

Prevalence & Severity of Vitamin D Deficiency in Type 2 Diabetic Patients

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Abstract

Background: The worldwide epidemic of Diabetes Mellitus (DM) is a serious current health problem because of the high toll of vascular complications associated with the condition. It has been estimated that 380 million individuals would be affected with diabetes worldwide by the year 2025. Vitamin D deficiency is increasingly recognized as a global problem and it has been estimated that nearly one billion people have either vitamin D deficiency or insufficiency. As vitamin D has been showed to have effect on pathophysiology of diabetes and diabetics having very high prevalence of vitamin D deficiency. Aim of the study: The aim of the study was to find out the prevalence and severity of vitamin D deficiency in type 2 diabetes mellitus (DM) in patients come in a tertiary care hospital. **Methods:** This retrospective study was conducted in the Department of Medicine, Shaheed Monsur Ali Medical College Hospital, Dhaka, Bangladesh. Data were collected in the period of October 2018 to November 2019. Purposive sampling technique used to collect the sample. 156 study people included for the study. Data were analyzed by using SPSS-20 and MS-Excel-2016 version. **Results:** In patients with controlled diabetes as per HbA1C criteria, the prevalence of sufficient, insufficient and deficient Vitamin D was 7(21.88%), 21(65.63%) and 4(12.5%) respectively, where in patients with uncontrolled diabetes it was 6(13.04%), 30(65.22%) and 10(21.74%) respectively. More number of diabetic patients with uncontrolled status (21.74%) was having overt vitamin D deficiency in comparison to controlled status (12.5%). **Conclusion:** Vitamin D deficiency is highly prevalent in diabetic patients than the normal healthy population. Maximum affected patients were male and deficiency found most in uncontrolled group.

Keywords: Prevalence, Severity, Vitamin D deficiency, Diabetes Mellitus.

INTRODUCTION

The worldwide epidemic of Diabetes Mellitus (DM) is a serious current health problem because of the high toll of vascular complications associated with the condition. It has been estimated that 380 million individuals

would be affected with diabetes worldwide by the year 2025. The incidence & prevalence of Type-2 Diabetes Mellitus (T2DM) is increasing rapidly. There were greater than 285 million patients worldwide with diabetes in 2010, increasing to approximately 438 million by 2030.^[1]



Asian Indians are at a high risk for developing insulin resistance, the metabolic syndrome, T2DM and coronary heart disease.^[2] Diabetes mellitus (DM) is a group of diseases with common feature of hyperglycaemia and associated with disturbance of carbohydrate, fat, and protein metabolism resulting from defects in insulin secretion, insulin action or both.^[3] Vitamin D deficiency is increasingly recognized as a global problem and it has been estimated that nearly one billion people have either vitamin D deficiency or insufficiency.^[4] Possible explanations include lack of adequate sun exposure in urban areas, lack of intake of fortified foods and obesity.^[5,6] Vitamin D deficiency is significant among individuals living in countries receiving large amounts of sunshine such as Italy, Spain, Greece and parts of the USA (i.e., South Florida).^[7] Living further from the equator (high latitudes) also poses an equally high risk for deficiency, if not greater. Further those with dark skin and women who cover large parts of the body with clothes (e.g., burqas or veils) are at a greater risk for developing vitamin D deficiency.^[8] In particular, individuals with dark skin require greater than 5–10 times more sun exposure than a white person to obtain the required amount of vitamin D.^[9,10] In India alone 41 million individuals are affected, and this is likely to go up to 70 million by the year 2025.^[11] Along with Insulin resistance and relative insulin Deficiency, Inflammatory factors, reactive oxygen species and autoimmune reactions have all strongly emerged as the major

pathogenic effectors for diabetes. Vitamin D deficiency is also a major health problem worldwide. The prevalence of vitamin D deficiency in India is around 50-90% in normal healthy population.^[12] As the major regulator for calcium homeostasis, vitamin D directly and indirectly improves insulin exocytosis via activating calcium-dependent endopeptidases, hence Vitamin D also improves glucose tolerance.^[13] Few Research reported association of that Vitamin D deficiency has been associated with a myriad of metabolic abnormalities, including hypertension, diabetes, dyslipidaemia and obesity.^[14] As vitamin D has been showed to have effect on pathophysiology of diabetes and diabetics having very high prevalence of vitamin D deficiency. This study was carried out with aim to see effect of both high prevalent diseases on each other. The aim of the study was to find out the prevalence and severity of vitamin D deficiency in type 2 diabetes mellitus (DM) in patients come in a tertiary care hospital in Bangladesh.

