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HYPOVITAMINOSIS D IN TYPE-2 DIABETES MELITUS PATIENTS;VARIATION WITH AGE, SEX AND SEASON.

KEYWORDS: Hypovitminosis D, Diabetes mellitus

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ABSTRACT *Introduction:Hypovitaminosis D (25[OH] D) with high prevalence in both developed and developing world, has been implicated in the development of diabetes and the metabolic syndrome' and it has also been shown to play a role in glycaemic control in diabetic patients. The main objective of the present study is to examine the incidence of 25[OH] D insufficiency and deficiency in type-2 DM patient attending Asian Institute of Gastroenterology Hyderabad, and to examine its variation with age, sex, and season. Methods:The parameters of 395 patients with established type-2 DM aged 30years and >50years were categorized by vitamin D status, patients with 25[OH]D levels <20ng/mol as deficiency, and 21-29ng/mol as insufficiency and >30ng/mol as sufficiency. Levels of FPG and HbA1C was also recorded. The data obtained were statistically analyzed and presented. Results: Hypovitaminosis D was common, with 66.3%(n 262) of patients affected with deficiency, and 17.5%(n 69) had insufficiency, where as rest 16.2 % (n 64) had sufficiency. A statistical significance p=0.0002was obtained between age and vitamin D status. A positive correlation (r= 0.155) was observed between age and vitamin D status. Negative correlation (r= -0.083) between FPG and vitamin D status was observed. Statistical significance(p=0.015) between season and vitamin D status was observed, also a negative correlation exist between season and vitamin D. There is no significant difference in the distribution of vitamin D deficiency between the two different age groups, but significant difference exist (p=0.0114) between the age group and vitamin D sufficiency. A statistical significance (p=0.0001) between male and female with vitamin D deficiency. However no significant difference was observed between male and females who had vitamin d sufficiency (p=0.0561). Conclusions:Hypovitaminosis D encompassing deficiency and insufficiency was common among patients with type-2 DM and varies with age, sex, and season. Being inexpensive vitamin D supplementation might help in attaining better glycemic control and avoidance of early diabetic complications.*

Introduction

Hypovitaminosis D with different variability in its prevalence, according to geographic areas is a public health topic gaining increased attention worldwide. Hypovitaminosis D is a pandemic problem; even in regions of high sum exposure (1) despite the plenty sunshine in India Vitamin D deficiency is epidemic. (2) Vitamin D which has been known as anti-ricketic or sunshine Vitamin has far more than a century being given attention by pediatrician, physician, radiologist, orthopediacian, endocrinologist, etc. for its varied spectrum of clinical, biochemical and pathological presentations.

Hypovitaminosis D condition when the 25(OH) Vitamin D levels are lower than 75nmol/L(30nglml) and it is sub-divided into two groups: Insufficiency(levels between 15 nmol to 74nmol/L or 10-29 ng/ml) and deficiency(lower levels of 50nmol/L or <10ng/ml .(3). There is increasing evidence that a new emerging global threat called Vitamin D deficiency which is not merely rickets or osteomalacia but a problem reaching epidemic proportions both in developed and developing world, (4).

Hypovitaminosis D provokes rickets in children and osteopenia and osteoporosis in adults. However correlation of this with increase risk of various cancer, diabetes mellitus type-1, multiple sclerosis (5) heart disease (6). The presence of Vitamin D receptors (VDR) on the β-Islet cells in the pancrease enhances insulin production and secretion (7) This may explain the relative risk of developing type-2 diabetes in men and women with Vitamin D deficiency (8). the mechanism of action of Vitamin D in type-2 diabetes is mediated not only through regulation of plasma calcium levels, which regulate insulin synthesis and secretion, but also through a direct action on pancreatic β-cell function. (9) Vitamin D replenishment improves glycaemia and insulin secretion in patients with type-2 diabetes mellitus

The objective of the present study is to: Determine the incidence of 25(OH) insufficiency and deficiency in type – 2 DM patients attending Asia institute of Gastroenterology, Hyderabad, and its variation with, age, sex and season.

Materials and methods:

The work is a retrospective, cohort study design in which the medical records of 395 known diabetic patients who had been enrolled in the Asian institute of Gastroenterology Hospital in Hyderabad from January 2013 to December 2013. All patients selected for this study were diagnosed as type – 2 diabetic mellitus in line with the criteria set up by the American Diabetic Association (ADA).

The data collected in this study included 395 individuals with established type 2 debates mellitus who had their 25 (OH) D, testing within the study period i.e. 01/01/2013 and 31/12/2013. 259 males, 136 females were included.

RESULTS

The data were analyzed using, SPSS Version 16.0. All P Values were based on two sided tests. When compared, difference is considered significant when P-Value < 0.005.

Statistical Analysis

The univariate analysis of vitamin D status of 395 subjects in this study shows that (refer to table 1 for details) 66.3% (n262) of the subject had for deficiency, 17.5 % (69) had insufficient ad 16.2% (64) had sufficiency.

