

Correlation between Vitamin D and HbA1C in Type 2 Diabetic patients

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Abstract

Background: The role of Vitamin D in various metabolic disorders including Diabetes Mellitus has been explored. Vitamin D has sparked widespread interest in the pathogenesis and prevention of diabetes.

Aim: This study evaluates the correlation between Vitamin D status and Glycated haemoglobin in Type 2 Diabetes Mellitus.

Material and methods: This study was a prospective case control study with 50 cases and 50 controls.

Results: Vitamin D insufficiency was observed in both cases and controls. The mean Vitamin D values in cases and controls were 13.89 ± 6.28 ng/ml and 17.30 ± 11.13 ng/ml respectively. Chi square test shows there is significant statistical difference in Vitamin D levels between cases and controls but inverse correlation between Vitamin D and HbA1C which was not found statistically significant.

Conclusion: Present study shown the inverse correlation between Vitamin D and HbA1C but it didn't came statistically significant, may be due to small sample size. Hence present study cannot establish the role of Vitamin D in preventing Diabetes Mellitus but it is highly recommended for Vitamin D screening in diabetic patients on a regular basis.

Keywords: Vitamin D, Diabetes Mellitus, Glycated haemoglobin.

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I. Introduction

Type 2 Diabetes Mellitus is a major health concern globally. The total number of Diabetics is expected to reach 366 million by 2030⁽¹⁾. In India alone 41 million individuals are affected by this disease and this is likely to go up to 70 million by the year 2025⁽²⁾. The prevalence of diabetes in India has remained 11.8% in the last 4 years, according to the National Diabetes and Diabetic Retinopathy survey report released by the health and family welfare ministry in the year 2019. The survey conducted during 2015-2019 by Rajendra Prasad Centre for Ophthalmic Sciences, AIIMS, New Delhi also showed that prevalence of known diabetes cases was 8.0% and new cases was 3.8%. "Males showed a similar prevalence of diabetes (12%) as females (11.7%). In spite of innovative methods in management of Diabetes Mellitus, the morbidity and mortality continues to be high⁽³⁾. Efforts should be made in preventing Diabetes Mellitus. Recently, Vitamin D has sparked widespread interest in the pathogenesis and prevention of diabetes. As the major regulator for calcium homeostasis, there are various mechanisms suggested to relate the role of Vitamin D with the development of Diabetes Mellitus, some of these includes expression of Vitamin D receptors in the beta cells of pancreas which improves insulin exocytosis via activating calcium dependent endopeptidases, improves peripheral utilization of glucose by expressing Vitamin D receptors, it acts like antioxidant this is how it also prevent diabetes and it also down regulate production of cytokines like Interleukin 6 and TNF alpha which causes insulin resistance⁽⁴⁻⁶⁾.

II. Material and Methods

Total 100 individuals who visited Cygnus Hospital, Kurukshetra (Haryana) between March 2020 to May 2020 for routine checkup were enrolled for this study. This study was prospective case control study with 50 cases and 50 controls. Our cases aged from 30 years to 85 years, diagnosed cases of Diabetes Mellitus based on American Diabetes Association (ADA) criteria: Hb1Ac values $\geq 6.5\%$ OR Fasting blood glucose ≥ 126 mg/dl or 2 hour post glucose ≥ 200 mg/dl OR patients with classical symptoms of diabetes (polyuria, polydipsia and polyphagia) with random blood glucose (RBS) of ≥ 200 mg/dl. And individuals with blood sugar within normal limits were selected as controls. Subjects on calcium or Vitamin D supplements were excluded in this study. Cases and controls were divided into three groups according to the plasma Vitamin D levels⁽⁷⁾:

Group1: Deficiency (< 20 ng/ml)

Group2: Insufficiency (20-30 ng/ml)

Group3: Normal (> 30 ng/ml)

The same cases were reclassified into 2 groups on the basis of HbA1C level as per ADA guidelines.

Group 1 : less than 7%

Group 2 : more than 7%

Informed consent was obtained from every patient enrolled for the study.

III. Method

Blood glucose was estimated by Oxidase Peroxidase method in Erba chem5+V2, Glycated haemoglobin was measured by HLC-723GX analyser and Vitamin D was measured by CLIA (Chemiluminescence) method in Abbott I 1000SR.

