www.jmscr.igmpublication.org
Impact Factor (SJIF): 6.379
Index Copernicus Value: 79.54
ISSN (e)-2347-176x ISSN (p) 2455-0450
crossrefDOI: https://dx.doi.org/10.18535/jmscr/v6i10.183

IGM Publication
Journal Of Medical Science And Clinical Research
An Official Publication Of IGM Publication

A Comparative Study of Serum Vitamin D levels in Type 2 Diabetes Mellitus Patients and Age Matched controls

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Abstract
Background: *Diabetes mellitus is one of the rapidly emerging non-communicable diseases worldwide. This study is done to the assess the vitamin D deficiency existing among the fast growing diabetic population.*
Aim: *To compare serum vitamin D levels in type 2 diabetes mellitus patients with age matched non diabetic population and to correlate vitamin D levels with the glycemic control and duration of diabetes.*
Materials and Methods: *This is a hospital based case control study conducted between November 2016 and August 2018. 50 diabetic subjects and 50 age matched non diabetic controls were included in the study. Serum levels of 25(OH)-vitamin D and glycated haemoglobin were measured in both groups.*
Results: *Mean age group among cases and control were 48.02 ± 9.01 years and 48.20 ± 8.90 years.The mean concentration of vitamin D in the case group was 16.8±7.96ng/dl and in the control group was 21.4±11.8 ng/dl. In diabetic patients, vitamin D level was deficient in 41 (82%), insufficient in 5(10%) and sufficient in 4(8%) patients. In the non diabetic group, these parameters were seen in 33(66%), in 7(14%) and in 10 (20%) respectively. Among diabetic patients, vitamin D level had a significant inverse correlation with patient's glycated hemoglobin levels.*
Conclusion: *Vitamin D deficiency was significantly high in diabetic patients than the age matched non diabetic individuals. Also Vitamin D levels were much lower among patients with poor glycemic control.*
Keywords: *Diabetes mellitus, serum Vitamin D, glycated haemoglobin.*

Introduction

Diabetes mellitus is a metabolic condition causing hyperglycemia due to deficient insulin secretion or its action. In a study by Wild et al. the global prevalence of diabetes is expected to double from 171 million in 2000 to 366 million in 2030 with a maximum incidence in India(1). According to WHO, about 8.7 % diabetic population in India is in the age group of 20 to 70 years. This epidemic will have an alarming rise unless effective

treatment and preventive measures are put in place to control it.

Vitamin D, also called as the 'Sunshine Vitamin', is proved to be related with various disorders like hypertension, heart disease, diabetes, cancer and so on[2].Many studies were conducted on vitamin Dto signify its vital role in maintaining health[3]. Both type 1 and type 2 diabetes mellitus are related to vitamin D deficiency[4]. Various mechanisms associated with vitamin D deficiency has been connected to insulin resistance and type 2 diabetes. Vitamin D deficiency increases parathyroid hormone levels (PTH) which paradoxically rise the intracellular calcium level ('calcium paradox') more than the optimal level which diminishes the cellular response to insulin action. Vitamin D regulates the transcription & expression of insulin receptors in peripheral tissues. Vitamin D deficiency alters the physiological homeostasis between extracellular and intracellular calcium in beta cells interfering with insulin synthesis and secretion[5,6].

Pittas et al reported that low vitamin D levels appears to interfere with glycaemic control and vitamin D supplementation can be tried to improve the glucose metabolism[7].In spite of being in tropical zone, occurrence of vitamin D deficiency in India is significantly high among all ages and for both urban and rural population. Hence this study is done to highlight the occurrence of vitamin D deficiency among the fast growing diabetic population.

Aims and Objectives

- To compare serum vitamin D levels in type 2 diabetes mellitus patients and age matched non diabetic individuals
- To correlate the level of serum vitamin D in type 2 diabetes mellitus patients with the duration of diabetes and glycemic control (HbA1C)

Materials and Method

The present study is a Case Control study, conducted after getting institutional ethical committee approval. 100 subjects with age ranging from 30 to 70 years, comprising of 50 diabetic cases and 50 age matched non diabetic controls, recruited from both outpatients and inpatients of Rajah Muthiah Medical College were included in the study. This study was conducted during November 2016 to August 2018.

Inclusion criteria for cases

1. Age (≥30 years and <70yrs)
2. Fasting plasma glucose levels (FBS ≥ 126.0 mg/dl)
3. HbA1c ≥ 6.5
4. 2 hours plasma glucose > 200mg/dl during an oral glucose tolerance test

Inclusion criteria for non-diabetic control group

1. Age (≥30 years and <70years)
2. HbA1c level < 6.5%
3. Plasma glucose levels (FBS <100mg/dl)

Subjects with Type 1 Diabetes, post menopausal woman, known case of osteoporosis, Chronic liver diseases (CLD), Chronic kidney diseases (CKD), Systemic hypertension, BMI>28, medication that affect vitamin D metabolism, malabsorption, Sunscreen usage, those with concomitant illness and intake of vitamin D supplements were excluded from the study.

