The Association between Vitamin D3 and Ca levels with Diabetes Type one

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Abstract— *50 patients and 30 healthy controls in different gender are roughly selected in wide range of age between (18-80 years), taken from different private laboratories in Baghdad through the period (2021-2022). They were separated into two groups (male 39– female 11(patients)) (male 17- female 13) control and applied a vitamin D test and Ca level. This study is designed to investigate the possible association between Ca and Vit D3 levels and diabetes type one patient. A highly significant difference between the patient and healthy control in low Ca levels (p-value 0.0084 **) A highly significant difference between the patient and healthy control in normal Ca levels (p- value 0.0097 **) while no significant difference when the Ca level is high (p-value 0.894 NS). No significant difference between the patient and healthy control in Vit D3 deficiency group (p-value 0.083 NS) while there is a significant difference between the patient and healthy control in Vit D3 insufficient group (p- value 0.0392 *) while there is no significant difference in Suboptimal vit D3 level group (p-value 00.602 NS). Also there is no significant difference in optimal vit D3 level group (p-value 0.907 NS). The conclusion of this study suggests that Men may be more likely than women to develop type 1 diabetes within the area from which the samples were collected depending on the results. Smoking may also be an influential factor, regardless of gender. But also non-smoking people have the condition. Blood pressure was not a significant factor in this study. People with diabetes tend to have lower levels of calcium in their bodies than normal people. They also have insufficient levels of vitamin D compared to normal people.*

Keywords—*Diabetes, type 1 diabetes, Vit D3, Calcium*

I. INTRODUCTION

Diabetes is a permanent change in a person's internal chemistry that results in a significant increase in glucose levels in the blood, and the reason is due to a deficiency in the hormone insulin. As for the hormone, it is a chemical substance produced by an organ in the body (in this case the pancreas) in the bloodstream to have an effect on other parts of the body. [1] There may be a complete failure in the secretion of insulin, as in the first type of diabetes, and in the second type, there is often a partial failure in the secretion of insulin accompanied by a decrease in the body's response to the hormone, which is called insulin resistance [2]

Type 1 diabetes is (an autoimmune disease.) The autoimmune diseases are diseases that occur when the body's immune system works against one part of the body.

The characteristics of type one diabetes include the following

The immune system attacks and destroys the (insulin-producing beta cells) in the pancreas in (type 1 diabetes) The pancreas produces little or no insulin The patient with type 1 diabetes must take insulin daily throughout their life. Type 1 diabetes begin to develop in children and young adults, but it also can appear at any age. [3]

If type 1 diabetes is not diagnosed and treated early, the patient may enter a coma that may lead to his death. This phenomenon is known as diabetic ketoacidosis.

Vitamin D3

Evidence and studies demonstrate the role of vitamin D in insulin secretion, for example the presence of vitamin D receptors in B cells and together with vitamin D-binding

proteins in pancreatic tissues and the association between specific allelic differences in the vitamin D receptor and the vitamin D-binding protein supports genes carrying glucose and insulin secretion. It is believed that the mechanism of action of vitamin D in type 2 diabetes is carried out not only by regulating plasma calcium levels, which regulate insulin synthesis and secretion, but also by directly affecting the function of pancreatic beta cells. Insulin secretion can occur without a change in glucagon secretion. The effects of vitamin D deficiency on insulin and glucagon secretion in isolated quenched rat pancreas were obtained by radioimmunoassay for secreted proteins. During 30 minutes of perfusion with glucose and arginine, the pancreas of vitamin D-deficient mice showed a 48 percent reduction in insulin secretion compared to the pancreas of vitamin D-deficient mice that were resupplied with vitamin D Calcium [2]

Calcium

Many scientific researches indicated that calcium has a role in regulating the level of sugar in the blood. It helps the hormone insulin to perform its function by increasing the sensitivity of insulin receptors on the cell surface, and stimulating the pancreas to secrete insulin.