Statistical methods:

Categorical data were reported as mean and standard deviation. Chi square test were used to test the difference between Vitamin D levels between cases & controls and also Vitamin D levels & HbA1C in cases. P value <0.05 was considered as statistically significant. And Pearson's correlation coefficient used to see correlation between Vitamin D and other diabetic parameters.

IV. Results

Out of 50 cases, 25 were males and 25 were females. Out of 50 controls, 21 were males and 29 were females. Cases aged from 30 to 85 years and controls aged from 17 to 88 years. The mean age of cases and controls were 57.50 ± 11.31 and 54.24 ± 14.38 respectively. Vitamin D insufficiency was observed in both cases and controls as shown in Table 3. The mean Vitamin D values in cases and controls were 13.89 ± 6.28 ng/ml and 17.30 ± 11.13 ng/ml respectively as shown in Table 1 & 2. Chi square test shows there is significant statistical difference in Vitamin D levels between cases and controls as shown in Table 4 but correlation between Vitamin D and HbA1C found not statistically significant as given in Table 5.

Table 1: Primitive information of study subjects (Cases: N=50)

Sr.No	Parameters	Mean+ Standard deviation
1.	Age	57.50±11.31
2.	FBS	179.12±70.60
3.	RBS	289.28±124.85
4.	Hb1Ac	8.80±2.05
5.	Vitamin D	13.89±6.28

Table 2: Information of study subjects (Controls: N=50)

Sr.No	Parameters	Mean+ Standard deviation
1.	Age	54.24±14.38
2.	Vitamin D	17.30±11.13

Table 3: Distribution of Vitamin D levels in cases and controls.

Vitamin D (ng/ml)	Cases(N=50) Number	Cases(N=50) Percentage	Controls(N=50) Number	Controls(N=50) Percentage	P value
<20	43	86%	35	70%	0.089
20-30	06	12%	09	18%	0.576
>30	01	02%	06	12%	0.111

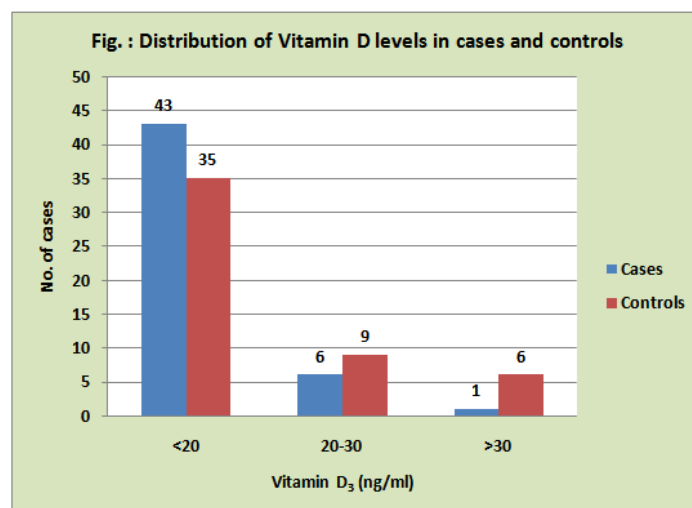


Table 4: Vitamin D levels (Mean, SD, P value) in cases and controls.

Subjects	Number	Mean Vitamin D levels(ng/ml)	Standard deviation	P value
Cases	50	13.89	6.28	0.011
Controls	50	17.30	11.13	

The association between Vitamin D between cases and controls was done using chi square test. **The P value was = 0.011**

Table 5: Vitamin D values in relation with HbA1c levels in study cases (N=50)

25 Hydroxy Vitamin D	HbA1C <7%	HbA1C>7%	Total	P value
<20ng/ml	10	33	43	0.357
20-30ng/ml	02	04	06	0.643
>30ng/ml	01	00	01	0.260
Total	13	37	50	

The association between Vitamin D groups and HbA1c group was done using chi square test. **The P value was = 0.203**

