MAK HILL Publications International Journal of Tropical Medicine

Research Article
doi: 10.59218/makijtm.2024.2.67.69

OPEN ACCESS

Key Words
Vitamin D, Diabetes mellitus, HbA1c

Corresponding Author
Parvez Khan Sameja,
Department of General Medicine, SPMC Bikaner, Rajasthan, India
parvezsameja@gmail.com

Author Designation
[1,2]Associate Professor

Received: 16 March 2024
Accepted: 22 April 2024
Published: 23 April 2024

Citation: Parvez Khan Sameja and Shyam Lal Meena, 2024. Association of Vitamin D Level with HbA1C. Int. J. Trop. Med., 19: 67-69, doi: 10.59218/makijtm.2024.2.67.69

Association of Vitamin D Level with HbA1C

[1]Parvez Khan Sameja and [2]Shyam Lal Meena
[1,2]Associate professor, Department of General Medicine, SPMC Bikaner, Rajasthan, India

ABSTRACT
Role of vitamin D is described in diabetes mellitus in multiple studies. To study the association between vitamin D level and HbA1C level. A cross sectional observational study on 100 patients of type 2 diabetes mellitus at sardar patel medical college Bikaner. All routine lab parameters were done and patients were evaluated for diabetes. Statistical analysis was done by Epi info software of CDC. Out of 100 cases vitamin D deficiency was found in 77 patients. Significant association was found between vitamin D deficiency and younger age. (p = 0.012) Negative correlation was present between vitamin D level and HbA1c. Vitamin D deficiency was found to be significantly associated with high HbA1c (p = 0.024). Vitamin d deficiency in type 2 diabetes mellitus is associated with poor glycemic control.

INTRODUCTION

Diabetes mellitus is one of the most common non communicable disease in modern world. According to National Family Health Survey (NFHS)- 5, 15.6% of men and 13.5% of women are living with high blood sugar level (>140 mg/dL) among adults age 15 year and above in India[1,2].

Vitamin D is a fat soluble vitamin playing vital role in calcium homeostasis. In last few decades, its role has been studied and described in conditions other than calcium homeostasis. Sometimes, vitamin D is stated as a hormone due to its widespread physiological role. Role of vitamin D is described in diabetes mellitus in multiple studies owing to its facilitation/inhibition of transcription factor and immune-modulator property.

Aim: To study the association between vitamin D level and HbA1C level.

MATERIALS AND METHODS

A cross sectional observational study on 100 patients of type 2 diabetes mellitus at Sardar Patel medical college Bikaner. All patients of age 30-70 year of age presenting to OPD and IPD of Department of Medicine with type 2 diabetes mellitus formed the study group. All routine lab parameters were done and patients were evaluated for diabetes. Patients with established chronic kidney disease, chronic liver disease, carcinoma, on glucocorticoid therapy, anti-epileptic drugs, supplementation of vitamin D, diuretics, Patients with acute complications were excluded. All routine tests were done including haemoglobin level, fasting and post-prandial blood glucose, HbA1c level, fasting insulin and 25-hydroxy vitamin D level. Statistical analysis was done by Epi info software of CDC.

RESULTS AND DISCUSSIONS

100 patients of type 2 diabetes mellitus were included and evaluated with socio-economic data, biochemical profile and clinical examination. Mean age of patients was 49.5±11 year. Out of these, 60 patients were male and 40 patients are female. Mean duration of diabetes was 6.5±5.18 year.

For comparison, patients were divided into different subgroups on the basis of different variables. Patients with serum 25(0H) D ≤20 ng/mL were considered as vitamin D deficient while serum 25 (OH) D >20 ng/mL were considered as vitamin D sufficient.

65 patients (65%) were vitamin D deficient while 35 patients (35%) were vitamin D sufficient.

Three groups were formed on the basis of HbA1c. Patients with HbA1c ≤7% were included in well control group. HbA1c of 7-8% formed poor control group. HbA1c >8% were included in uncontrolled group.

