.0	8	57.1	53.3	4	28.6	30.8
	Total	2	6.7	100.0	15	50.0	100.0	13	43.3	100.0
Gender	F	0	.0%	.0	4	66.7	26.7	2	33.3	15.4
	M	2	8.3	100.0	11	45.8	73.3	11	45.8	84.6
	Total	2	6.7	100.0	15	50.0	100.0	13	43.3	100.0
HbA _{1c}	Out of control	0	.0	.0	8	66.7	53.3	4	33.3	30.8
	Poorly control	2	11.1	100.0	7	38.9	46.7	9	50.0	69.2
	Total	2	6.7	100.0	15	50.0	100.0	13	43.3	100.0
Single Double_ Triple	Double	0	.0	.0	4	50.0	26.7	4	50.0	30.8
	Single	0	.0	.0	7	53.8	46.7	6	46.2	46.2
	Triple	2	22.2	100.0	4	44.4	26.7	3	33.3	23.1
	Total	2	6.7	100.0	15	50.0	100.0	13	43.3	100.0

Table 4: Vitamin D analysis with other variables

Vitamin D with following parameters	Chi square/Fishers exact test p	
Age	0.319	NS
Gender	0.580	NS
HbA _{1c}	0.234	NS
Single_Double_Triple	0.280	NS

Table 5: Angiogram report with Glycated haemoglobin (HbA_{1c}) levels

	N	Mean HBA1C	Std. Deviation	P	
Single	13	9.185	2.0663	.244	NS
Double	8	10.338	1.7952		
Triple	9	10.422	1.6784		
Total	30	9.863	1.9202		

Table 6: Angiogram report with Vitamin D levels

	N	Mean Vitamin D	Std. Deviation	P	
Single	13	18.8908	7.87096	.660	NS
Double	8	18.4375	6.41829		
Triple	9	16.1111	6.81107		
Total	30	17.9360	7.06313		

disease on the coronary angiogram had normal vitamin D levels while 23.1%(3) with triple vessel disease on the coronary angiogram had normal vitamin D levels. There was no statistical significance between the abnormal coronary angiogram report in patients and the vitamin D levels as shown in Table 5 and Table 6.

Patients with single vessel disease on the coronary angiogram had lower mean HbA_{1c}(9.18) levels in our study. Patients with triple vessel disease had poorly controlled mean HbA_{1c} levels (10.42)

Patients with single vessel disease on coronary angiogram had higher mean Vitamin D (18.89) levels as shown in the above table. Patients with triple vessel disease had lower mean vitamin D levels (16.11).

DISCUSSION

In this study we did not find any significant difference between the serum vitamin D deficiency levels with patients with angiographic severity of the coronary artery disease. In a study done by Dhibar⁴ et al it was concluded that vitamin D deficiency was prevalent in subjects with angiography – proven normal coronary artery, and vitamin D deficiency and severity of deficiency does not correlate with angiographic severity of the disease. Similar study

done by T. Akhtaret al⁵ showed vitamin d deficiency does not correlate with the severity of coronary artery disease. Syal et al.⁶ reported a higher prevalence of vitamin D deficiency in angiographically proven CAD patients and noted a positive association with severity of CAD and endothelial dysfunction with vitamin D deficiency, but their study lacks a control group.

The study done by Darraj H⁷ et al showed significant correlation between HbA_{1c} levels with Vitamin D deficiency in diabetic patients. In a study done by Dossariet al⁸ Vitamin D deficiency was seen in patients with poor glycemic control with type 2 diabetes. Patients with high HbA_{1c} levels had very low vitamin d deficiency levels in study done by Saif – Elnasaret al.⁹ In this study patient with triple vessel disease on angiography had higher HbA_{1c} levels (10.42) as compared with patients with double vessel and single vessel disease and also had lower vitamin d levels though was not statistically significant.

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CONCLUSION

In this study we did not find any significant difference between the serum Vitamin D deficiency levels with patients with angiographic severity of the coronary artery disease. Patients with poorly controlled diabetes mellitus had more severe angiographic proven coronary artery disease.

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Authors Contribution:

AB- Concept and design of the study; interpreted the results, prepared the manuscript and critical revision of the manuscript; **AR-** statistically analyzed, interpreted, reviewed the literature; **PP-** concept, coordination, analyzed the angiogram; **ARA-** Design of the study, statistically analyzed and interpreted, and revision of the manuscript.

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