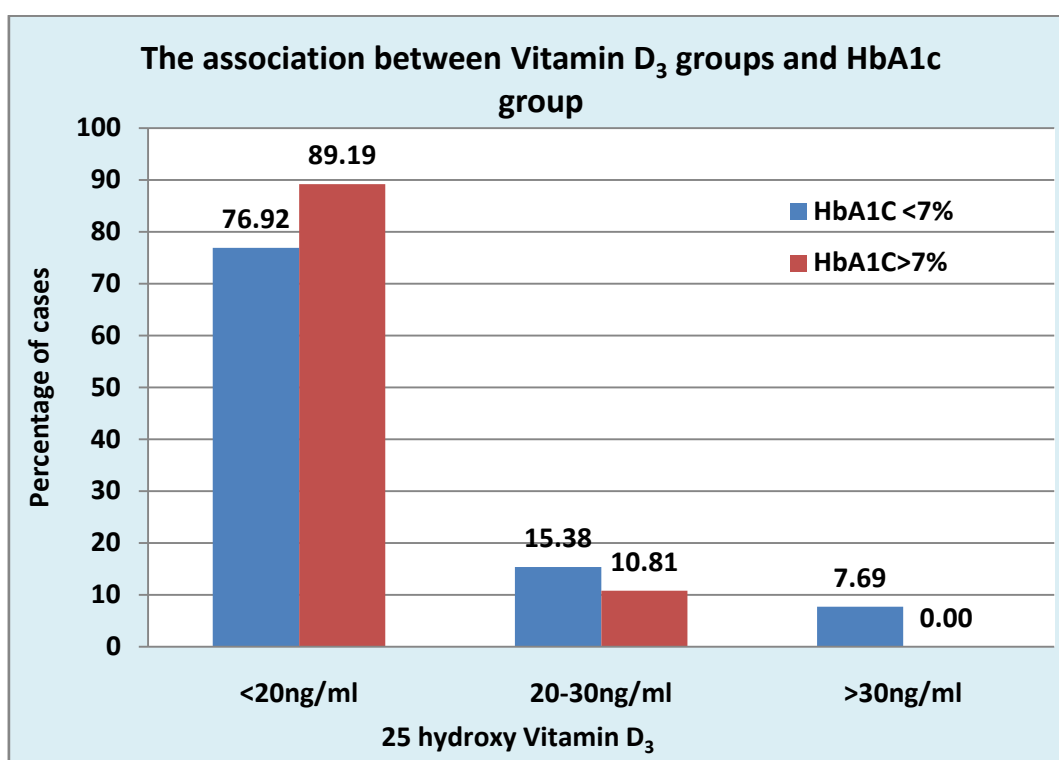
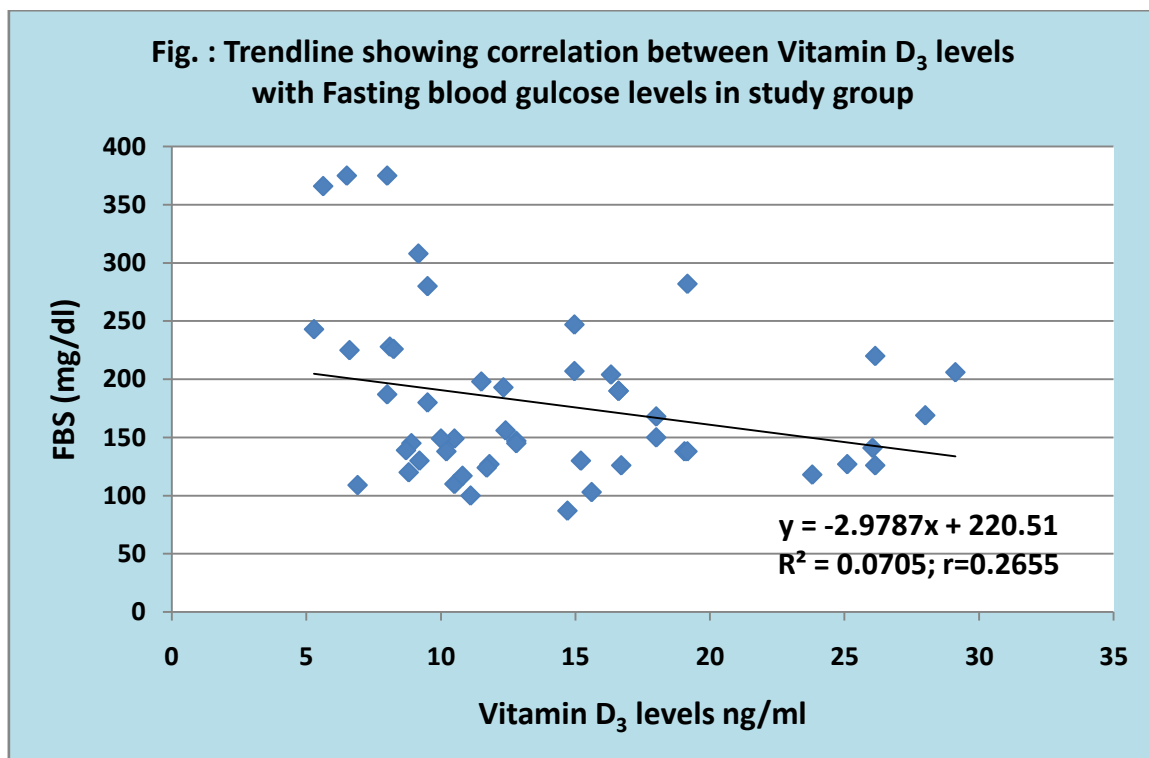