The objective of this study was to find out the prevalence and severity of vitamin D deficiency in type 2 Diabetes Mellitus patients in a tertiary care hospital.

MATERIALS AND METHODS

This retrospective study was conducted in the department of Medicine, Shaheed Monsur Ali Medical College Hospital, Dhaka, Bangladesh. Data were collected in the October 2018 to

November 2019. Purposive sampling technique were used to identify the study people. After obtaining the concern of the patients and the clearance of Ethical committee. Total 156 participants were enrolled in the study out of which 78 healthy people were enrolled as case (Group-A) and 78 type-2 diabetic mellitus patients as controls (Group-B). Controls include age and sex matched healthy individuals. Patients younger than 18 years, patients with chronic kidney disease, patients taking calcium supplements or vitamin D supplements within last 3 months, patients suffering from any known chronic illness were excluded from this study. The patients fulfilling the above-mentioned criteria were selected after informed consent. All participants included in this study were subjected to complete history and clinical examination. Routine laboratory Investigations like CBC, FBS, RBS, PP2BS, HbA1C, blood urea, serum creatinine, lipid profile, urine albumin and Vitamin D3 levels were done by standard methods in central laboratory of Shaheed Monsur Ali Medical College Hospital, Dhaka, Bangladesh. The value of serum vitamin D level was further divided in following category: sufficient = 30-100ng/ml, insufficient=20-29ng/ml, deficiency = less than 20ng/ml. Appropriate statistical methods were used to analyses the results. Data were analyzed by using SPSS-20 and MS-Excel-2016 version.

RESULTS

From 156 study people we found highest 58(37.18%) in the range of 40-50 years then 50(32.05%) people in 50-60, 26(16.67%) in <40 and 22(14.10%) in >60 respectively [Figure1]. There about 95(60.90%) males and 61(39.10%) females were enrolled in study [Figure2]. Frequency Distribution of Participants according to Severity of Vitamin D level noted. Prevalence of low vitamin D level in healthy population group-A (case) was only 12(15.38%) in my study, while prevalence was 65(83.33%) in Diabetic group. Among diabetic patients having abnormal Vitamin D level, majority 50(64.10%) were having insufficiency, only 16(20.51%) were having overt vitamin D deficiency in Diabetic patients [Figure-3]. Out of 27(34.62%) patients having diabetes duration of 1-5 years, 35(44.87%) had 6-10 years and 16(20.51%) had more than 10 years of duration. 14(17.95%) had hypertension and 4(5.13%) had ischemic heart disease which had relation with the deficiency of vitamin D level [Table1].

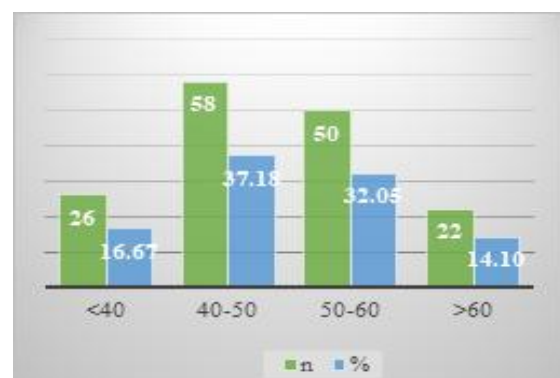


Figure-1: Age distribution of the study people (N=156)

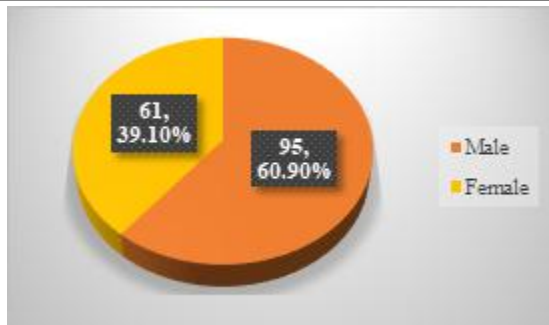


Figure 2: Gender distribution of the study people (N=156)



Figure 3: Type of the study people according to the severity of vitamin D level on two groups (N= 156)

In patients with controlled diabetes as per HbA1C criteria, the prevalence of sufficient, insufficient and deficient Vitamin D was 7(21.88%), 21(65.63%) and 4(12.5%) respectively, where in patients with uncontrolled diabetes it was 6(13.04%), 30(65.22%) and 10(21.74%) respectively. More number of diabetic patients with uncontrolled status (21.74%) was having overt vitamin D deficiency in comparison to controlled status (12.5%) [Table2].

