A descriptive study of vitamin D levels in common population and compare with diabetics carried out at tertiary care centre in Sangli

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AbstractVitamin D deficiency is recognised as common problem in India despite having ample sunlight. It also found to affect
Diabetes Mellitus inversely. The present study is aimed of studying Vit D deficiency in common population and in
diabetic patients. Levels of Serum Vitamin D were analysed on chemiluminiscent autoanalyser. 100 healthy volunteers
were included from doctors, medical students, Nurses and healthy attendants of patients as Control group. It included 45
males and 55 females .Total 200 patients of Diabetes were included of which 124 were males and 78 were females. In
this study we found severe vitamin deficiency (Vit D levels <10ng/ml) in6% in control group and 15% diabetics.
Moderate Vitamin deficiency (Vit D levels 10-20ng/ml) is observed in 40% controls and 27% diabetics. Mild Vitamin
deficiency (Vit D levels 20-30ng/ml) is observed in 22% controls and 29.5% diabetics. Uncontrolled diabetics had high
blood sugar levels. Thus it can be predicted that vitamin D deficiency is common amongst general population, more in
diabetic population. Vitamin D deficiency might have contributed to uncontrolled diabetes.
Keywords: vitamin D, diabetic.

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INTRODUCTION

Vitamin D deficiency is common deficiency disorder in population worldwide. About one billion people worldwide have vitamin D deficiency². Many studies have observed that, India also has vitamin D deficiency despite having ample sunlight. India is tropical country extending from 8.4°N latitude to 37.6°N latitude. Vitamin D₃, or cholecalciferol, is formed in the skin by ultraviolet radiation. It is fat soluble vitamin, synthesized in the skin from 7 hydrochlestrol in subcutaneous fat. Vitamin D levels depend upon duration of sun exposure, dietary intake of Vitamin D, age, race, geographic region of residence, season of blood drawn, obesity, physical activity and pollution. Data suggests that, uncontrolled blood sugar levels in diabetics in winter and rainy season due to reduced sunlight in these days that causes vit D deficiency. The role of vitamin D in type 2 DM is suggested by a seasonal variation in glycemic control reported in patients with type 2 DM being worse in the winter^{54, 55, 56} The incidence of type 2 diabetes mellitus (type 2 DM) is increasing both nationally and worldwide¹. 30 minutes exposure of skin over arms and face to sunlight between 10 am to 2 pm can synthesise adequate vitamin D, as maximum UVB rays are transmitted during this time daily¹. The vitamin D₃ generated in the skin is biologically not inactive and is activated via two enzymatic steps-

- 1. vitamin D_3 is hydroxylated to 25hydroxycholecalciferol (25(OH)D₃) in the liver by the enzyme 25-hydroxylase.
- 1-alpha-hydroxylase, present in the kidneys mainly, hydroxylates 25(OH) _{D3} into 1,25dihydroxycholecalciferol (1,25-(OH)2_{D3}), the hormonally active form of Vitamin ^{D5}.

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Recently many studies have showed that vitamin D deficiency can be a risk factor in glucose homeostasis. Vitamin D has beneficial effect on insulin action both directly by stimulation expression of insulin receptor and so enhancing insulin responsiveness for glucose transport.() Low levels of vitamin D may be a risk factor for the development of both type 2^1 and type 1^2 diabetes. vitamin D may also reduce apoptosis of β cells in type 2 diabetes by inhibiting inflammatory reactions⁶ and increasing calbindin, a cytosolic calcium binding protein⁴. Inadequate calcium intake or vitamin D insufficiency may alter the balance between the extracellular and intracellular β -cell calcium pools, which may interfere with normal insulin release, especially in response to a glucose load. Vitamin D deficiency is considered to be present when

- Serum 25(OH) D levels <10 ng/ml
- Serum 25(OH) D levels are 10- 20 ng/ml;
- Insufficiency between 20-30 ng/ml and
- Sufficient > 30 ng/ml.

In north Indian study vitamin D requirement of 60,000-1, 20,000 IU/month to achieve Vitamin D level > 30 ng/ml. While another study reported to have supplementation of Vitamin D at least 2,000 IU/day²

MATERIAL AND METHODS

Study Design: Descriptive comparative study. **Sampling:** All Diabetic patients attending Medicine

OPD.

Sample size: calculated 200 patients, 100 controls. Group A-Control

100 healthy controls of age 18-58yrs were selected from doctors, Medical Students, Nurses working in B. V. D. U. M. C. Sangli and asymptomatic healthy attendants of patients.