And that the deficiency in the level of calcium can cause the occurrence of diabetes through its effect on the action of insulin. [1]

Scientific studies have indicated that CaV3.1 channels play an important role in healthy beta cells that secrete insulin in the pancreas, but they become hyperactive with diabetes, The increase in the activity of these channels leads to an excessive flow of calcium, which leads to impaired gene expression of "exocytotic" proteins in beta cells, and this leads to a decrease in insulin secretion in beta cells.

And there is a relationship that combines calcium with vitamin D3 and with diabetes. Vitamin D3 plays an influential role in the accumulation of calcium within cells in re-forming the surrounding insulin resistance. [3]

Vitamin D3 deficiency and diabetes

Some medical studies have indicated a relationship between vitamin D3 and diabetes, as those who suffer from vitamin D3 deficiency are more likely to develop type 1 and type 2 diabetes, as vitamin D3 deficiency reduces immune cells and thus leads to weakness in insulin secretion. [4]

Aim of study

The objective of this study is to prevalence of measuring the percentage of decrease and increase in vitamin D3 and Ca between patient with diabetes type one in Baghdad / Iraq.

II. MATERIALS AND METHODS

50 patients and 30 healthy controls in different gender are roughly selected in wide range of age between (18-80 years) and took from different private laboratories in Baghdad through the period (2021-2022). They were separated into two groups (male 39– female 11(patients)) (male 17- female 13) control and applied a vitamin D test and Ca level.

The test can be performed with serum:

Following standard procedure, collect a venipuncture whole blood specimen using blood collection tube Test is performed immediately after the specimens have been collected, without leave the specimens at room temperature for prolonged period. Specimens are stored at 2 - 8 C for up to 4 days for long-term storage; specimens are kept below -20 C.

The kit of (Ichroma™ Vitamin D Control) was used and using I Chroma II devise, for Vit D estimation .

And the kit of (AGAPPE calcium kit), and using I-Chamber devise for calcium estimation

Also the kit of (AGAPPE glucose kit) was used after separating the serum, and using mindray BA-88 A devise for glucose level estimation.

III. STATISTICAL ANALYSIS

The Statistical Analysis System- SAS (2012) program was used to detect the effect of different factors in study parameters. Chi-square test was used to significant compare between percentage (0.05 and 0.01 probability) in this study. (5).

IV. RESULTS

A total of 80 subjects were used in this study for analysis of the Relationship between vit D3 and Ca Our comparative statistic study in 50 patients **(39 male and 11female)** and 30 healthy control **(male 17- female 13)** showed at an average age of 36±18 of infected patients and 37±18 years of uninfected controls (Table 4-1). Individuals were all tested for Glucose by using the kit of (AGAPPE glucose kit) after separating the serum, and using mindray BA-88 A devise confirmation of diabetes type one. Risk factors such as the Smoking and blood pressure status of both groups, as well as the D3 levels and the Ca levels as showed in table (1).

Table (1): Clinical data and risk factors of studied subjects of patients Infected Diabetes type 1and uninfected controls.

Variable	Diabetes type 1	Healthy control	P-value
Age (year)	36±18	37±18	0.882 NS
Gander			
Male	39 (78%)	17 (56.67%)	0.0073 **
Female	11 (22%)	13 (43.33%)	0.794 NS
Smoking			
Smoker	16 (32%)	9 (30.00%)	0.0265 *
Nonsmoker	34 (68%)	21 (70.00%)	0.0053 **
Blood pressure			
Yes (high)	5 (10%)	4 (13.33%)	0.731 NS
No (normal)	45 (90%)	26 (86.67%)	0.0069 **
D3 Levels	37.2±11.3	40.2±16.5	0.603 NS
Ca levels	10.4±6.2	10.4±8.7	0.916 NS
* (P≤0.05), ** (P≤0.01).			