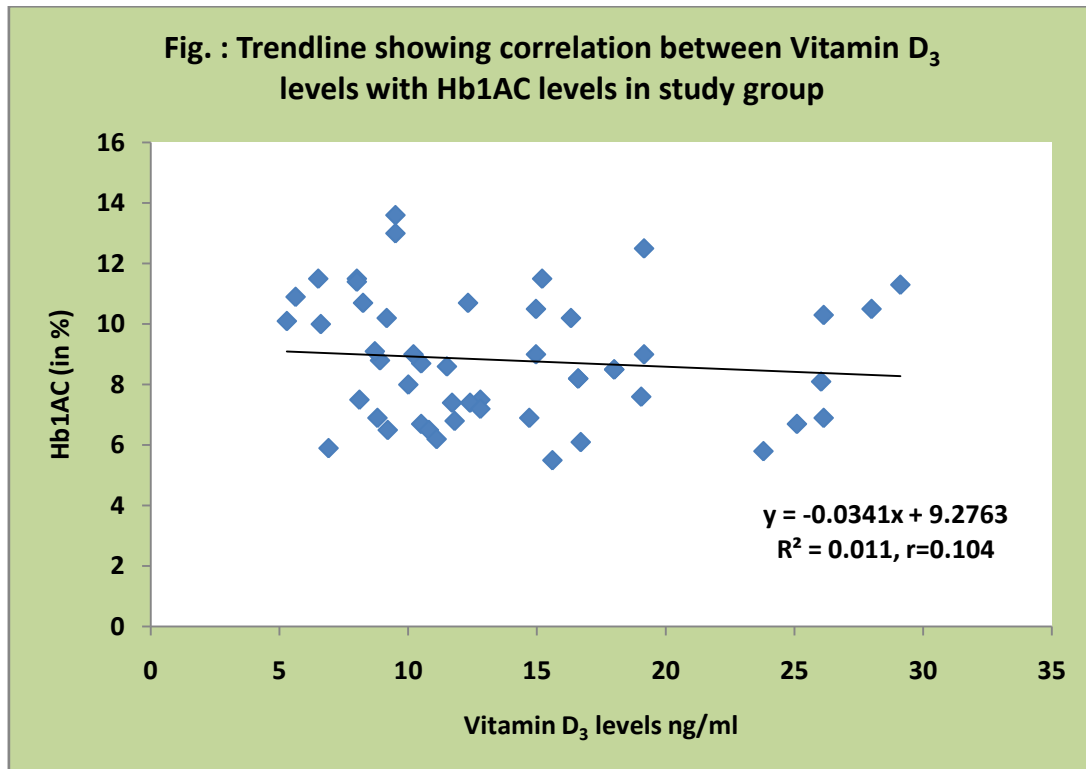
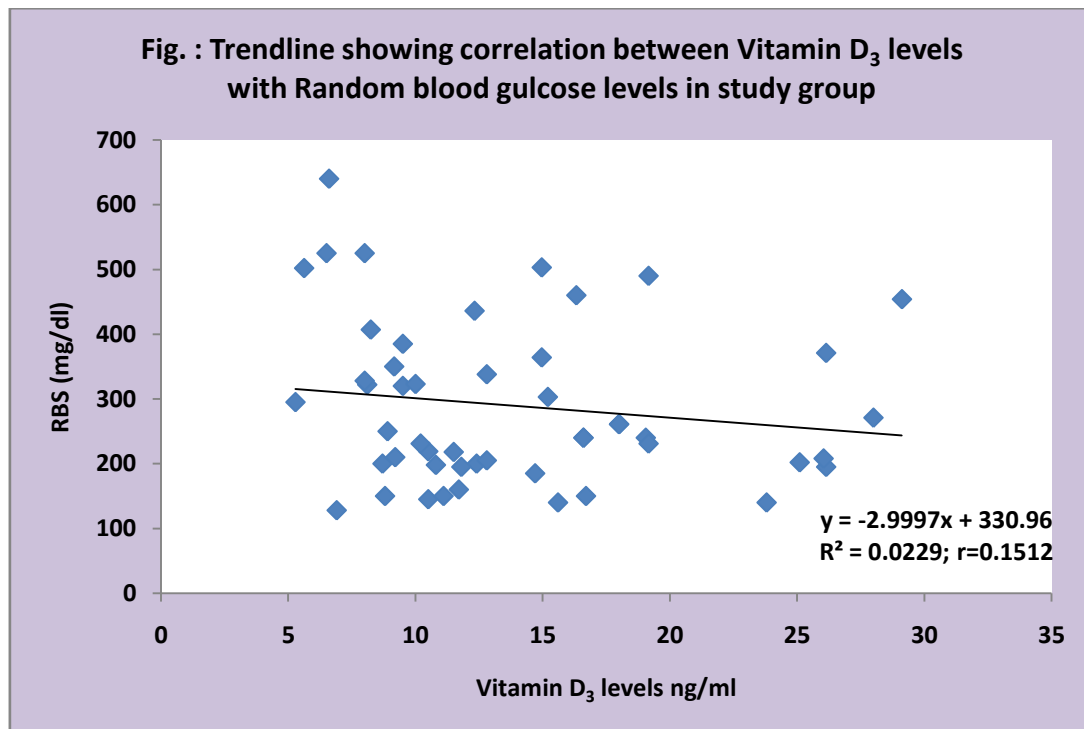


