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ORIGINAL ARTICLE

HbA1C in Type 2 Diabetic Population is inversely related to Serum Vitamin D

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ABSTRACT

Background: Vitamin D is involved in the regulation of calcium levels, insulin secretion, and insulin action. Diabetes is a non-communicable condition that results in insulin insufficiency and insulin resistance in the body. The question in this case was whether or not vitamin D levels were associated with type 2 diabetes.
Aim To determine if vitamin D has an effect on HbA1c levels in people with Type 2 diabetes.
Methods: In tertiary care, a three-month retrospective investigation was conducted. We looked at FBS, PPBS, HbA1c, and Vitamin D. FBS was the most common. The data were analysed with the help of SPSS version 23.
Results: In the study, 65 percent of the 52 patients had vitamin D deficiency, while 26 percent had insufficient vitamin D levels. HbA1c values were higher than 6.5 percent in 77 percent of patients, whereas levels were lower than 6.5 percent in 23 percent of patients. The blood sugar level HbA1c and vitamin D revealed a negative connection.
Conclusion: Clearly, vitamin D levels and HbA1c levels are inversely related.
Keywords: Type 2 Diabetes, Vit. D,

INTRODUCTION

UV rays of sunlight stimulates the production of vitamin D, a fat-solublevitamin. It is effective in the treatment of rickets, osteodystrophy, and osteoporosis. It's found in both animals and plants as a source (Vitamin D2 and cholecalciferol). Fatty fish, egg yolk, cheese and animal liver are excellent sources of vitamin D in the diet. Adipocytes are responsible for storing vitamin D in the form of cholecalciferol (Vitamin D3). The activation of vitamin D_3 is a two-step process. The first step is the conversion to 25(OH) D in liver by the 25-hydroxylase enzyme (CYP2R1). Vitamin D that is stable. Protein that binds to vitamin D -binding protein(DBP) in the blood. The second stage involves the hydroxylase enzyme (CYP27B1) to form $1,25(OH)_2D_2$, which is the metabolically active form of Vitamin D, which results in the formation of 1, $25(OH)_2D_2$. It has been shown that $1,25(OH)_2D_2$ increases gene expression as well as the creation of calcium-binding proteins (CBPs), which are essential for maintaining calcium homeostasis. CBP has been shown to boost calcium and phosphorus absorption in the intestinal and renal tracts. The activity of this gene is quite variable. In contrast, $1,25(OH)_2D_2$ has an inhibitory effect on its activity. Hypophosphatemia and hypocalcemia both boost its activity. The vagus nerve receptor (VDR) is found in the colon and the renal tubules of the kidney. Vitamin D deficiency can be caused by a lack of physical exercise or by poor nutritional habits. Diabetes, renal failure, hypoalbuminemia, and heart disease are among conditions that might have an impact on vitamin D levels. 1, $25(OH)_2D_2$ is used to test vitamin D adequacy because it has a longer half-life and a greater prevalence than 1, $25(OH)_2D_2$ and so has a longer half-life and higher prevalence. Normal value is 30ng/ml, lower limit is 20ng/ml, and adequate is between 21 and 20ng/ml. The majority of people are deficient in vitamin D. It has a negative influence on world health. People of various ages, colors, and cultures are impacted by this disease, even children. Long-term renal and hepatic illnesses, a lack of sunlight exposure, a lack of physical activity, poor food habits, and so on. cardiovascular problems, and neurological problems have all been linked to a lack of vitamin D.

Diabetes mellitus is caused by a lack of insulin or by insulin resistance. Diabetes is connected with several factors such as age, gender, genetics, occupation, environment, and illnesses, among others. Although the causes of diabetes are widely established, the etiology of the disease is not. It has the potential to impact every organ. There are two types of diabetes: Type 1 and Type 2. Type 1 diabetes is an autoimmune illness that results in insulin insufficiency in the body. Type 2 diabetes is characterized by the presence of endocrine dysfunction or resistance. Diabetes etiology and prevention have been linked to vitamin D for the first time. In order to do this, it is necessary to increase calcium dependent endopeptidases in pancreatic cells while simultaneously lowering insulin resistance in target organs. Moreover, it protects cells from death by increasing suppressor cell activity and inhibiting the development of cytotoxic T cells , macrophages, and natural killer cells.

