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RESEARCH ARTICLE

STUDY OF ASSESSMENT OF LEVELS OF 25 (OH) VITAMIN D3 IN DIABETES MELLITUS AND ITS CORRELATION WITH GLYCEMIC CONTROL AND MICRO VASCULAR COMPLICATIONS

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ABSTRACT

Aims and Objective: The world today is witnessing epidemic of Diabetes Mellitus. It is a chronic disorder with multiorgan involvement. The aim of the present study 25(OH) Vitamin D3 as a causative factor in pathogenesis of type 2 diabetes Mellitus.

Material and Methods: The present study was undertaken in the Department of General Medicine, RIMS, Ranchi. A total of 100 patients with Type 2 DM were included in the study and 40 controls were included. The quantitative determination of Vitamin D in human serum and plama was done using Chemiluminescent microparticle immunoassay (CMIA) with a flexible assay protocols, reffered as Chemiflex.

Results: Of the total 100 cases 62(62%) were males and 38(38%) cases were female .Out of the total 100 cases 98(98%) were Vitamin D deficient and among controls out 0f 40 , 36(90%) were Vitamin D deficient. There was a negative correlation of serum Vitamin D level with FBS (r= -0.339).

Conclusion: The general population is deficient in serum Vitamin D level and in diabetes mellitus patients it is still lower than the non diabetic control group. In view of the high incidence of Vitamin D deficiency across general population a long term follow up involving large number of patients is necessary to substantiate the relationship between Vitamin D deficiency in diabetes mellitus

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INTRODUCTION

Diabetes mellitus or simply diabetes refers to a group of common metabolic disorders that share the common phenotype of hyperglycemia (raised glucose levels in blood). Several distinct types of DM are caused by a complex interaction of genetics and environmental factors. The metabolic dysregulation associated with DM causes secondary pathophysiologic changes in multiple organ systems that impose a tremendous burden on individual with diabetes and on health care system (Alvin, 2015). The world today is witnessing epidemic of diabetes mellitus. International diabetes federation (IDF) estimated that in the year 2014 there were 387 million (prevalence 8.3%), this world incresee to 592 million by 2035. India htas become the diabetes capital of the world with 66.85 million diabetics between 20-79 years suffering from this dreaded disease and continues to increase day by day. The international diabetes federation estimates that by 2030, 8.4% of india's adult population will have diabetes and this figure is expected to go up to 10.11 million (IDF, 2014).

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Diabetes mellitus is a chronic disorder with multiorgan involvement having many microvascular and macrovascular complications. Microvascular complications (Diabetic neuropathy, Neuropathy & Retinopathy), macrovasular complications (coronary artery disease, peripheral artery disease, stroke). Cardiovascular disease is the leading cause of death in individuals with DM. If glycaemic control is not attained in early stages of the disease, the complications could be many resulting in significant morbidity and mortility (Schering, 2004; Champe, 2013). With such a background it becomes important to understand the pathogenecity of this disease so as to prevent its alarming rise rather than wait to initiate treatment once the insult has set in. Genetic factors and environmental factors such as sedentary lifestyle, physical inactivity, obesity etc. contribute towards its onset. Evidence is also accumulating for a role of vitamin D in maintaining normal glucose homeostasis, for instance in both animal and human studies vitamin D depletion was significantly relate to insulin resistance and impaired insulin secretion. Notably, this condition is reversible upon repletion of vitamin D. Moreover a significant and strong association between vitamin D deficiency and b-cell dysfunction has been reported in healthy, non diabetic or diabetic populations (Leahy, 2005; Isaia;

2001). Both vitamin D deficiency and Diabetes are common in both urban and rural india. Jharkhand is a mountain region which is covered with a dense growth of forest occupying around 30 percent of its area. In India not many studies have been reported so far. The aim of the present study is to evaluate correlation between 25(OH) Vitamin D3 levels with glycemic control and microvascular complications complications in Type 2 diabetes mellitus and pathogenesis of type 2 Diabetes Mellitus for 25 (OH) Vitamin D3. In this background it was decided to take up this study in the Jharkhand population.

MATERIAL AND METHODS

The present study was undertaken in the Department of General Medicine, RIMS, Ranchi, Jharkhand during the period of October 2014 – October 2015.A total of 100 patients (Group 1) of age group 30 to 70 years were taken as case.

quantitative determination of Vitamin D in human serum and plama using Chemiluminescent microparticle immunoassay (CMIA) with a flexible assay protocols, reffered as Chemiflex (www.accessdata.fda.gov/.../K110619.pdf). Table 1 indicates age and sex distribution of 100 diagnosed type-2 diabetes mellitus cases of whom 62(62%) were male, 38(38%) were female. Maximum numbers of cases were in 41-50 year age group ie. 40(40%), out of which 22 are male and 18 are female. The mean level of 25(OH) Vitamin D3 in cases was17.09±1.36ng/dl and control was 18.29±1.26 ng/dl. The Vitamin D deficiency was equally prevalent in both males and females. However, females are more prone to Vitamin D deficiency. The various microvascular complications studied in 100 cases in which Nephropathy was present in 82 cases. There was a statistically non significant difference in Nephropathy patients. However, there was a statistically significant difference between Neuropathy cases and Retinopathy cases.

