

Comparison of Vitamin D Levels in Pre And Post Menopausal Type 2 Diabetic Females

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Abstract:

Background: Incidence of diabetes mellitus is increasing worldwide. The role of vitamin D through pancreatic beta cells function is to increase the sensitivity and secretion of insulin. Low vitamin D levels are associated with impaired glucose metabolism. Estrogen hormone activates vitamin D and increase vitamin D receptors (VDR). In menopause, due to decline of estrogen hormone leading to further deficiency of vitamin D (25OH vitamin D).

Aims and objective: 1.To find out the levels of vitamin D in pre and post menopausal diabetic (type 2) females. 2. Comparison of vitamin D level in the two groups. 3. To established a correlation between vitamin D (25OH vitamin D) and fasting blood glucose level.

Method: The study was conducted in Govt. Medical College, Kota and attached group of hospitals during January 2015 to July 2015. A total of 70 diabetes mellitus type 2 females of age group between 40 -70 years were included, out of which 40 were post menopausal and 30 were pre menopausal diabetic females. Estimation of vitamin D (25OH vitamin D) was done by chemiluminescence in Hormonal Assay Lab, Biochemistry Department, Govt. Medical College, Kota. Serum level of vitamin D were categorized into normal (≥ 30 ng/ml or 75 nmol/l), insufficient (≥ 20 to < 30 ng/ml) and deficient (< 20 ng/ml or 50 nmol/l).

Results: Vitamin D deficiency (< 20 ng/ml) was seen in 60 % and 80 % of diabetic pre and post menopausal females respectively. There was an inverse association of vitamin D level and Fasting Blood Glucose. Pearson correlation coefficient was -0.55. p value is < 0.05 which is significant.

Conclusion: Vitamin D deficiency is higher in diabetes mellitus type 2 patients as it is related to glucose control. The deficiency was more in post menopausal diabetic females as compare to pre menopausal diabetic females due to decrease in estrogen hormone.

Key words: Diabetes mellitus, 25OH vitamin D, Menopause.

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I. Introduction

Type 2 Diabetes mellitus is a metabolic disease characterized by hyperglycemia due to absolute or relative insulin deficiency(1). It is multifactorial disease, influenced by genetic and environment factors. Now a days diabetes mellitus (type2) occur in early ages due to life style modifications and reduced physical activities (2). The International Diabetes Federation (IDF) estimates around 61.3 million diabetic individuals (2011) in India that is further set to increase to 101.2 million with a global estimate of 552 million by the year 2030 (3).

Vitamin D is a fat soluble vitamin which is not only a dietary constituent but also a hormone. Major active form is $1,25$ (OH)₂D/calcitriol (4). Amongst the nutritional factors, vitamin D has an important role in glycemic control (5,6). Vitamin D acts via a cytosolic receptor that is translocated to the nucleus where it regulate gene expression(4). Vitamin D receptors exist in many tissues including pancreatic beta cells, allowing vitamin D to potentially modulate the insulin response to regulate blood glucose levels (7). Vitamin D prevents apoptosis of β cells and preserves β cell mass (8). It is essential for exocytosis of insulin in β -cells (9). It decreases the transcription of various proinflammatory cytokine genes which are increased in type 2 diabetes mellitus that contribute to insulin resistance. Vitamin D also acts as a potent immune suppressor (10,11,12)

Serum level of vitamin D were categorized into normal (≥ 30 ng/ml or 75 nmol/l), insufficient (≥ 20 to < 30 ng/ml) and deficient (< 20 ng/ml or 50 nmol/l) (13,14).

Menopause is the time of life when menstrual cycles ceases. It is strictly defined as 1 year without menses and is caused by reduced secretions of ovarian hormones, estrogen and progesterone(15). It naturally occurs at the age of 45 – 55 years. Symptoms of menopause are hot flushes, vaginal dryness,

depression, weight gain and loss of bone density (osteoporosis) (16). Estrogen enhance the activity of the enzyme responsible for activating vitamin D. End organ response to 1,25 (OH)₂D is also impaired in post menopause. The resulting vitamin D resistance can be attributed to decrease in number of vitamin D receptor and its activity due to decline in estrogen level (17,18). Hypovitaminosis is more common in post menopausal women.(19)

II. Aims And Objectives

1. To find out the levels of vitamin D in pre and post menopausal diabetic type 2 females.
2. Comparison of levels of vitamin D in between the two groups.
3. To established a correlation between vitamin D and fasting blood glucose levels.