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MATERIALS AND METHOD

Patients who met the criteria were identified and documented. Participants with Type 2 diabetes who did not have any concomitant conditions were included in the research. Pregnant women and those using vitamin D or calcium supplements were exempt from participating. The qualifications were satisfied by 52 people. We took note of their gender and age. We examined Fasting blood sugar (FBS), postprandial blood sugar (PPBS), HbA1c, and Vitamin D levels. FBS was the most common. People (all diabetic)were classified as "normal," which is defined as >30 ng/ml, "insufficient," which is defined as ≤20 –29ng/ml, or "deficient," which is defined as less than ≤19ng/ml. Based on their HbA1c values, the individuals were separated into two groups: those with levels less than 6.5 and those with levels greater than 6. The results were put into the SPSS 23 statistical package. It was employed when the situation demanded it. $P \leq 0.05$ was deemed to be statistically significant.

RESULTS

A total of 52 persons participated in the study, with 36 males and 16 females. They ranged in age from 20 to 65 years, with a mean value of 48.01 + 8.02 years. The average vitamin D level in the group was 19.34±5.28ng/mL. Less than 34% of individuals had normal levels of Vitamin D in their blood. A deficiency in vitamin D (20ng/ml) was discovered in 34 participants (11 female, 23 male), with the majority of them being male. Twenty-four men and eight women were found to have vitamin D insufficiency (20–29 ng/ml). The relationship between vitamin D and HbA1c was negative, with a correlation coefficient of –0.169.The same was true for Vitamin D and FBS

Table 1(a): Demographical data and glycated hemoglobin levels Association with Vitamin D

Vitamin D	**Male (*n*=36)**	**Female (*n*=16)**
Normal (≥30 ng/ml)	3	1
Insufficiency (20–29 ng/ml)	9	5
Deficiency (≤19 ng/ml)	23	11

Table 1(b) Demographical data and glycated hemoglobin levels Association with Vitamin D

Glycosylated hemoglobin	
Normal (≤6.5%)	**Raised (>6.5%)**
2	2
4	8
6	30

Table 2: Summaries the FBS, PPBS, and HbA1c values in each patient.

Parameters	**Mean ± standard deviation**
Age (in years)	48.01+ 8.02
Fasting blood sugar (in mg/dl)	130.72±22.7
Postprandial blood sugar (in mg/dl)	228.42±43.65
Glycosylated hemoglobin (in %)	8.1±1.4
Vitamin D (ng/ml)	19.34±5.28

Table 3: Lower HbA1c = higher levels of Vitamin D.

Correlation between	**Pearson correlation values**
Vitamin D and FBS	–0.094
Vitamin D and HbA1c	–0.169

DISCUSSION

In Type 2 diabetics, vitamin D deficiency has a negative impact on glycemic management and bone health. A retrospective analysis was out at a hospital was conducted.74.2 percent of Type 2 diabetics have vitamin D deficiency, according to the American Diabetes Association. Ghavan and colleagues. Geographical dispersion, sun exposure, and eating trends are all factors that contribute to this phenomenon. They established a link between Vitamin D and hemoglobin A1C levels in the study group. Vitamin D and FBS levels in the study group were shown to be negatively linked. Kotwal et al. and Mehta et al. discovered results that were similar to theirs.

According to study, vitamin D regulates blood glucose levels as well as the use of glucose in target tissues. In both animals and humans, vitamin D has been shown to be associated with insulin production. Type 2 diabetes is caused by a combination of glycosuria and insulin resistance. Adequate vitamin D supplementation can be beneficial for persons who are at risk of developing diabetes. Vitamin D may also be beneficial in the prevention of long-term diabetes complications. The presence of Vitamin D insufficiency in diabetic individuals must be investigated. Vitamin D supplementation can help to prevent deficiency symptoms and the development of diabetes. More research is needed to assess the advantages of 4000 IU of Vitamin D, as well as the risks. Because the findings were based on a limited sample size, they cannot be applied to a larger population. It is recommended that larger sample sizes be used. Several studies have found a link between it and insulin resistance as well as cardiovascular disease and perhaps cancer. Vitamin D insufficiency lowers the chance of developing diabetes and improves glycemic control in those who have impaired glucose tolerance, according to research.

Because of the increase in Type 2 diabetes cases, immediate action is essential. There is currently limited research on the relationship between Vitamin D and HbA1c in Type 2 diabetes, particularly in Punjab. The current investigation was carried out at a tertiary care hospital with the goal of determining vitamin D levels in Type 2 diabetic patients and their relationship to HbA1c levels.

CONCLUSION

Clearly, vitamin D levels and HbA1c levels are inversely related.

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