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Table 1: Shows the univariate analysis of vitamin D status of the study subjects.
Tables on Vitamin D data (10.3.14)

1 Univariate Analysis			
		No	%
	Deficiency	262	66.3
	Insufficiency	69	17.5
	Sufficiency	64	16.2
	Total	395	100
	Mean	52	
	Median	52	
	SD	10.32	
			%
	Male	259	65.6
	Female	136	34.4
	Total	395	100
	Mean	140	
	Median	127	
	SD	53.6	
	CV	38.20%	
		No	%
	Summer	95	24.1
	Monsoon	138	34.9
	Winter	162	41
	Total	395	100

Table 2: Shows the distribution of vitamin D status with age or between the two age groups(30-50years and >50years)

Vitamin D	30-50 years	%	>50 YEARS	%	Total	P value
Deficiency	119	45.4	143	54.6	262	0.1742
Insufficiency	35	50.7	34	49.3	69	0.9813
Sufficiency	20	31.3	44	68.7	64	0.0114
Total	174	44.1	221	55.9	395	

Table 3: shows the distribution of vitamin D status between male and female

Vitamin D	Male	%	Female	%	Total	P value
Deficiency	168	64.1	94	35.9	262	0.0001
Insufficiency	50	72.5	19	27.5	69	0.0017
Sufficiency	41	64.1	23	35.9	64	0.0561
Total	259	65.6	23	35.9	395	

Table 4: Shows the distribution of vitamin D Status with season.

Vitamin D	Summer	%	Monsoon	%	Winter	%	Total
Deficiency	65	24.8	92	35.1	105	40.1	262
Insufficiency	16	23.2	25	36.2	28	40.6	69
Sufficiency	14	27.9	21	32.8	29	45.3	64
Total	95	24.1	138	34.9	162	41	395

DISCUSSION

The popular sunshine Vitamin, Vitamin D mainly synthesizes in the skin as a result of sun exposure or ingested from the dietary source, travels to the liver where it is converted in to 25(OH) D, and this is the major circulating form of Vitamin D, thus its determination is used to determine the Vitamin D status of a person. (10) This 25(OH) D is inert and must be converted in the kidneys in to its active form 1,25 – dihydroxy Vitamin D. the role of Vitamin D in the pathogenesis of type – 2 diabetes in human being have been suggested by several studies; A study of London Bangladesh Population at risk of type – 2 DM have low serum 25(OH) compared with the study with the subject not at risk.(11)

A study conducted on a Bulgaria female population with type – 2DM who had high prevalence of Hypovitaminosis D, had normalized insulin secretion and action following Vitamin D treatment (12).

Hypovitaminosis D prevalence is high among the type – 2 DM patients studied, despite the abundant sunshine present in the region 66.3% of the subject had deficiency, and 17.5% had insufficiency, this might not be expected in a tropical country where there is abundant sunshine throughout the year, the finding of this study might be explained, as to be caused due to changes in the lifestyle where due to type of work most people remain indoor, and some covered all this

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results in peoples sun exposure less than the recommended time. The high prevalence of Hypovitaminosis D in type – 2 DM patients suggest the increased risk of developing diabetic complications and other metabolic disease, in support of this, several studies have suggested a great prevalence of metabolic syndrome in subjects with Hypovitaminosis D than subjects without Hypovitaminosis D. (13) Similarly a prospective study on Coronary Artery Risk development in young adults, reported that treatment with vitamin D was more potent than either trogilitazone or metformin in improving insulin sensitivity. The first objective of this study has been achieved as to show the presence of Hypovitaminosis D in type 2 diabetes patients. Figure 1 shows the percentage of Vitamin D Deficiency in sufficiency, and sufficiency in type 2 DM patients.

A Statistical significance (P=0.002) was obtained between age and Vitamin D in this study, this shows that Vitamin D level differs with the age, this agrees with finding of Michael F. Hollick that Vitamin D level differs with different age groups,(10) and decreases In production is seen in old age. Even though the finding of it is study shows a positive correlation between age and vitamin D r=0.115, though it is a weak positive correlation, this might suggest increase in the level of vitamin D with increase in age until a certain limit when there will be decrease in the level of vitamin D with increasing age, of it may be that's some of the patients in this study are already taking Vitamin D supplementation.

A negative correlation r=-0.03 even though weak between fasting blood glucose and Vitamin D, this finding agrees with the finding of several researches that shows glycaemic control with improve Vitamin D , this finding agrees with the finding of Boucher and his colleagues showed a normalized glucose level with longer Vitamin D treatment among London , Bangladeshi population (11). Palomer 2008 suggests that Hypovitaminosis D may be a significant risk factor for glucose intolerance in some but not all populations. The correlation between FBG and Vitamin D was not statistically significant.

Statistical significance p=0.015 was obtained between season and Vitamin D levels, with highest percentage of Vitamin deficiency found in winter 41%, followed by monsoon 34.9% and summer 24.1% this can be attributed to the abundant sunshine during summer, and increase exposure to sunlight during this period especially in rural people who are engaged in agricultural practices during this period. The objective to show the seasonal variation in Vitamin D in the study population was attained. Correlation between season and Vitamin D r=-0.122 shows that Vitamin D deficiency and insufficiency is present in the study population year round with the variation in the distribution between seasons (summer – winter).