III. Material And Methods

The study was conducted in Govt. Medical College, Kota and attached groups of Hospital during January 2015 to July 2015. .

A total of 70 diabetic (type 2) females of age group between 40 -70 years were included in the study, Out of which 30 were pre menopausal females and 40 were post menopausal females. Inclusion criterias were

(a) age >40years and < 70 years (b) duration of diabetes > 5 years.(c) fasting blood glucose level >126.0 mg/dl.

The patients with parathyroid disease, prior history of metabolic bone disease and vitamin D deficiency, chronic kidney disease, liver disease, type 1 diabetics, malignancy, chronic drug use like antiepileptic agents, steroids and history of calcium or vitamin-D supplementation in the last one year, which are likely to interfere with vitamin-D metabolism and the patients who did not give the consent were excluded.

SAMPLE: After the consent of the patient, a 2ml of blood was withdrawn. After centrifugation, serum sample was analyzed for fasting glucose level by auto analyzer based on principal of glucose Oxidase Peroxidase Method. Vitamin D level measured by Roche cobas e 411 by chemiluminescence in Hormonal Assay Lab, Biochemistry department, Govt. Medical College, Kota.

IV. Statistical Analysis

The statistical analysis was performed by using Microsoft Excel Program. The results were compared between pre and post menopausal diabetic (type 2) females by Student's unpaired t test. The results were expressed as mean ± standard deviation. P<0.05 was considered statistically significant. Correlation was assessed by Pearson correlation between Vitamin D and Fasting Blood Glucose levels.

V. Results

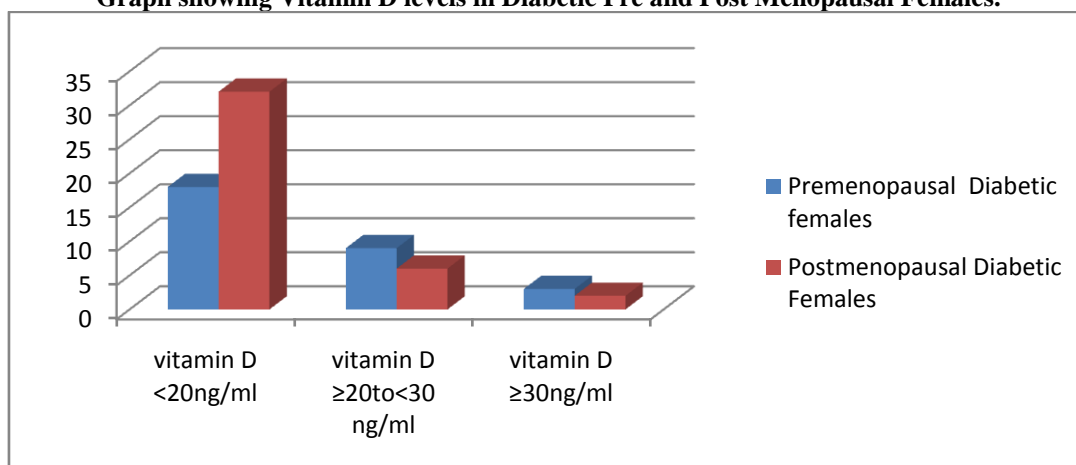
Among the total of 70 diabetic females, 30 were pre menopausal and 40 were post menopausal diabetic females. 60% of diabetic pre menopausal females were found to be vitamin D deficient (<20 ng/ml), 30% cases had vitamin D insufficiency (≥20ng/ml to <30 ng/ml), and 10% were with normal levels of vitamin D (≥ 30 ng/ml).

In diabetic post menopausal females, 80% presented with vitamin D deficiency (<20 ng /ml), 15% with vitamin D insufficiency and 5% had normal vitamin D. The deficiency of vitamin D was more in post menopausal diabetic females as compared to pre menopausal diabetic females.