After getting informed consent, detailed history comprising of duration of diabetes mellitus, medications history, other associated problems like dyslipidaemia, thyroid disorder, coronary artery heart disease, osteoporosis, CKD, CLD were sought. Body Mass Index (BMI) is calculated using standard formula (Quetelet index)[8]. Blood samples for measuring total vitamin D and HbA1c levels were collected. Vitamin D was estimated using chemiluminescent immune assay (C.L.I.A). HbA1c value is measured by Ion exchange resin method.

Correlation between Glycemic control as assessed by HbA1c value and vitamin D levels was analysed. SSPS21 software was used for statistical analysis and T test was done to correlate the parameters.

Results

Table 1 - Demography of the study population		
Parameter	Cases	Control
	Mean±Standard deviation	Mean±Standard deviation
Age	48.20 ± 8.90	48.02 ± 9.01
BMI	25.42 ± 1.61	24.52 ± 2.06
HbA1c	8.16 ± 1.29	5.56± 0.50

In the present study, the mean age among the cases was 48.20±8.90. The mean age among control was 48.02±9.01. Most of the cases were in the age group 41-50 years. Males predominated in both case and control groups (N=32, 64%, 33, 66%). The mean BMI among cases was 25.42±1.61 and among control was 24.52±2.06. The duration of diabetes was less than 5 years in about 66% of the cases, 6- 10 years in 32 % of cases and more than 11 year in 6% of the cases.

Table 2 Vitamin D Levels among Cases and Control				
Vitamin D Status (ng/ml)	**CASES**	**Percentage (%)**	**Control**	**Percentage (%)**
DEFICIENT (<20)	41	82	33	66
INSUFFICIENT (20 – 30)	5	10	7	14
SUFFICIENT (> 30)	4	8	10	20
MEAN VITAMIN D ± SD	**16.80± 7.96**		**21.44 ± 11.83**	

In this study, diabetic cases had a higher percentage of vitamin D deficiency (N = 41, 82%). Also, 5 cases (10%) had vitamin D insufficiency and 4 cases (8%) had normal vitamin D levels. Among non - diabetics controls, 33 (66%) were vitamin D deficient, 7(14%) had insufficient vitamin D levels and 10 (20%) had normal vitamin D levels. The mean serum vitamin D level among diabetic patients and age matched controls were 16.80±7.96 and 21.44±11.83 respectively.

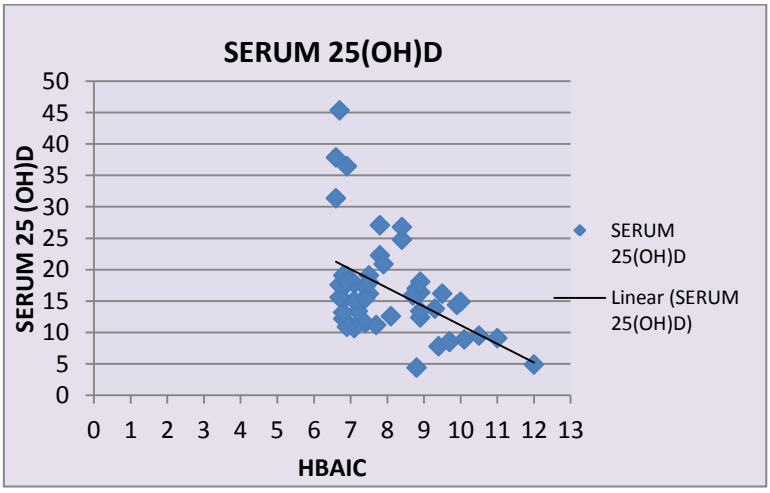

Figure 1 – Graph Showing Correlation between Hba1c and Vitamin D Levels among Cases

Discussion

In this study, cases were selected in the age of 30 to 70 years and an age matched non diabetic control group was selected accordingly. Among them 41- 50 years predominated the study population. The mean age among cases was 48.20±8.90 and that of controls was 48.02±9.01. This was similar to the study conducted by Nanda.

S et al where 48.5±11.9 and 44.0±10.5 were the mean age observed among the cases and controls respectively[9].

The measured serum Vitamin D values were compared among diabetic cases and non diabetic controls and were categorised as deficient, insufficient and sufficient. The mean vitamin D levels among cases was 16.80 ± 7.96 and among controls was 21.44±11. Vitamin D deficiency was reported among most of the diabetic population in this study (N=41, 82%). About 5 (10%) cases had insufficient vitamin D values and 4 (85) cases had normal vitamin D levels. Among the control group, 33 (66%) were vitamin D deficient, 7 (14%) had insufficiency and 10 (20%) had normal levels. In this study, vitamin D deficiency was observed more among the diabetic cases (82%) than the non diabetic controls (66%). Daga et al. conducted a study in the Northern India, which stated that 91.1% of diabetic patients had decreased vitamin D levels. They observed a mean vitamin-D level of7.88±1.2among diabetic patients and16.64±7.83among non-diabetic individuals[10]. According to Kotwal et al. 81% of diabetes patients had lower Vitamin D levels in contrast to 67% of non diabetic controls[11].