Measurements of Ca levels in Diabetes type one patient and healthy control

A total of 70 samples including 50 Diabetes type one patient (39 male and 11female) and 30 healthy uninfected controls (male 17- female 13) were enrolled in this study. A summary of the results of the Ca levels in both patina and control is shown in Table 4-2. Representative Images of detection of the levels of Ca (4-1).
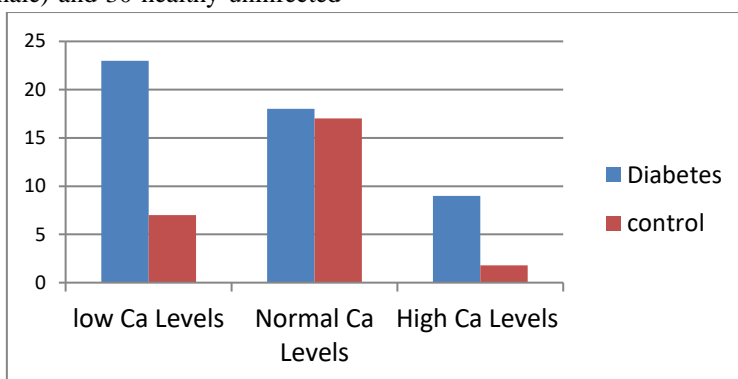

Fig.1: A summary of the Ca levels in both patient and control

Table (2): A summary of the Ca levels in both patient and control

Ca levels	Diabetes	Control	P-value	OR (95%)
Low <8.5	23 (46.00%)	7 (23.33%)	0.0084 **	1.28 (0.72-1.94)
Normal 8.5-10.2 mg/dl	18 (36.00%)	17 (56.67%)	0.0097 **	1.07 (0.65-1.71)
High 10.2<	9 (18.00%)	6 (20.00%)	0.894 NS	0.261 (0.093-0.72)
** (P≤0.01).				

Measurements of D3 levels in Diabetes type one patient and healthy control

A total of 70 samples including 50 **Diabetes type one patient (39 male and 11female)** and 30 healthy uninfected controls **(male 17- female 13)** were enrolled in this study. A summary of the results of the D3levels in both patina and control is shown in. Representative Images of detection of the levels of D3.
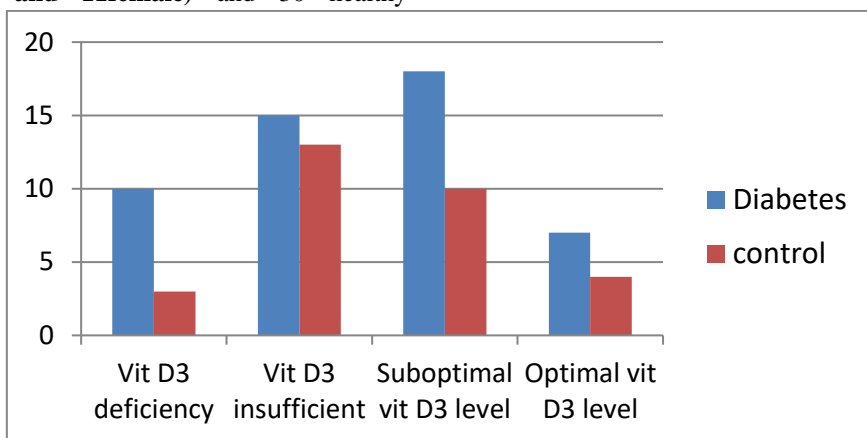

Fig.2. A summary of the D3 levels in both patient and control

Table (3): a summary of the D3 levels in both patient and control

D3 level	Diabetes	Control	P-value	OR (95%)
<12 ng/ml Vit D3 deficiency	10 (20.00%)	3 (10.00%)	0.083 NS	0.147 (0.06-0.296)
12-20 Vit D3 insufficient	15 (30.00%)	13 (43.33%)	0.0392 *	0.704 (0.39-1.58)
20-30 Suboptimal vit D3 level	18 (36.00%)	10 (33.33%)	0.602 NS	0.224 (0.092-0.537
30-50 Optimal vit D3 level	7 (14.00%)	4 (13.33%)	0.907 NS	0.084 (0.031-0.251)
* (P≤0.05).				