Out of 65 patients of vitamin D deficiency, 46 patients (70.12%) had uncontrolled glycaemic status, while 18 patients (51.42%) out of 35 patients with vitamin D sufficiency had uncontrolled glycaemic status indicating that vitamin D deficiency has significant association with poor glycaemic control (p = 0.024) (Table 1).

Patients were categorised in three categories based on serum 25(0H) D values- vitamin D deficient (≤10 ng/mL), vitamin D insufficient (11-20 ng/mL) and vitamin D sufficient (>20 ng/mL).

Significant association was found between vitamin D deficiency and young age. (P-value = 0.0100) Near significant association was found between vitamin D deficiency and poor glycaemic control. (P-value = 0.0535) (Table 2).

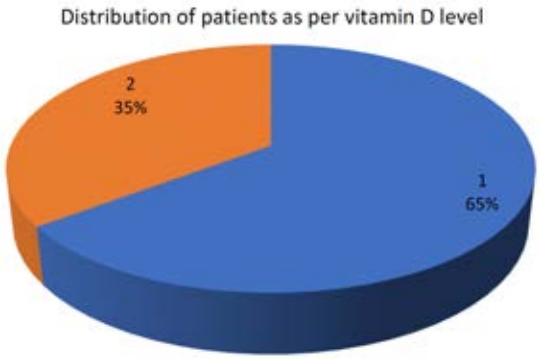

Fig. 1: Illustrates distribution of patients as per vitamin D level

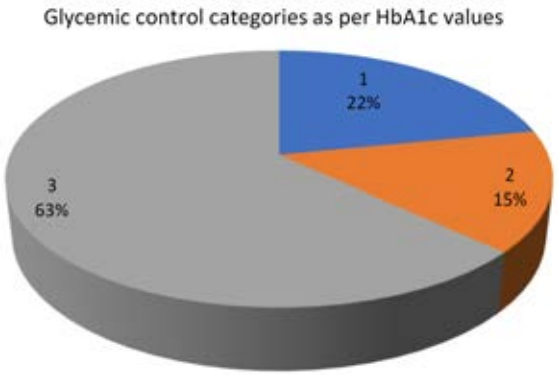

Fig. 2: Categories of glycaemic control as per HbA1c values. 22 patients (22%) formed well controlled group. 15 patients (15%) formed poor control group. 63 patients (63%) formed uncontrolled group.

Table 1: Illustrates association between vitamin D and glycaemic control. Vitamin D deficient group had significant association with poor glycaemic control

HbA1c	Vitamin D sufficient (>20 ng/mL)	Vitamin D deficient (<=20 ng/mL)	p-value
≤7% (well controlled)	12	9	0.001*
7-8% (Poor control)	5	10	
>8% (uncontrolled)	18	46	

Table 2: Illustrates comparison of mean values of different variables among three subgroups based on vitamin D level

Parameter	Vitamin D deficient (≤10 ng/mL) (n = 33)	Vitamin D insufficient (11-20 ng/mL) (n = 33)	Vitamin D sufficient (>20 ng/mL) (n = 34)	p-value
Age	45.66±11.7	49.4±10.7	53.05±9.4	0.0100
BMI	27.75±4.4	26.4±4.1	27.18±4.07	0.3724
HbA1c	9.8±2.6	8.6±1.6	8.7±2.4	0.0535
Fasting plasma glucose	191.8±41.7	183.6±29.6	174.4±43.4	0.1363

In present study, vitamin D showed negative correlation with HbA1c and significant association was noted between vitamin D deficiency and poor glycaemic control. Vitamin D and HbA1c also showed negative linear regression on regression analysis. Similarly Li *et al*.[3] in 2021 and Zhao *et al*.[4] in 2020 found Vitamin D deficiency was significantly associated with poor glycaemic control.

Various mechanisms have been proposed to explain the role of vitamin D in diabetes mellitus. Various animal studies done on rat pancreas and human studies suggest that vitamin D directly can stimulate insulin secretion[5-7]. It also facilitates transcription of insulin receptors and thus, increases insulin sensitivity[8,9]. Vitamin D also helps in maintaining balance between intracellular and extracellular calcium which is essential for optimal insulin secretion[10]. It has immune-modulatory property by which it is described to delay the apoptosis of beta cells and improving insulin secretion.