Vitamin D status distribution between different age groups (30 – 40years, > 50 years) the finding shows no significant difference between the 2 age groups with the respect to Vitamin D insufficiency, whereas a statically significance p=0.0114 was obtained within the age groups with respect to Vitamin D sufficiency, this finding is striking as it shows the high percentage of individuals with sufficient Vitamin D status falls under the category of above 50 years this may be those group of patients might be taking oral Vitamin D supplementation or it may be that their lifestyle expose those to sunlight more than the other group where many might be in the working class to have less exposure to sunlight due to their work which keeps them in door most of the day time. The distribution of Vitamin D status on the basis of gender shows the statistical significance between male and female who have Vitamin D deficiency p=0.0001 with male having high percentage of 64.1% compared to female who have 35.9%, this finding doesn't agree with the finding of Chi Hao Chen – Ku – 2012 who reported a high percent of 80% females with Hypovitaminosis D this may be caused by the reason that likely the female in this study might be taking Vitamin D supplements more than the males, or that they have longer time of sun exposure when compared to their male counterpart, same explanation might be extended to the Vitamin D insufficiency between males and females whereas statistical significance was also obtained p=0.00017, with males having the percentage of 72.5% compared to the 27.5% in females. No statistical significance was obtained with regard to sufficiency in Vitamin D levels between males and females p=0.0561.

CONCLUSIONS

Hypovitaminosis D encompassing Vitamin D deficiency and insufficiency is present among patients with type – 2 diabetes mellitus, with significant difference in distribution between sex ratio season and age. Being inexpensive Vitamin D supplements might help in better glycaemic control and avoidance of diabetic complications.

Figure 1 Percentage of Vitamin D deficiency

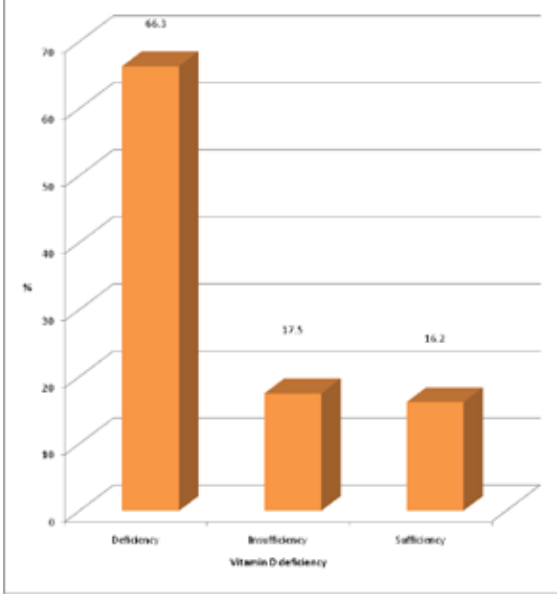
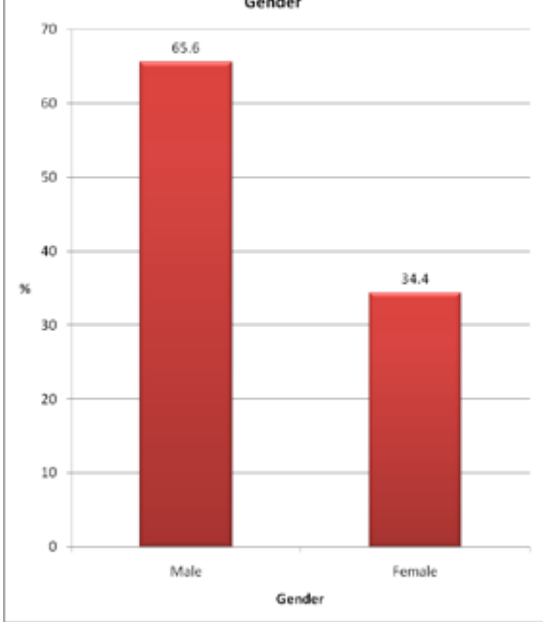


Figure 2: Percentage of Vitamin D deficiency by Gender



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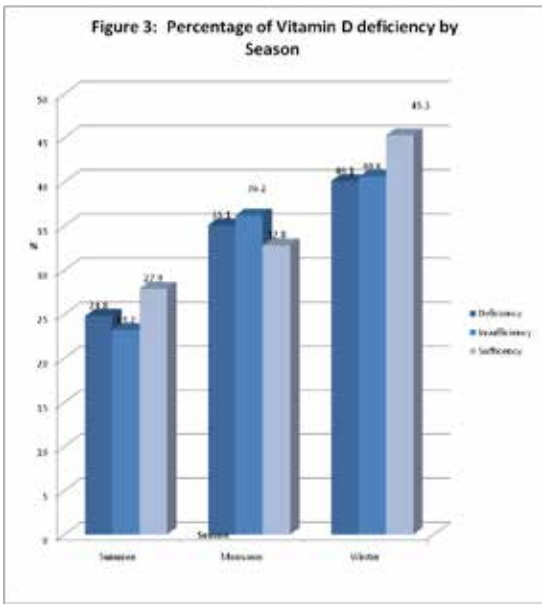

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