Table 1. Age and sex distribution of cases

+Age Group (years)	Male		Female		Total	
	No	%	No	%	No	%
31-40	10	10	4	4	14	14
41-50	22	22	18	18	40	40
51-60	18	18	14	14	32	32
61-70	12	12	2	2	14	14
Total	62	62	38	38	100	100

Table 2. Mean Level of 25(OH) Vitamin d3 in cases and controls

	Cases	Control	P value
Mean level of 25 (OH) Vitamin D3	17.09±1.36ng/ml	18.29±1.26 ng/ml	0.001

Table 3. Mean Vitamin D in males and female

	Mean Vitamin D (ng/ml)	P value
Male	17.0±1.37	0.53
Female	16.9±1.37	

Table 4. Various Microvascular complications of Cases

Complication		Nos.	%	Mean Vitamin D in ng/ml	P value	Remark
Nephropathy	Present	82	82%	17.08±1.37	0.946	NS
	Absent	18	18%	17.08±1.32		
Neuropathy	Present	50	50%	16.52±1.31	0.002	S
	Absent	50	50%	17.66±1.18		
Retinopathy	Simple	38	38%	16.89±1.26	0.012	S
	Proliferative	26	26%	16.41±1.01		
	Absent	36	36%	17.79±1.41		

A detailed history was taken as proforma thorough clinical examination with necessary laboratory tests were done. The serum levels of Vitamin D in the diabetes patients admitted to medicine ward and ICU were ncluded. Group 2 (Controls) included 40 healthy subjects from doctors and paramedical staff of RIMS, with no long standing medical illness or history of drug intake affecting Vitamin D metabolism. The patients with Type 1 DM, patients with CKD, Chronic liver disease, hyperparathyroidism, patients on dialysis, patients with diabetic nephropathy, epilepsy, patients on drug that affect Vitamin D supplementation were excluded from the study. Diagnosis of Type 2 DM was made according to the criteria laid down by American Diabetic Association (American Diabetes Association, 2014). The quantitative determination of 25(OH) Vitamin D3 in human serum and plasma will be done by ARCHITECT 25(OH) Vitamin D assay which is a delayed one step immunoassay including a sample pretreatment for the

DISCUSSION

Type 2 diabetes is the most common non communicable disease on global scale and is being fuelled by the worldwide obesity epidemic. A novel association with diabetes that has received considerable attention recently in Vitamin D deficiency. Mounting evidence indicates a surprisingy high prevalence of Vitamin D deficiency worldwide. Vitamin D deficiency is usually caused by low dietary Vitamin D intake and reduced cutaneous production of Vitamin D. The latter condition is associated with reduced sunlight exposure due to geographic location, genetic background affecting skin color, age , and cultural or religious practices. Consistent with the hypothesis that Vitamin D deficiency and diabetes are related areas with a high prevalence of Vitamin D insufficiency and deficiency have been associated with a higher prevalence of diabetes and associated complication (Chonchol, 2007). There

have been many reports that Vitamin D status is associated with insulin sensitivity, glucose intolerance, and βcell function. (Balasubramanian Shanthi *et al*., 2012; Khadilkar, 2010) In the present study 100 cases of type 2 Diabetes mellitus and 40 healthy controls were taken for study. Both cases and controls were well matched for age, sex, BMI. The mean level of Vitamin D3 shows that Jharkhand population is deficient in serum Vitamin D level and in diabetes patients it is still low as compared to non diabetic control group. A t-test comparing these two groups was significant (p= 0.0001).The low serum vitamin D levels were negatively correlated with Hb A1c (r= -0.668), the FBS (r=-0.339) as well as the postprandial blood sugar levels(r=-0.226) (Awumey, 1998; Fu, 2009; Babu, 2010). In this study correlation between duration of diabetes vs levels of Vitamin D3 (r= 0.094), p=0.514 which is not significant. Correlation between BMI and levels of Vitamin D3is not significant. A study by BalasubramanianShanthi *et al* (2012) shown the similar result with the age of participants with the 25(OH) Vitamin D3 insufficiency and the assessed glycemic control with FBS (Balasubramanian Shanthi, 2012). A study of Vitamin D Deficiency and Type 2 Diabetes Mellitus in a North Indian population by Bashir Ahmed *et al* has shown the mean serum Vitamin D in cases and control was 18.8±15.18 ng/ml and 28.46±18.89 ng/ml (Bashir Ahmed Laway, 2014). (p=0.00) The study by Jung Re Yu *et al* entitled "Serum Vitamin D status and its relationship to metabolic parameters in patients with Type 2 Diabetes Mellitus" shown mean 25(OH) Vitamin D3 serum levels were quite low in both control and Type 2 Diabetes mellitus subjects (Jung, 2012). Hence we found retinopathy and neuropathy significantly associated with Hypervitaminosis D but not with nephropathy. Multiple regression analysis showed that the number of complications was associated with decreased 25(OH) Vitamin D3 concentration (p= 0.016) which is statistically significant. Our results of the present study are in accordance with the findings of the above mentioned studies.

Conclusion

As per individual complication concerned retinopathy and neuropathy significantly associated with hypovitaminosis but not with nephropathy. This reaffirms the previously reported findings that deficiency of vitamin D could possibly play a role in causation of the disease and complication. Further interventional studies may be needed to decide upon the recommended daily allowances of Vitamin D alone or along with calcium to prevent the development of diabetes mellitus and its complication and improves glycemia.

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