In 2013, Kostoglou-Athanassiou *et al*.[11] reported that Vitamin D deficiency was found to be more prevalent in diabetic patients and it was significantly associated with poor glycaemic control. Also Li *et al*.[12] in 2018 found Significant inverse association was found between vitamin D level and fasting insulin, HbA1c but insignificant with fasting plasma glucose. And Buhary *et al*.[13] in 2017 also found a significant association between vitamin D deficiency and poor glycaemic control.

CONCLUSION

Prevalence of vitamin D deficiency is higher in younger age. Probable risk factors for vitamin D deficiency are dietary habits, indoor and urban lifestyle. Vitamin D deficiency in type 2 diabetes mellitus is associated with poor glycaemic control.

REFERENCES

1. WHO., 2021. Diabetes-fact sheet. https://www.who.int/news-room/fact-sheets/detail/diabetes.
2. IIPS., 2021. National family health survey (NFHS). https://main.mohfw.gov.in/basicpage-14
3. Li, Z., F. Wang, Y. Jia, F. Guo and S. Chen, 2021. The relationship between hemoglobin glycation variation index and Vitamin D in Type 2 diabetes mellitus. Diabetes, Metabolic Syndrome and Obesity: Targets and Therapy, Vol. 14, No. 1937.
4. Zhao, H., Y. Zhen, Z. Wang, L. Qi, Y. Li, L. Ren and S. Chen, 2020. The relationship between vitamin D deficiency and glycated hemoglobin levels in patients with type 2 diabetes mellitus. Diabetes, Metabolic Syndrome and Obesity: Targets and Therapy. Vol. 13, No. 3899.
5. Norman, A.W., B.J. Frankel, A.M. Heldt and G.M. Grodsky, 1980. Vitamin D deficiency inhibits pancreatic secretion of insulin. Science, 209: 823-825.
6. Chertow, B.S., W.I. Sivitz, N.G. Baranetsky, S.A. Clark, A. Waite and H.F. Deluca, 1983. Cellular mechanisms of insulin release: the effects of vitamin D deficiency and repletion on rat insulin secretion. Endocrinology, 113: 1511-1518.
7. Kadowaki, S. and A.W. Norman, 1984. Dietary vitamin D is essential for normal insulin secretion from the perfused rat pancreas. J. Clin. Invest., 73: 759-766.
8. Maestro, B., J. Campión, N. Dávila and C. Calle, 2000. Stimulation by 1, 25-dihydroxyvitamin D3 of insulin receptor expression and insulin responsiveness for glucose transport in U-937 human promonocytic cells. Endocrine J., 47: 383-391.
9. Maestro, B., N. Dávila, M.C. Carranza and C. Calle, 2003. Identification of a Vitamin D response element in the human insulin receptor gene promoter. The J. Of Steroid Biochem. And Mol. Biol., 84: 223-230.
10. Fleet, J.C., 2017. The role of vitamin D in the endocrinology controlling calcium homeostasis. Mol. Cell. Endocrinol., 453: 36-45.
11. Kostoglou-Athanassiou, I., P. Athanassiou, A. Gkountouvas and P. Kaldrymides, 2013. Vitamin D and glycaemic control in diabetes mellitus type 2. Ther. Adv. Endocrinol. Metab., 4: 122-128.
12. Li, D., H. Wei, H. Xue, J. Zhang, M. Chen, Y. Gong and G. Cheng, 2018. Higher serum 25 (OH) D level is associated with decreased risk of impairment of glucose homeostasis: data from Southwest China. BMC Endocr. Disord., 18: 1-9.
13. Buhary, B.M., O. Almohareb, N. Aljohani, S. Alrajhi and S. Elkaissi, 2017. Association of glycosylated hemoglobin levels with vitamin D status. J. Clin. Med. Res., Vol. 9:1013-1018.