Pearsons correlation was used to analyse Vitamin D levels and HBA1C. It showed a statistically significant inverse correlation between Vitamin D levels and HBA1C. Correlation coefficient was found to be - 2.301 (p value 0.024) (Figure–1). In Dalgard et al, an independent association between increase in HBA1C with decrease in Vitamin D levels was made out similar to this study[12]. Buhary et al. also observed an inverse relationship between HBA1C and Vitamin D levels[13]. However, Sheth et al. could not find any correlation between Vitamin D levels and HbA1c[14]. Sabherwal et al. conducted a study in south Asian type 2 Diabetes Mellitus patients which showed an improvement in HBA1C levels after Vitamin D administration, indicating the benefit of Vitamin D in glycaemic control[15].

Conclusion

In this study, an increased occurrence of vitamin D deficiency and insufficiency in diabetic patients than non-diabetic individuals was observed. There was an inverse correlation between Vitamin D levels and Glycated haemoglobin in the present study. Thus, adequate treatment of under diagnosed Vitamin D deficiency can thus help in improving glycemic status of the diabetic patients. Fortification of staple food with Vitamin D may be tried to overcome the prevalent vitamin D deficiency in our country. However, further researches are needed to establish the benefit of vitamin D supplementation in diabetic patients.

Declaration of Conflicting Interests– No Conflicting Interests

References

1. Wild S, Roglic G, Green A, Sicree R, King H. Global Prevalence of Diabetes: Estimates for the year 2000 and projections for 2030. Diabetes Care. 2004 May 1;27(5):1047–53.
2. Wang H, Chen W, Li D, Yin X, Zhang X, Olsen N, et al. Vitamin D and Chronic Diseases. Aging Dis. 2017 May;8(3):346–53.
3. Heaney RP. Vitamin D in Health and Disease. CJASN. 2008 Sep 1;3(5):1535–41.
4. Nair R, Maseeh A. Vitamin D: The "sunshine" vitamin. Journal of Pharmacology and Pharmacotherapeutics. 2012 Apr 1;3(2):118.
5. Lips P, Eekhoff M, van Schoor N, Oosterwerff M, de Jongh R, Krul-Poel Y, et al. Vitamin D and type 2 diabetes. The Journal of Steroid Biochemistry and Molecular Biology. 2017 Oct 1;173:280–5.
6. Maddaloni E, Cavallari I, Napoli N, Conte C. Vitamin D and Diabetes Mellitus. Vitamin D in Clinical Medicine. 2018;50:161–76.

7. Pittas AG, Lau J, Hu FB, Dawson-Hughes B. The Role of Vitamin D and Calcium in Type 2 Diabetes. A Systematic Review and Meta-Analysis. J Clin Endocrinol Metab. 2007 Jun 1;92(6):2017–29.
8. Nuttall FQ. Body Mass Index. Nutr Today. 2015 May;50(3):117–28.
9. Nanda S. evaluation-of-vitamin-d-status-and-its-correlation-with-glycated-haemoglobin-in-type-2-diabetes-mellitus. Biomed Res. 2017;28(1):5.
10. Daga RA, Laway BA, Shah ZA, Mir SA, Kotwal SK, Zargar AH. High prevalence of vitamin D deficiency among newly diagnosed youth-onset diabetes mellitus in north India. Arquivos Brasileiros de Endocrinologia & Metabologia. 2012 Oct; 56(7):423–8.
11. Laway BA, Kotwal SK, Shah ZA. Pattern of 25 hydroxy vitamin D status in North Indian people with newly detected type 2 diabetes: A prospective case control study. Indian Journal of Endocrinology and Metabolism. 2014 Sep 1;18(5):726.
12. Dalgård C, Petersen MS, Weihe P, Grandjean P. Vitamin D status in relation to glucose metabolism and type 2 diabetes in septuagenarians. Diabetes Care. 2011 Jun;34(6):1284–8.
13. Buhary BM, Almohareb O, Aljohani N, Alrajhi S, Elkaissi S, Sherbeeni S, et al. Association of Glycosylated Hemoglobin Levels With Vitamin D Status. J Clin Med Res. 2017 Dec;9(12):1013–8.
14. Sheth JJ, Shah A, Sheth FJ, Trivedi S, Lele M, Shah N, et al. Does vitamin D play a significant role in type 2 diabetes? BMC Endocr Disord. 2015 Feb 26;15:5.
15. Sabherwal S, Bravis V, Devendra D. Effect of oral vitamin D and calcium replacement on glycaemic control in South Asian patients with type 2 diabetes. International Journal of Clinical Practice. 2010 Jul 1;64(8):1084–9.