Group B-Patients

200 tients are selected from patients of Diabetes Mellitus attending,

- 1. Medicine OPD for Diabetes control.
- 2. Dr. Milind Patwardhan's Endocrinology Clinic at Miraj.

Exclusion Criteria

H/O major illness, H/O Fracture, Malignancy, Osteoporosis, Infections, Autoimmune Disorders, Ethical committee sanction taken. History and clinical examination of each patient done thoroughly.

RESULTS

Normal->30 units/ml vit D levels (Asian standards).

Table 1: Descriptive Statistics							
Variable	Ν	Mean	Std. Dev.	Minimum	Maximum		
Vit D_P	202	22.33	16.01	1.8	125.2		
F-BSL_P	202	163.32	58.87	66	332		
VIT D_C	100	28	11.44	8	52		
F-BSL C	100	89.81	17.68	62	132		

Tabl	Table 2: Two-Sample T-Test: Vitamin D, Sex i): for patient							
	Sex	N	Mean	Std dev	P- Value			
-	F	124	21.7	19.6	0.210			
	Μ	78	23.26	7.26	0.218			
T-Test of d	lifference	= 0 (vs <	0 (vs <): T-Value = -0.78 P-Value = 0.218 DF = 169					
			ii): for Co	ontrols	0.218 P-Value = 0.218 DF = 169			
	Sex_C	N	Mean	StDev	P Value			
	F	55	26.5	11.3	0.091			
	М	45	29.8	11.4	0.081			

t-test of difference = 0 (vs <): T-Value = -1.41 P-Value = 0.081 DF = 93

Table 3: Two-Sample T-Test and CI: Vitamin D, Religeon i): for Patients

	Religeon	Ν	Mean	StDev	P-Value	
-	Н	175	22.6	16.8		
	М	27	20.36	9.11	0.850	
T-Test of	Γ-Test of difference = 0 (vs <): T-Value = 1.05 P-Value = 0.850 DF = 58					
	ii) for Controls					
	Religeon	Ν	Mean	StDev	P- Value	
	н	79	28.1	11.3	0.532	
	М	21	27.8	12.2		

T-Test of difference = 0 (vs <): T-Value = 0.08 P-Value = 0.532 DF = 29

Table 4: Descriptive Statistics: Vit D_P, Vit D_C(P-Patients,C-

	controlsj			
	Ν	Mean	StDev	P- Value
Vit D_P	202	22.3	16	0.000
Vit D_C	100	28	11.4	

T-Test of difference = 0 (vs <): T-Value = -3.53 P-Value = 0.000 DF = 262. Correlation Between F-BSL and Vit D in Patients, Pearson correlation of F-BSL_P and Vit D_P = -0.263, P-Value = 0.000

DISCUSSION

Data from NHANES III show that vitamin D insufficiency (25-OHD < 25 ng/ml) may affect up to half of the non-institutionalized adolescent and adult population in the United States, even in the southern latitudes during the winter⁸⁷. Additional studies have shown a prevalence of vitamin D insufficiency ranging from 36–100% in a variety of populations including healthy young adults to hospitalized elderly individuals²⁰. Based on basic and animal studies, vitamin D and calcium have also been suspected as modifiers of diabetes risk. Vitamin D insufficiency has long been suspected as a risk factor for type 1 diabetes based on animal and human observational studies⁶. More recently, there is accumulating evidence to suggest that altered vitamin D and calcium homeostasis may also play a role in the development of type 2 DM. MEDLINE review was conducted through January 2007 for observational studies and clinical trials in Observational studies show a relatively consistent association between low vitamin D status, calcium or dairy intake, and prevalent type 2 DM or metabolic syndrome adults with outcomes related to glucose homeostasis. Evidence from trials with vitamin D and/or calcium supplementation suggests that combined vitamin D and calcium supplementation may have a role in the prevention of type 2 DM only in populations at high risk (*i.e.* glucose intolerance). Studies in several cohorts with varied baseline vitamin D status have reported an association between vitamin D deficiency and impaired glucose-mediated insulin release. Vitamin D supplementation improved insulin release in some 17,21,23,24 , but not all $^{(21,23,25)}$, small-scale short-term randomized trials. In the Nurses Health Study, the group of female nurses with the highest intake of calcium (>1200 mg/d) and vitamin D (>800 IU/d) that was associated with the lowest risk of incidence type 2 DM was only 1.3% of the cohort⁵². Therefore, given the potential link between vitamin D. calcium, and diabetes described above, it is plausible that the rising incidence of type 2 DM may, at least in part, be due to suboptimal vitamin D and calcium status of the U.S.

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