V. DISCUSSION

This study is designed to investigate the possible association between Ca and Vit D3 levels and diabetes type one patient. A highly significant difference between the patient and healthy control in low Ca levels (p-value 0.0084 **) as in (Zhu, J., Xun, P *et.el...*) A highly significant difference between the patient and healthy control in normal Ca levels (p- value 0.0097 **) as in (Al-Yassin, Hussein *et. el.*) while no significant difference when the Ca level is high (p-value 0.894 NS).

No significant difference between the patient and healthy control in Vit D3 deficiency group (p-value 0.083 NS) while A significant difference between the patient and healthy control in Vit D3 insufficient group (p- value 0.0392 *) as in (Mathieu, C., Gysemans, C. *et. et.)* while no significant difference in Suboptimal vit D3 level group (p-value 00.602 NS). Also no significant difference in Optimal vit D3 level group (p-value 0.907 NS) as in (Pittas, A. G., & Dawson-Hughes *et..el..*)

VI. CONCLUSION

The conclusion of this study suggests that Men may be more likely than women to develop type 1 diabetes within the area from which the samples were collected and depending on the results. Smoking may also be an influential factor, regardless of gender. But also non-smoking people have the condition. Blood pressure was not a significant factor in this study. People with diabetes tend to have lower levels of calcium in the body than normal people. They also have insufficient levels of vitamin D compared to normal people

REFERENCES

[1] Jaffe, L. F. (1983). Sources of calcium in egg activation: a review and hypothesis. Developmental biology, 99(2), 265-276.

[2] Brownlee, M., VLASSARA, H., & Cerami, A. (1984). Nonenzymatic glycosylation and the pathogenesis of diabetic complications. *Annals of internal medicine*, *101*(4), 527-537.

[3] Fujita, T. (2000). Calcium paradox: consequences of calcium deficiency manifested by a wide variety of diseases. Journal of Bone and Mineral Metabolism, 18(4), 234-236

[4] Slawson, D. L., McClanahan, B. S., Clemens, L. H., Ward, K. D., Klesges, R. C., Vukadinovich, C. M., & Cantler, E. D. (2001). Food sources of calcium in a sample of African-American and Euro-American collegiate athletes. International journal of sport nutrition and exercise metabolism, 11(2), 199-208.

[5] Mellitus, D. (2005). Diagnosis and classification of diabetes mellitus. Diabetes care, 28(S37), S5-S10.

[6] Pittas, A. G., Lau, J., Hu, F. B., & Dawson-Hughes, B. (2007). The role of vitamin D and calcium in type 2 diabetes. A systematic review and meta-analysis. The Journal of Clinical Endocrinology & Metabolism, 92(6), 2017-2029.

[7] Zhu, J., Xun, P., Bae, J. C., Kim, J. H., Kim, D. J., Yang, K., & He, K. (2019). Circulating calcium levels and the risk of type 2 diabetes: a systematic review and meta-analysis. *British Journal of Nutrition*, *122*(4), 376-387.

[8] Al-Yassin, D. A. M. H., Hussein, A. M., Ali, T., & Dohan, C. E. (2009). Calcium and diabetes mellitus type Two a prospective study done on people with type 2 diabetes in Diwaniya teaching hospital. *Kufa Med. J*, *12*(1), 468-475.

[9] Mathieu, C., Gysemans, C., Giulietti, A., & Bouillon, R. (2005). Vitamin D and diabetes. *Diabetologia*, *48*(7), 1247-1257.

[10] Pittas, A. G., & Dawson-Hughes, B. (2010). Vitamin D and diabetes. *The Journal of steroid biochemistry and molecular biology*, *121*(1-2), 425-429.