Table 6: Correlation between Vitamin D and various diabetic factors (Using Pearson’s correlation coefficient) in study cases (N=50)

Correlation between two parameters	R value
Vitamin D and HbA1C	-0.1047
Vitamin D and FBS	-0.2655
Vitamin D and RBS	-0.1512

The ‘r’ value between Vitamin D and Hb1AC, FBS, RBS were -0.1047,-0.2655,-0.1512 which suggested that there was an inverse correlation between these parameters respectively. The ‘r’ value calculated between Vitamin D and HbA1C showed an inverse correlation between them which means that as HbA1C rises, the Vitamin D is found to be low in the same.





V. Discussion

In the present study, Vitamin D deficiency was observed in 98% of cases and 88% of controls which is comparable with other study^(8,9) where they got Vitamin D deficiency in 91.4% of cases of Diabetes Mellitus and 93% in the control group hence could not establish any association between Vitamin D and HbA1C. Our study shows an inverse correlation between Vitamin D and HbA1C as shown in Table 6 comparable with other study⁽¹⁰⁾ but there is no statistically significant association between Vitamin D and HbA1C which is also seen in other study^(11,12) that is not in agreement with the findings of other studies^(10,13). This study has few limitations like its small sample size which may limit the generalization of results, both cases and controls found were deficient of Vitamin D and secondly correlation between Vitamin D levels and HbA1C in diabetic cases should have seen after giving Vitamin D supplements, was not undertaken.

VI. Conclusion

There is an inverse correlation between Vitamin D and HbA1C that is also statistically significant, seen in many studies, the present study also shown the inverse correlation between Vitamin D and HbA1C but it didn't came statistically significant, may be due to small sample size. Hence present study cannot establish the role of Vitamin D in preventing Diabetes Mellitus but it is highly recommended for Vitamin D screening in diabetic patients on a regular basis.

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