Table 1: Distribution of Vitamin D levels in Premenopausal and Postmenopausal Diabetic Females

Vitamin D level (ng/ml)	Pre menopausal diabetic females		Post menopausal diabetic females	
	Number	Percentage	Number	Percentage
<20 ng/ml Vitamin D Deficient	18	60 %	32	80 %
≥21 to<30 ng/ml Vitamin D In sufficient	9	30 %	6	15 %
≥30 ng/ml Vitamin D Normal	3	10 %	2	5 %

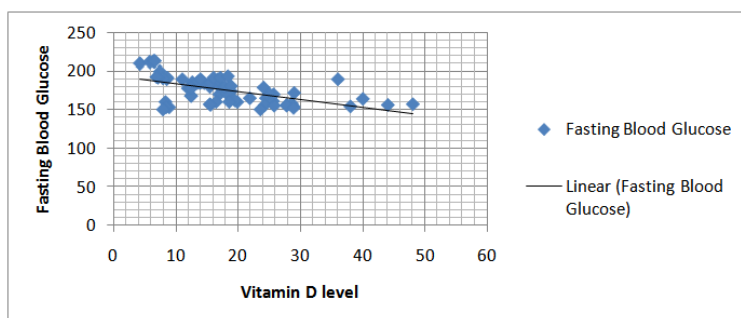
Graph showing Vitamin D levels in Diabetic Pre and Post Menopausal Females.



In pre menopausal diabetic females , mean \pm SD of Age is 43.8 ± 3.6 ,Mean \pm SD of Fasting Blood Glucose is 166.1 ± 15.3 , Mean \pm SD of vitamin D is 21.3 ± 9.6 . In post menopausal diabetic females, Mean \pm SD of Age is 61.9 ± 3.7 , Mean \pm SD of Fasting Blood Glucose is 182.9 ± 14.07 , Mean \pm SD of vitamin D is 15.3 ± 8.05 . p value is <0.05 found to be statistically significant. Correlation was assessed between Vitamin D level and Fasting Blood Glucose level by using Pearson correlation coefficient (-0.55) .There was inverse association of vitamin D an Fasting Blood Glucose level.

TABLE - 4

PARAMETERS	Pre menopausal Diabetic Females. (n=30) Mean \pm SD	Post menopausal Diabetic Females. (n=40) Mean \pm SD	P value
Age (years)	43.8 ± 3.6	61.9 ± 3.75	<0.05
FBS (mg/dl)	166.1 ± 15.3	182.9 ± 14.07	<0.05
Vitamin D(ng/ml)	21.3 ± 9.6	15.3 ± 8.05	<0.05



Graph showing inverse association between Vitamin D (25OH vitamin D) and Fasting Blood Glucose

VI. Discussion And Conclusion

Diabetes type 2 is highly prevalent in world as well in India. Several factor including genetic, lifestyle, environment and nutritional condition have important role in its development. Complications of diabetes type 2 are well documented. Majority of vitamin D is synthesized in the skin by the action of ultraviolet light, so called as sun shine vitamin, although a small proportion ($<20\%$) of vitamin D comes through diet from a limited range of foods. Season, skin melanin content ,sunscreen, affect vitamin D synthesis by ultra radiation exposure.

The extra skeletal effects of vitamin D are currently the focus of research efforts(20). Vitamin D induces immune tolerance (21). Vitamin D deficiency being related to the development of autoimmune diseases, such as multiple sclerosis(22), rheumatoid arthritis (23) . Vitamin D has been shown to be related to glucose metabolism and the development of diabetes mellitus type 2 (24,25). There is an inverse association of vitamin D and fasting plasma glucose in several studies(26,27). Supplementation of vitamin D after onset of diabetes type 2 maintain vitamin repletion and improve fasting blood glucose level(29)

In menopause vitamin D deficiency occur due to decrease in Estrogen ,as it increase the activity of the enzyme responsible for activating vitamin D and its receptors (VDRs). In a study in postmenopausal women, fasting glucose levels were found to be negatively correlated with serum 25(OH)D (30).Current recommendation by National Institute of Health is to maintain vitamin D levels above 50 nmol/l, and post menopausal females should take 600-800 IU/day.

By this study we conclude that vitamin D deficiency is higher in diabetes mellitus type 2 patients as it is related to glucose control. Vitamin D deficiency in post menopausal diabetic females was more as compare to pre menopausal females. There is more decline of levels of vitamin D in post menopausal females, due to the effect of decreased levels of oestrogen. Levels of vitamin D were significantly decreased in post menopausal phase.

There is inverse association of fasting plasma glucose with Vitamin D deficiency, indicating that increased blood sugar levels is associated with decreased level of vitamin D, hence good control of blood sugar is essential. Vitamin supplementation may improve hyperglycemia in type 2 diabetic patients.

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