Table 1: Vitamin D level in diabetes patients in relation with the parameters (N=78).

Parameters		n	%
Duration of diabetes	1-5 years	2	34.6
		7	2
	6 -10 years	3	44.8
		5	7
	>10 years	1	20.5

		6	1
Hypertension	Yes	1	17.9
		4	5
	No	6	82.0
		4	5
Ischemic heart disease	Yes	4	5.13
	No	7	94.8
		4	7

Table2: The prevalence & severity of vitamin D level with the category of diabetes control (N=78)

Vitamin D level	Diabetes control			
	Controlled Diabetic (n=32)		Uncontrolled Diabetic (n=46)	
	n	%	n	%
Sufficient	7	21.88	6	13.04
Insufficient	21	65.63	30	65.22
Deficient	4	12.5	10	21.74

DISCUSSION

Vitamin D deficiency is a major health problem worldwide. The overall worldwide Vitamin D deficiency prevalence is around 15% according to study done by Pfothnerhauer KM et al.^[15] As vitamin D has been showed to have effect on pathophysiology of diabetes and have very high prevalence of vitamin D deficiency, so we have taken up this study to see effect of both high prevalence diseases on each other. Various studies done in different geographical region and cultural background have shown varied range of prevalence of vitamin D deficiency in diabetic group ranging from 67%-98.8%.^[12,16] Our study along with Bashir et al and Ifigenia-Kostoglou A et al



studies had shown higher prevalence of vitamin D deficiency in diabetes mellitus patients compared to healthy individuals, but two other studies had shown no difference of prevalence between diabetic and healthy population.^[17,18] From 156 study people we found highest 58(37.18%) in the range of 40-50 years then 50(32.05%) people in 50-60, 26(16.67%) in <40 and 22(14.10%) in >60 respectively. There about 95(60.90%) males and 61(39.10%) females were enrolled in study. Almost similar result of age and gender found in the study of Patel D et al.^[19] Frequency Distribution of Participants according to Severity of Vitamin D level noted. Prevalence of low vitamin D level in healthy population group-A (case) was only 12(15.38%) in my study, while prevalence was 65(83.33%) in Diabetic group. Among diabetic patients having abnormal Vitamin D level, majority 50(64.10%) were having insufficiency, only 16(20.51%) were having overt vitamin D deficiency in Diabetic patients. Out of 27(34.62%) patients having diabetes duration of 1-5 years, 35(44.87%) had 6-10 years and 16(20.51%) had more than 10 years of duration. 14(17.95%) had hypertension and 4(5.13%) had ischemic heart disease which had relation with the deficiency of vitamin D level. In patients with controlled diabetes as per HbA1C criteria, the prevalence of sufficient, insufficient and deficient Vitamin D was 7(21.88%), 21(65.63%) and 4(12.5%) respectively, where in patients with uncontrolled diabetes it was 6(13.04%), 30(65.22%) and 10(21.74%) respectively. More number of diabetic patients with uncontrolled

status (21.74%) was having overt vitamin D deficiency in comparison to controlled status (12.5%). Vitamin D deficiency and insufficiency (%) was more prevalent among nondiabetic patients than T2DM patients (44.4 vs 28.6 and 14.4 vs 11.9, respectively) found by Subramanian A20. Study by Shalini P et al found that Vitamin D deficiency is more prevalent (80.4%) in hypertensive patients than healthy (67.7%) individuals.^[21]

Limitations of the study:

Limitation of this retrospective study was inability to nullify the effect of confounding factors for vitamin D level like duration of sun exposure and complexion of the skin. We had not analysed association of BMI with vitamin D level in our study while analysing study data.

CONCLUSION

Vitamin D deficiency is highly prevalent in diabetic patients than the normal healthy population. Maximum affected patients were male and deficiency found most in uncontrolled group. All patients with type 2 diabetes mellitus must be screened for vitamin D levels and those found to be having insufficiency or deficiency of vitamin D should be started on vitamin D supplements. Also, strict control of diabetic status is mandatory in order to prevent vitamin D deficiency.



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